Exploring the diagnosis and correction of vocal faults encountered during the training of the classical singing voice

by

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Abstract

The aim of this study is to provide a framework to diagnose and correct vocal faults encountered in the training of the classical singing voice with regard to the foundational aspects of classical vocal technique. The study follows a qualitative research approach to investigate and interpret authoritative literature sources. The research problem of this dissertation is approached by means of a narrative literature review and is conducted within an interpretive paradigm.

The investigation of the diagnosis and correction of vocal faults revealed that: Firstly, the foundational aspects of classical vocal technique include dynamic body alignment, breath management, phonation, resonation, articulation, registration and vibrato. Secondly, vocal faults are directly linked, or can be traced directly to the interdependent foundational aspects of classical vocal technique. Thirdly, vocal faults occur when sound is produced in such a way that it can cause temporary or permanent damage to the voice and occur when the foundational aspects involved in the act of singing are employed incorrectly.

It is recommended that voice teachers assist singing students to understand the foundational aspects of the complex and intricate processes underlying the classical vocal technique to produce healthy vocal sound. Also, exercises that are employed to assist in the correction of vocal faults must focus on creating a healthy balance within the processes of the foundational aspects of classical vocal technique to prevent hyper- or hypo-functionality.

Keywords

Articulation

Breath management

Classical singing

Dynamic body alignment

Foundational aspects

Phonation

Registration

Resonation

Vibrato

Vocal fault

Vocal technique

Vocal training

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Chapter 1 Introduction

1.1 Background to the study

As a singer there are many questions one comes across while learning or teaching the art of singing. When I was a voice student receiving practical and theoretical training in classical voice performance, I became aware of the complexity of the singing process. As a voice teacher I soon realised, while teaching beginner students, that there was a need to explain this complexity to students in an understandable and useful manner. McKinney (1994:31) states that a singer's main guides are sensations, because unlike most other musicians, singers cannot see where their sound originates; a singer cannot physically take apart his or her instrument to find out how it works and then reassemble it.

As part of a BMus third-year project, our class created a summarised manual, based on existing literature, for voice teachers to accurately and easily identify vocal faults made by beginner students. The project served as a structural framework for my final year research essay. Due to the limitations of that study, not all the foundational aspects of the singing process could be investigated and analysed. In the present study, the research was extended to include all the foundational aspects, namely: dynamic body alignment, breath management, phonation, resonation, articulation, registration and vibrato (Patenaude-Yarnell, 2004:491-495). Furthermore, the study is not limited to the identification of the causes of vocal faults, but includes an overview of corrective procedures as well as physical and vocal exercises that could be applied to remedy vocal faults.

The premise of this study is that a fault can only be corrected if its cause is properly understood. According to Sataloff (2008:467), a singer must strive to understand his or her voice in order to recognise its delicacy and prevent vocal damage. The preeminent vocal pedagogue Karyn O'Connor (2017a:1) agrees, stating that a voice student who is aware of how the voice is produced and who understands the physical processes involved has a deeper appreciation of his or her complex and delicate instrument and treats it with greater care. O'Connor goes on to explain that singers often do not understand the technicalities of healthy voice production and the physical demands that are put on the human body when producing sound. Often the early diagnosis of a vocal fault can have a positive outcome, resulting in better technique and future

resilience due to the fact that more time was spent on addressing the vocal fault and the vocal rehabilitation process (Milo, 2014:17).

This study is presented as a narrative review to develop a framework which will assist in diagnosing and correcting vocal faults encountered in the singing process. Firstly, emphasis is placed on understanding the foundational aspects of vocal technique involved in the production of the classical singing voice, namely dynamic body alignment, breath management, phonation, resonation, articulation, registration and vibrato (Patenaude-Yarnell, 2004:491-495). Secondly, a framework is proposed with which to analyse and interpret frequently encountered vocal faults and symptoms in terms of these aspects. Lastly, corrective procedures and exercises are suggested to assist in remedying these vocal faults. This will assist classically trained singers and voice teachers to diagnose vocal faults and apply corrective techniques and exercises to produce a healthy vocal sound.

1.2 Purpose of the study

The purpose of this study is to provide a framework with which to diagnose and correct vocal faults with regard to the foundational aspects of vocal technique encountered in the training of the classical singing voice.

1.3 Research questions

1.3.1 Main research question

How can vocal faults encountered during the training of the classical singing voice be diagnosed and corrected?

1.3.2 Secondary research questions

In order to answer the main research question, it is necessary to conduct an investigation into the following secondary research questions:

- What are the foundational aspects of vocal technique for classical singing?
- What are frequently encountered vocal faults?
- How can such vocal faults be diagnosed?
- What corrective procedures can be employed to address these faults?

1.4 Research design and methodology

This literature-based study follows a qualitative research approach and uses mainly secondary sources. As mentioned previously, the study of vocal technique for classical singing is an intricate matter. Although current literature on voice studies acknowledge the phenomenological and cultural domains of the human voice, the available research does not provide a simplified, systematic breakdown of this complexity.

The underlying assumptions of this study are firstly, that there are a limited number of clearly identified vocal faults typically encountered in the training of the classical singing voice, secondly, that the respective vocal faults are caused by the inappropriate application of the physical aspects related to voice production, and thirdly, that there are exercises and corrective procedures to assist in remedying of these vocal faults. What is lacking is a framework to assist in determining the origin of various causes of specific vocal faults and possible corrective vocal and physical procedures that can be applied accordingly. An in-depth study of the available literature addressing these issues was conducted with the view to summarising the findings and suggestions of various authors in one document. Therefore, the research problem of this dissertation is approached by means of a narrative literature review and is conducted within an interpretive paradigm. This study is aimed at developing a thorough understanding of vocal sound production for singing, the causes of vocal faults and a handy framework of physical and vocal corrective procedures to remedy such faults.

1.5 Delimitations of the study

This is not a step-by-step guide to the diagnosis and correction of vocal faults encountered during the training of the classical singing voice. The content serves only as guidelines and does not provide solutions or corrective medical procedures for permanent injuries to the vocal tract. It does not discuss all the aspects of the singing process, but focuses on the key foundational aspects. The content does not include general vocal exercises to warm up the voice or vocal and physical exercises to be used by every singing student at any given time, but suggests exercises to assist in the correction of specific vocal faults encountered in individual students. The study does not discuss the different schools of singing as it falls outside the scope of the study, but is approached and built on the framework of the American-Italian school of singing.

1.6 Value of the study

As stated by Miller (1996:7), one of the main issues that most voice teachers encounter is the challenge of correcting a student's vocal faults. He is of the opinion that it can only be done through careful guidance and a clear understanding of the various aspects entailed in the singing process. Great vigilance and cautious consideration are involved in explaining the singing process as well as specifically designed vocal and physical exercises to aid in the correction of vocal faults. Because there are so many types and causes of vocal faults, voice teachers must have sufficient knowledge to assist in the correction of faults as they are encountered during the lesson. It is of the utmost importance that vocal faults are corrected as soon as possible, for the longer they are allowed to continue, the more damage they will do to the voice.

This research study therefore highlights factors which might contribute to the cause of vocal faults, methods of correction of these faults and specifically selected vocal and physical exercises to aid and serve as guidelines in the process of correcting the vocal faults encountered. A thorough yet easily understandable explanation is included which explains the process of how vocal sound is produced. This is a convenient summary which can be used by teachers to explain the act of singing to the student in a clear and concise way. It will also make students aware of the reasons for the occurrence of specific vocal faults.

1.7 Chapter outline

Chapter 1 provides an overview of the background to the study and introduces the foundational aspects of classical vocal technique. This chapter also discusses the aims and value of the study. Chapter 2 expounds the research methodology of the study, and Chapter 3 explains each of the foundational aspects of classical vocal technique regarding how they contribute towards producing classical vocal sound. Chapter 4 discusses the causes of typical vocal faults encountered during the training of the classical singing voice and the respective symptoms of these faults. Chapter 5 provides corrective procedures for the vocal faults mentioned in the previous chapter as well as desirable qualities of the foundational aspects. Chapter 6 summarises this study and gives conclusions of the research findings as well as suggestions for further research. As this study is a literature-based narrative review, which in itself is the main body of the document discussed in Chapters 3 to 5, there is no separate literature review chapter.

Chapter 2 Research methodology

2.1 Introduction

In this chapter the research methodology that underpins the study is discussed with regard to the research approach, research design and data collection techniques and the interpretation thereof, as well as any ethical implications that may be involved in the study.

2.2 Research approach

This literature-based study follows a qualitative research approach which, according to Creswell (2013:47-48) and Nieuwenhuis (2010:79), is appropriate when a complex and detailed understanding of the issue at hand is required and when already established information does not fully capture the complexity of the issue. The study of vocal technique for classical singing is an intricate matter. This study is therefore aimed at developing a thorough understanding of vocal sound production for singing and the causes of vocal faults, as well as physical and vocal corrective procedures by means of a handy framework.

Although current literature on voice studies acknowledges the phenomenological and cultural domains of the human voice, this study is conducted within an interpretive paradigm to provide and assist the vocal instructor with a framework to correctly identify and diagnose the cause of vocal faults. Interpretive refers to analysing, simplifying and paraphrasing sources to ultimately understand a specific issue (Tulloch, 1993:798). Denzin and Lincoln (2011:3) explain that an interpretive paradigm is often applied in qualitative research to make sense of a phenomenon. Paradigm is defined by Creswell (2013:299) as the philosophical stance taken by the researcher that provides a set of beliefs that guides the action, whereas Nieuwenhuis (2010:47) defines it as a set of assumptions or opinions about the fundamental aspects of reality.

2.3 Research design

This study is literature-based, and makes use of mainly secondary sources which, as Kumar (2014:196) explains, refer to data which have already been collected by someone else and from which the required information is extracted.

After investigating the existing literature, it was clear that primary research has proven that different technical deficiencies may lead to specific vocal faults. What is lacking is a framework to assist in the understanding of the origin of various causes of specific vocal faults and potential corrective vocal and physical procedures that can be applied accordingly. Therefore, the research problem of this study is approached by means of a narrative literature review to create a framework for interpreting vocal faults and determining their symptoms, diagnosis and corrective procedures.

A narrative review focuses on the background and contextual material of existing studies by experienced authors, and critically assessing their theories and outcomes. The author of a narrative review selects applicable literature to assess in order to contribute towards a better the understanding of his or her own research problem, thereby gaining assurance that the review presented and the information it contains is comprehensive and unbiased (Garg et al. 2008:253; Jesson et al. 2011:15).

2.4 Data collection techniques

According to Bak (2004:24), rigorous research does not necessarily have to include empirical data collection but can also be purely theoretical. Academic texts most suitable to the research problem were collected by consulting books, journals, articles, dissertations and, where necessary, retrieving the most current information from websites and online blogs by reputable voice teachers and specialists in vocal pedagogy, the foundational aspects of the vocal process, vocal faults, symptoms and their causes, as well as cures and remedies for vocal faults. Information that was collected focused on the classical singing technique specifically as this technique serves as the foundation for most other styles of singing (Balistreri, 2012:1). Relevant sources that are directly related to the research problem, such as *The Diagnosis and Correction of Vocal Faults* by James C. McKinney, were selected and interpreted in terms of the understanding of vocal sound production to form a concise, historically grounded approach that addresses the problems likely to be encountered in singing tuition as referred to in the background to this study. Outdated resources were avoided, as was information that had no valid accreditation.

2.5 Interpretation of data

As mentioned previously, the research methodology employed for this study consists of a narrative review of literature published by various experts in the field of vocal pedagogy to ensure that the research problem was assessed from a number of perspectives. Their approaches were interpreted with the view to identifying commonalities that were used to form the basis of an interpretive framework with which to diagnose and correct vocal faults. The information obtained was cross-checked, reviewed and summarised to ensure the validity and applicability of the proposed approach to diagnosing and correcting vocal faults.

2.6 Ethical considerations

There are no ethical considerations to this study as the research consisted of a narrative literature review. However, the application of the study to the field of teaching for which it is intended is subject to the ethical constraints inherent in that field. All sources used are referenced in accordance with university policy, and it was endeavoured not to misrepresent them.

Chapter 3 The foundational aspects of classical vocal technique

3.1 Introduction

According to Patenaude-Yarnell (2004:491-495), the most frequent technical problems and vocal faults encountered when working with young singers are directly linked to the foundational aspects of classical vocal technique, namely dynamic body alignment, breath management, phonation, resonation, articulation, registration and vibrato. This chapter reviews the existing literature based on these foundational aspects, which are discussed individually with regard to what they are and how they contribute to producing classical vocal sound.

3.2 Dynamic body alignment

McKinney (1994:33) states that sufficient dynamic body alignment is essential to create the right conditions for coordinating all the elements involved in the vocal process and for the muscles in the body to move freely and efficiently, as the body functions best when the right conditions are present. Ware (1998:49) adds that the physical appearance of a singer with the correct body alignment should be graceful and attractive.

The spinal cord is a cable of nerve fibres which descends from the brain, passing through a loop behind each vertebra. From there it branches out to all parts of the body. This enables the body to send signals from the brain directly to specific muscles to control physical actions, receive signals from the tactical sensory areas, and return signals to the brain for appropriate muscular response (Bickel, 2008:13-14). Bickel and Slater (1990:8-9) explain that the spine consists of 24 vertebrae. The vertebrae rest on top of each other and are connected by supportive tissue. The 24 vertebrae consist of 7 cervical vertebrae located in the neck, 12 thoracic vertebrae located in the thoracic cavity and 5 lumbar vertebrae located in the lower back. Ware (1998:74) mentions that the lowest lumbar vertebrae connect to the pelvis, which consists of the sacrum and coccyx bone. The vertebrae increase in size from the smallest in the neck to the largest in the small of the back.

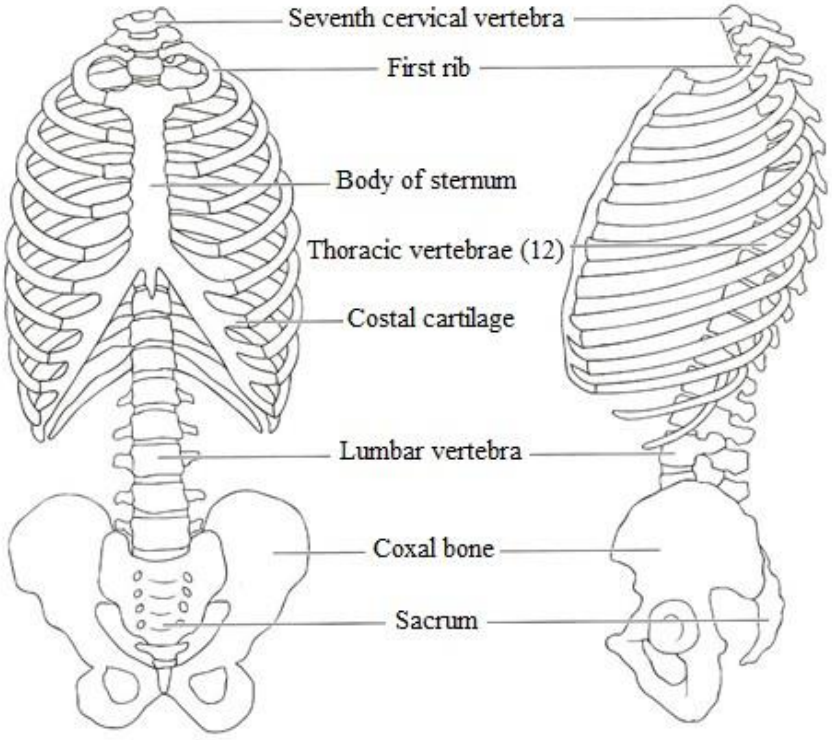


Figure 1: Skeletal framework of the human body
Source: Ware 1998:75

The thoracic cavity consists of 24 ribs, also known as costae, which creates a semicircle around the body that protects the heart and lungs within. Bickel (2008:14) and Ware (1998:75) explain that the costae are composed of bone with a section of cartilage connecting the upper 7 thoracic costae to the sternum, also known as the breast bone. This cartilage cushions the joining of the two bones, absorbing shock, weight and body movement. Costae 8, 9 and 10 are not connected to the sternum, but are connected to the cartilage above, whereas costae 11 and 12 are shorter than the other costae and have very little cartilage. Because they are not connected to the sternum, they are known as floating costae (Bickel, 2008:14; Slater, 1990:9).

3.3 Breath management

McKinney (1994:53) states that breath support is the dynamic relationship between the muscles of exhalation and inhalation, which serves the purpose of supplying enough breath pressure to the vocal folds to sustain the desired pitch or dynamic level. Many singing teachers, including myself, prefer to call this process regulating airflow ‘breath management’, as it suggests a deliberate and successful coordination or skillful directing of attention and energy towards the

utilisation of breathing. Therefore, in this study I will henceforth refer to the breathing process as 'breath management' and not 'breath support'.

According to Dayme & Vaughn (2008:284), breathing for speaking is the subconscious process of taking air into and expelling it from the lungs. In a more wholistic approach to breathing, Smith (2007:34) explains that the process of breathing for speaking is a subconscious act that we employ when we have the desire to communicate. Subconsciously our bodies know that if we do not breathe deeply enough when attempting to communicate, we will run out of breath, resulting in our not being able to communicate at all.

There is a difference between communicating through speech and singing. In speaking, inhalation and exhalation are shallow because our bodies do not require as much air, whereas for singing our bodies require more air, which results in a deeper, more rapid inhalation process and a slow and steady exhalation process as phrases are sung (O'Connor, 2017c:1). The air pressure which occurs in the vocal tract varies with regard to the amount of breath passing between the vocal folds, causing them to vibrate. Singing is an extension of speech which allows each vocal vibration to continue for a longer period of time to sustain the tone, whereas speaking requires small amounts of air and less rigorous breath management (Bickle, 2008:57).

Breath management in singing refers to the way in which various parts of the body are used in combination with the function of the lungs and larynx to produce desired results such as better tone production, the ability to sing extended phrases and the ability to sustain notes for longer. Two important aspects of breath management are regulating the pace and amount of air that is allowed out of the lungs and pushed past the vocal folds, as well as ensuring that this stream of air is steadily maintained. The rate of breathing is determined by how much air the body needs; thus it varies depending on what we are doing (McKinney, 1994:46; O'Connor, 2017c:1).

Bickel (2008:44) and Smith (2007:37) state that the muscles for singing combine the voluntary, involuntary and the voluntary/involuntary muscles. In other words, some muscles can be controlled consciously or unconsciously, whereas other muscles function automatically. For example, you can control your breathing or allow it to function completely automatically, as when sleeping. For singing it is very important to learn how to consciously control all the breathing functions that we are physically able to control.

The primary role of the respiratory mechanism is to provide a series of conduits and organs that are responsible for exchanging the gases from the atmosphere and the blood circulating through the alveoli in the lungs (Ware, 1998:72). According to Bickel (2008:19-20), singing requires the full range and capacity of the lungs. Therefore, singers continuously strive to develop full lung capacity and conscious control of the process of breathing.

The lungs are cone-shaped porous structures situated in the thoracic cavity, resting on the surface of the diaphragm (Slater, 1990:9). Ware (1998:77) adds that the lungs are lined with a closed sac of smooth, moist and elastic membrane, known as the pleura, which serves as a double lining for the lungs. The space between this double lining is filled with a liquid which has a negative internal pressure, causing the two pleurae to be sucked together in order to enable the lungs as well as the rib cage to expand and contract.

Air movement from the larynx to the lungs passes first via the trachea, a flexible, cylindrical, cartilaginous pipe, to the two bronchi within the lungs, which subdivide into millions of ever-narrowing bronchioli that terminate the alveolar sacs where they exchange carbon dioxide and oxygen (O'Connor, 2017f:1; Ware, 1998:77). When explaining the functions of the lungs to my students, I use the same description as Sundberg (1987:27), who compares it to blowing up and deflating a balloon. Similar to a balloon, the lungs continuously attempt to shrink. The lungs are prevented from shrinking by the vacuum that they are hanging in. When filled with air, the lungs tend to deflate and reduce this volume of air with force. The level of force is determined by the amount of air in the lungs. The lungs make use of an entirely passive expiratory force which is increased with the amount of air that is inhaled.

The lungs and the thorax work together as a unit as their movement is dependent on the musculature around them. Furthermore, the thorax, also known as the rib cage, is one of the most important parts of the human anatomy for singers. Not only does it house the lungs and heart, but is also required for the use of the air pressure which is established in the thoracic cavity (Bickel, 2008:14, 20).

The intercostal muscles are considered the most important muscles within the thorax as far as singing is concerned (which O'Connor (2017f:1) and Ware (1998:80) agree is the case), as their main purpose is to assist with inhalation and exhalation. These muscles are located between the ribs or costae, and get their name from the prefixes 'inter' (meaning 'between') and 'costae'

(meaning ‘ribs’). Bickel (2008:15-16) and Dayme & Vaughn (2008:287) state that almost all the muscles in the human body come in pairs, with each muscle coordinating with its paired muscle to result in movement. This is known as muscular antagonism. The two pairs of muscles that form the intercostal muscles are the internal intercostal muscles and the external intercostal muscles, consisting of two muscles each.

The *internal* intercostal muscles are considered the primary muscles that assist with *exhalation* (Ware, 1998:81). They originate from a lower rib, inserted into a higher rib, upward and outward from the backbone. Bickel (2008:15) adds that these muscles are responsible for pulling the ribs downwards. In this position they create an inner layer of muscles attached to the external intercostal muscles. The *external* intercostal muscles are considered the primary muscles that assist with *inhalation* (Ware, 1998:80). They originate from a higher rib, inserted into a lower rib, diagonally and away from the backbone. Bickel (2008:15) explains that these muscles are responsible for pulling the ribs upwards, thus increasing the size of the thoracic cavity.

Dayme & Vaughn (2008:289) explain that together the internal intercostal muscles and the external intercostal muscles coordinate to create actions to contract and expand the thorax, in other words exhaling and inhaling. The intercostal muscles as a whole can be developed for maximum exhalation and inhalation during the phonation process.

In addition to the intercostal muscles, there is one other muscle that is considered the most important muscle in the breathing process, namely the diaphragm (Dayme & Vaughn, 2008:289). Ware (1998:78-79) and Slater (1990:8) explain that the diaphragm can be seen as the floor of the thorax and is considered the foundation of breath management in singing. It separates the upper body cavity (thoracic cavity) from the lower body cavity (abdominal cavity). At its highest point, this large double-dome-shaped muscle is attached to the pericardium, which is the sac that contains the heart muscle. At its lowest point it is attached to costae 11 and 12 (Bickel, 2008:16).

The diaphragm is arched high in the thoracic cavity when relaxed, but lowers towards the abdominal cavity in a downward and forward motion, flattening out as it contracts (Smith, 2007:35, 37). Thus the floor of the thorax is lowered, increasing its size and allowing the lung volume to expand during inhalation. The abdominal muscles contract, which allows the

abdomen to move forward and outward in response, creating space for the descending diaphragm. Bickel (2008:16) agrees and adds that during exhalation the diaphragm returns to its high arched, dome-shaped position within the thoracic cavity as it is gently pushed up as a result of the relaxing the abdominal cavity. This results in the lungs compressing and expelling air (Slater, 1990:30). Therefore, the volume of the lungs is dependent on the activity of the abdominal wall muscles.

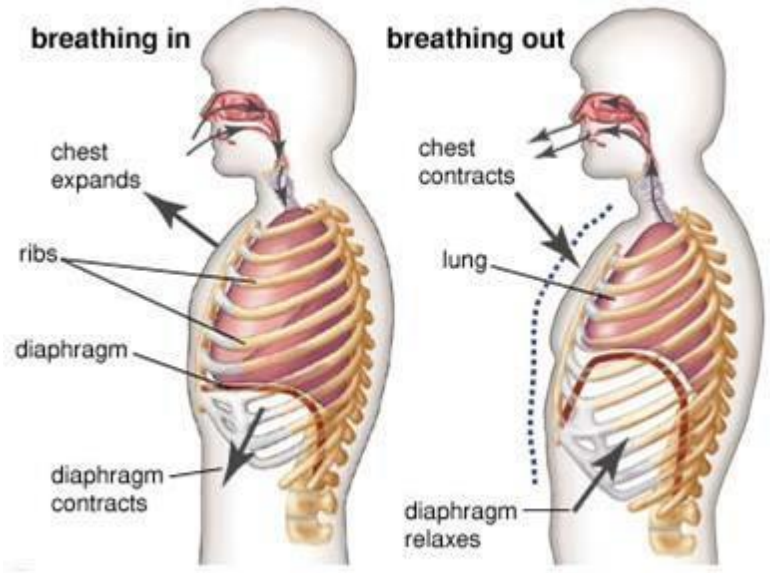


Figure 2: Movement of the diaphragm during inhalation and exhalation
Source: Banis, 2012:1

Smith (2007:37) points out that during the breathing process there should be no muscular activity above the diaphragm other than the activities mentioned, because when the body is correctly aligned the chest will already be expanded as much as necessary. There is only one exception in the case of the natural movement of the shoulders. The shoulders are located above the thorax and consist of the collarbones (clavicles) and the two shoulder blades (scapulae). The clavicles are attached to the top of the sternum by ligaments. As a whole, the shoulders are connected to the costae by various muscles which influence the breathing process when they pull on the costae (Bickel, 2008:20).

3.4 Phonation

Phonation is the process during which airflow from the lungs are released and converted into audible vibrations when meeting the resistance of the vocal folds. The vocal folds, situated within the larynx, are pushed apart by the airflow caused by exhalation and brought together by means of the inter-arytenoid muscles that pull the two arytenoid cartilages together (McKinney, 1994:76; Ware, 1998:178). The larynx is capable of performing the various necessary functions of singing through a complex coordination of musculature, cartilage and bone. Bickel (2008:58) mentions that these functions include starting and stopping tones, establishing particular pitches, changing dynamic levels and changing the tone colour of a specific pitch.

According to Nave (2012:1) there are three major theories on the process of phonation:

- The myoelastic theory
- The neurochronaxic theory
- The aerodynamic theory.

McKinney (1994:76) describes the myoelastic theory as the process whereby the vocal folds are brought together by means of negative air pressure that is applied to them from underneath, also known as subglottic pressure. The subglottic pressure intensifies until it becomes sufficient to push the vocal folds apart, allowing the air to escape. The escape of air results in a decrease in pressure beneath the vocal folds, allowing the muscle tension recoil to pull the vocal folds back together again. Breath pressure builds up once again, and the cycle is repeated. The pitch of the phonated sound is determined by the rate at which the vocal folds open and close.

According to Pate (2011:1) the neurochronaxic theory states that the pitch of the phonated sound is determined by the chronaxy of the recurrent nerve, and not by breath pressure, muscular tension or the rate of vibration of the vocal folds. McKinney (1994:77) agrees and explains that at the time the neurochronaxic theory was thought to be a valid explanation of the phonatory process. Advocates of this theory believed that the vibration of the vocal folds was a result of an impulse from the recurrent laryngeal nerves and that the acoustic core in the brain regulated the speed of vocal fold vibration. Speech and voice scientists began questioning the assumption that vocal folds vibrate out of phase, as the left laryngeal nerve of the vocal folds

is longer than the right laryngeal nerve. Therefore, nerve impulses on the left side should take longer than those on the right side, proving that the vocal folds cannot vibrate out of phase.

The neurochronaxic theory was dispensed with when the following facts were proven:

- The laryngeal nerve muscles are unable to contract fast enough to accomplish the vibration (McKinney, 1994:77).
- People with paralysed vocal folds and those who had tracheotomies (a surgical procedure of making a hole in the trachea to assist in breathing) can phonate, proving that phonation does not affect neural impulses per se, and that air pressure is an essential component of phonation (Pate, 2011:1).

The aerodynamic theory is based on the Bernoulli Effect and is explained by McKinney (1994:76) as follows: When breath flows through the glottis, the arytenoid cartilages are pulled together by the inter-arytenoid muscles. This creates a push-pull effect on the vocal fold tissues, which maintain self-sustained oscillation. The push occurs during glottal closing when the glottis is convergent, whereas the pull occurs during glottal opening when the glottis is divergent. During glottal closure, the air flow is cut off until breath pressure pushes the folds apart and the flow starts up again, causing the cycles to repeat.

The most widely accepted model of voice production today according to Pate (2011:1) is the myoelastic-aerodynamic theory, which combines muscle force from the myoelastic theory and tissue elasticity and air pressure from the aerodynamic theory. It can be understood as follows: Medial compression keeps the vocal folds closed, which results in increased subglottal air pressure. When this air pressure becomes sufficient, it overcomes the resistance of the closed vocal folds and pushes them apart. Air passes through the vocal tract, causing the vocal folds to vibrate. The elasticity of the vocal folds allows them to recoil back to their closed position, forming a narrow space on the way. The velocity of the air is increased, and the air pressure is decreased (Bernoulli Effect). This creates a vacuum which finally closes the vocal folds, and the process is repeated.

During the phonatory process, the larynx serves as a valve and sound producer (McKinney, 1994:65). Other functions of the larynx include keeping air in the lungs, preventing foreign matter from entering the lungs and assisting in the breathing process. The larynx is situated at the top of the trachea and resembles a signet ring.

Slater (1990:12) states that the skeletal framework of the larynx contains the hyoid bone and five cartilages, namely the thyroid, cricoids, two arytenoids and the epiglottis. The hyoid bone is attached to the base of the tongue and is therefore affected by the tongue's movement. It is signet shaped, opening at the back of the throat. The thyroid cartilage is suspended from it (O'Connor, 2017f:2).

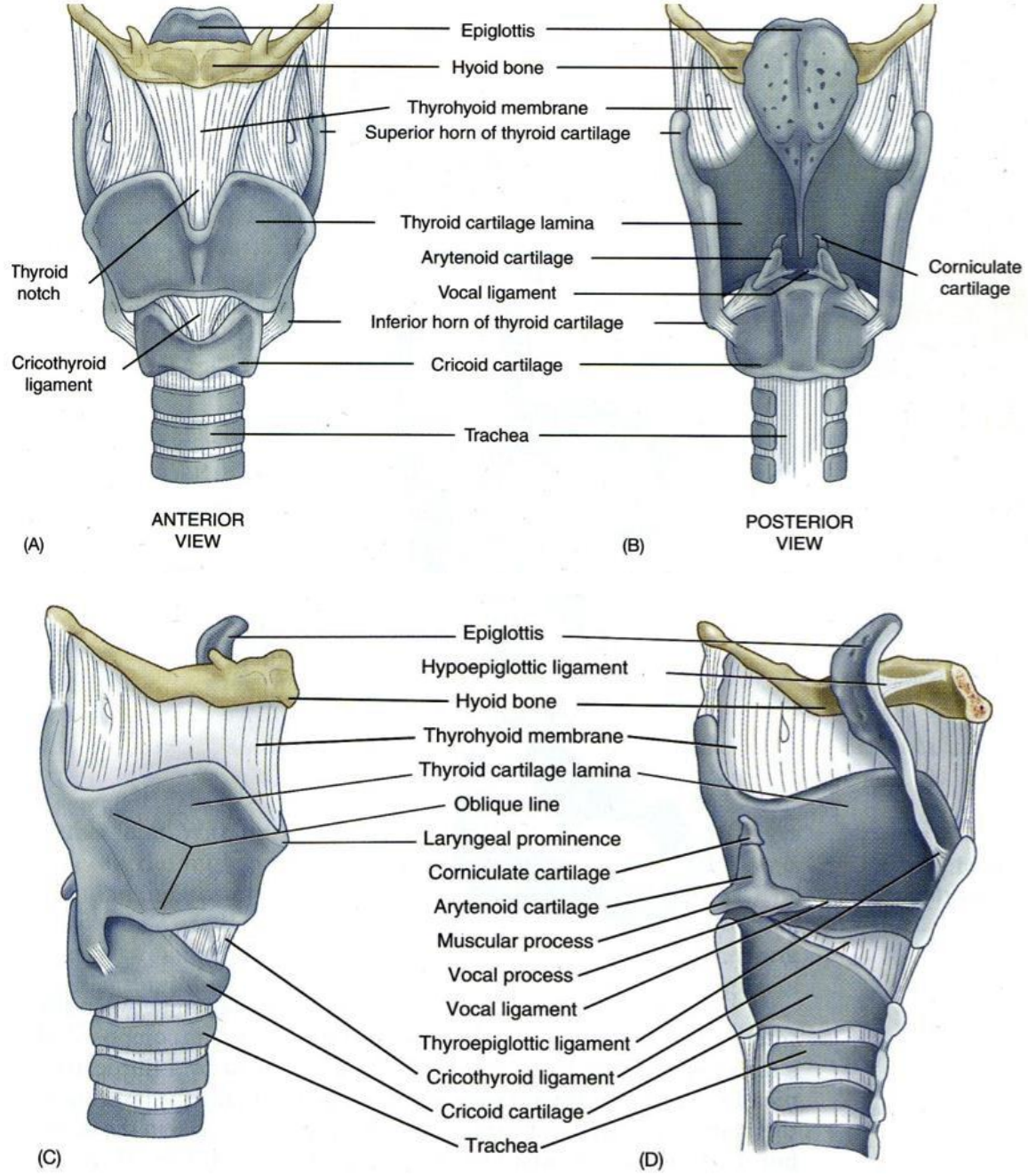


Figure 3: The larynx

Source: Maci, 2012:1

The thyroid cartilage is also known as the 'Adam's apple', and is the most physically prominent part of the larynx (Bickel, 2008:24). McKinney (1994:66) mentions that the more prominent the thyroid, the lower the range of the singer. The thyroid cartilage has two horns pointing upwards and away towards the hyoid bone, and two horns pointing downwards and away, forming the points of articulation together with the cricoid cartilage.

The cricoid cartilage is regarded as the base or foundation of the laryngeal framework. It is joined to the highest cartilage of the trachea by various ligaments. The cricoid forms a circular cartilage around the bottom edge of the trachea, resembling a signet ring at the front of the throat and the back of the larynx (Slater, 1990:13).

The next pair of cartilages are the two arytenoids. Bickel (2008:24) explains that they are connected to the cricoid cartilage as well as the vocal folds and have an irregular shape, forming a pyramidal profile in the lower part or the cartilage. These irregularly shaped structures have three prongs each: One forward for assistance in the vocal process, one sideways to assist in the muscle process, and one upward also known as the apex. The apex has an upward extension called the corniculate cartilage and is a visible part of the larynx on films of vocal cord action (McKinney, 1994:67).

Also within the larynx a leaf-like structure known as the epiglottis is found. The epiglottis is attached to the anterior of the thyroid cartilage, hanging freely and moving upwards (Bickel, 2008:24). Slater (1990:15) states that the primary function of the epiglottis is to prevent the intrusion of any foreign matter from entering the larynx.

McKinney (1994:69-70) mentions that in addition to the skeletal framework of the larynx, there are two basic categories of muscles involved in the laryngeal functioning: the intrinsic and extrinsic muscles. The intrinsic muscles are those which have the origin and insertion in the larynx, whereas the extrinsic muscles have only one end attached to the larynx. The intrinsic muscles consist of various other muscles which assist in the opening, closing, shortening, lengthening, thickening and thinning of the vocal folds in the phonatory process (Bickel, 2008:24).

O'Connor (2017h:2) explains them as follows:

- The thyroarytenoid muscle connects the thyroid and arytenoids cartilages.

- The cricothyroid muscle connects the cricoid and thyroid cartilages in front of the cricoid cartilage, which lengthens and stretches the vocal folds.
- The cricoarytenoid muscles consist of the posterior and lateral cricoarytenoids, which together are responsible for medial compression.
- The arytenoid muscle is a single muscle that connects the arytenoid cartilages, pulling them towards each other when they contract, thus bringing the back of the vocal folds together.

Bickel (2008:24) states that the extrinsic muscles consist of various other muscles that connect the larynx to the sternum, clavicle and other parts of the thoracic cavity in order to coordinate the positioning of the larynx during the phonatory process.

McKinney (1994:74-75) points them out and explains them as follows:

- The supralaryngeal muscles are active in functions such as swallowing, chewing and tongue actions during the articulation process.
- The infralaryngeal muscles are active in functions such as yawning and inhaling.

O'Connor (2017h:3) states that a set of mucosal folds are also situated within the larynx, namely the vocal folds. Not only are the vocal folds primarily responsible for phonation, but they also assist with retaining air in the lungs. The two upper folds are known as the false or vestibular vocal folds, whereas the two lower folds are known as the true vocal folds.
The false vocal folds are situated on both sides of the glottis and assist the epiglottis in preventing the intrusion of any foreign matter from entering the larynx (Slater, 1990:24). The true vocal folds stretch horizontally across the top of the larynx. Unlike the false vocal folds, the true vocal folds contain skeletal muscle and therefore have a pearly white colour (O'Connor, 2017h:3).

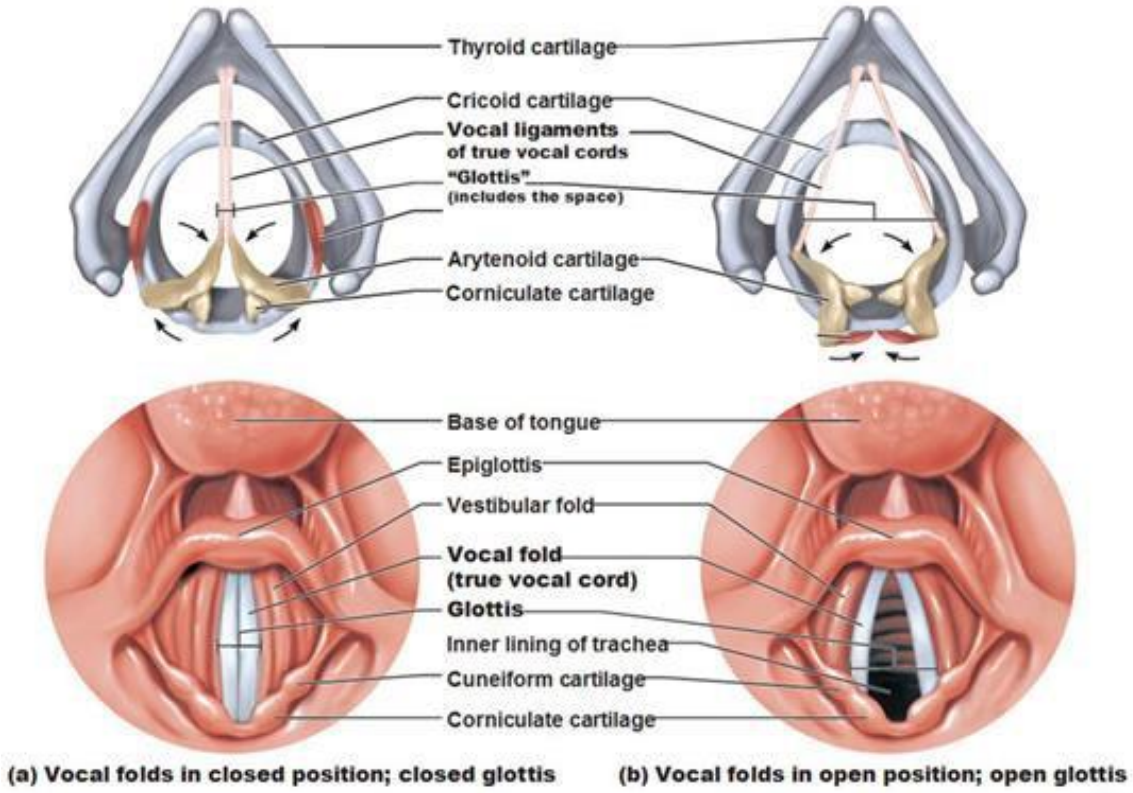


Figure 4: The vocal folds in their closed and open positions

Source: Maci, 2012:1

During the process of phonation, the false vocal folds relax while the true vocal folds are brought together, thus creating resistance to the air flow sent from the lungs. As the abdominal and intercostal muscles coordinate with the diaphragm, air is sent upward, forcing the vocal folds to open in order to let the air escape. This results in the vibration of the vocal folds, thus creating vocal tone (Bickel, 2008:24).

3.5 Resonation

The process during which the phonatory product is enhanced is called resonation (McKinney, 1994:120)**.** Brown (1996:79), explaining the process of resonation, states that as the sound travels, the musical tone becomes intensified and enriched as the result of a relationship between two or more bodies vibrating at the same frequency. The vibrations of one body cause another body to vibrate in tune with it, reinforcing and prolonging the sound by reflection or vibration (Ware, 1998:178). Vocal resonators are classified as either primary or secondary. According to McKinney (1994:120) a resonator can be defined as a secondary vibrator which is set in motion by the primary vibrator, adding its own characteristics to the sound waves

generated. The larger the resonator the lower the frequency it will respond to, and the greater the volume of air the lower the pitch. Bickel (2008:104) agrees, stating that a resonator is not the originator of the pitch but a column of air or solid surface which will not only accept the original vibration, but will vibrate sympathetically while adding new properties to the original sound.

LeBorgne & Rosenberg (2014:87) and Brown (1996:79) list the vocal resonators from lowest to highest: the chest, tracheal tree, larynx, pharynx, oral cavity, nasal cavity and the sinuses. All of these contribute to the shaping and resonating of vocal tones produced by the vocal folds. According to McKinney (1994:121) and Dayme & Vaughn (2008:300), factors affecting resonators include the size, shape, type of opening, composition and thickness of the walls, surface and the combination of resonators.

Regardless of its size, design and location, the chest does not make a significant contribution to the resonance of the singing voice. McKinney(1994:123) explains that the reason for this is that as a resonator it is located on the wrong side of the vocal folds and therefore cannot reflect the sound waves back towards the larynx.

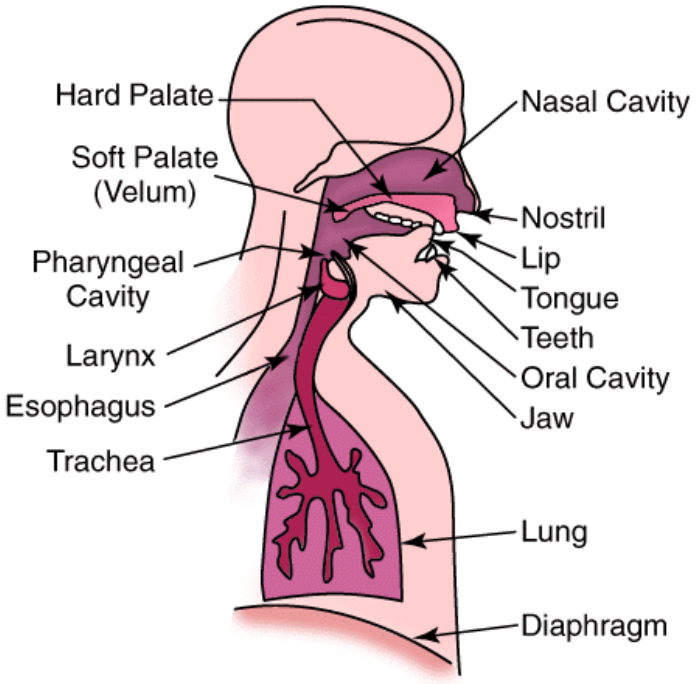


Figure 5: **Various resonators that contribute to the singing process**
Source: Donisch 2008:1

The tracheal tree connects the lungs to the larynx and consists of the trachea and the bronchial tubes which are combined to form a definite Y-shaped structure with hard surfaces of fibrous membrane (Slater, 1990:11). According to McKinney (1994:123-124), the shape and size of the tracheal tree cannot consciously be controlled, therefore the response of the tracheal tree will be the same for all pitches. Thus, it makes no significant contribution to the resonance system except for a negative effect around its own resonant frequency.

Dayme & Vaughn (2008:292) explain that the larynx contains the vocal folds which functions as the primary vibrator. Therefore, the larynx also serves as a resonator, regardless of being a small cavity. It is mainly a resonator for high frequencies due to its size.

The pharynx can be regarded as the most important resonator as it is the first cavity through which the product of the laryngeal vibrator passes (Slater, 1990:56). The other resonators only receive what the pharynx passes on to them. Dayme & Vaughn (2008:301) describe the pharynx as a muscular tube-like structure attached to various bones and cartilages, located at the base of the skull. It has open passageways to the nose, mouth and larynx.

According to Bickel (2008:24), the pharynx can be divided into three parts:

- The nasopharynx, which include the nasal cavities
- The oropharynx, which includes the mouth cavity
- The laryngopharynx, which extends downwards and behind the larynx.

The nasopharynx is located between the base of the skull and the soft palate. The soft palate can move up and close off the nose, assisting in making non-nasal sounds and swallowing. It can also be lowered to assist in making nasal sounds and breathing (Dayme & Vaughn, 2008:301).

Mayer (2010:1) and Dayme & Vaughn (2008:302) state that the oropharynx is located at the base of the skull and soft palate and continues to the middle of the epiglottis near the back of the tongue, which is the most flexible area and can assume many different shapes. Therefore, the oropharynx is especially effective for differentiating vowels.

The laryngopharyx is the first space that the larynx opens into and extends from the middle of the epiglottis to the lower border of the cricoid cartilage. Although it is somewhat fixed in size, its effectiveness as a resonator is credited with contributing to the acoustic part of the voice responsible for its carrying power (Dayme & Vaughn, 2008:302).

According to McKinney (1994:126), the oral cavity is second in importance, as it too is well-suited by its location, size and adjustability to serve as an effective resonator. Vennard (1967:93) states that the function of the oral cavity is to shape the vocal tone into words, whereas Greene (1989:70) argues that the oral cavity's function is to provide a focus for the projection of sound. I agree with both Vennard and Greene that the oral cavity is responsible for all the functions mentioned.

McKinney (1994:127) points out that the nasal cavity's primary functions include cleaning, adjusting the temperature and adding moisture to the incoming air. It is third in rank as a resonator, as it is essential for nasal consonants such as [m], [n] and [ŋ]. The sinuses do not exert any significant influence on the vocal tone as their size, location, minuteness of orifice and lack of adjustability limits their potential, although McKinney (1994:128, 134) calls attention to the fact that it is important to note that there is such a thing as 'true nasal resonance', which is essential in producing correct resonance. True nasal resonance occurs when the nasal port is open so that the nasal resonator can exert the predominant influence on the external sound produced.

3.6 Articulation

The human voice is the only instrument that can communicate by means of words. In singing, articulation refers to expressing oneself fluently and understandably. This allows the listener to hear and understand every aspect of the musical text clearly by the singer stressing particular syllables (Bickle, 2005:87; McKinney, 1994:144). Articulation in singing also refers to the process during which air is shaped by the muscular changes and movements of the speech organs, also known as the articulators, into recognisable speech sounds such as vowels and consonants (Brown, 1996:100).

During the process of articulation, consonants and vowels are combined to pronounce words clearly and vocal sound is shaped into recognisable speech by the muscular changes and movements of the speech organs. A vowel is an unrestricted speech sound created by the vibration of the vocal folds without any audible friction. Vowels have a definite shape or form and are capable of being sustained, thus they are continuants. They are usually voiced or phonated and are required to form syllables within a word (Fisher & Kayes, 2016:42). A consonant is a restricted speech sound created when the breath is partly or fully obstructed when moving through the vocal tract, resulting in conspicuous and audible friction which can further be classified as either voiced or unvoiced. Therefore, consonants function as interrupters defining the borders of a syllable, shaping vocal tone into recognisable speech to convey meaning (McKinney, 1994:143-144; Tulloch, 1993:306, 1763). Although some languages contain various inflections, the singing musician must always strive to coordinate speech sounds such as vowels and consonants with effective communication, whether it is a vocalise, in a foreign language or one's mother tongue.

The speech organs which shape consonants and vowels into sounds and words are called articulators, which are shaped and adjusted by muscular movements (Brown, 1996:100; Sataloff, 2008:326). Articulators are categorised as either primary or secondary. Primary articulators include the tongue, lips, lower jaw, soft palate, glottis, epiglottis and the larynx. Secondary articulators include the teeth, alveolar ridge, hard palate and the pharyngeal wall (McKinney, 1994:143). The articulators, whether primary or secondary, in coordination with the brain, are responsible for successful execution of clear and understandable articulation (Bickel, 2008:26).

Articulators can be further categorised as movable, limited or restricted (McKinney, 1994:143). Movable articulators are adjustable and allow the singer to mould the speech as desired. There are four movable articulators, namely the tongue, lips, lower jaw and soft palate.

The first movable articulator is the tongue, which Ritonga (2013:1) explains, is mainly muscle covered with mucous membrane and is controlled by extrinsic and intrinsic muscle groups. The movements and alterations made by these muscle groups alter the shape and position of the tongue, which affects the enunciation of vowels and consonants as well as the resonance of vocal tone.

Ritonga discusses the second movable articulator, the lips, which are composed of skin, muscle, glands and an internal mucosal layer. Bickel (2008:26-27) adds that the primary muscle involved in the control and movement of the lips is the orbicularis oris, which is situated in a circular shape around the opening of the mouth. This muscle interacts with numerous other facial muscles to allow additional movement and the capability of facial expression to convey the emotional content of a text in addition to the function of articulation.

The third movable articulator, which is the lower mandible of the jaw, is also the only movable portion of the scull (Bickel, 2008:26) and must be carefully controlled as it can alter not only the articulatory process, but also the resonance space in the oral cavity and pharynx. Roach (2009:10) adds that the jaw differs from the other movable articulators as it cannot make contact with other articulators.

The fourth movable articulator mentioned by McKinney (1994:143) is the soft palate, also known as the velum. When the soft palate is in a relaxed position, it allows air to pass through the nose and mouth, but often in speech or singing it is raised and thus restricts air from escaping through the nose. The soft palate and the tongue create velar consonants such as [k] when the tongue touches the lower side of the soft palate (Roach, 2009:9).

McKinney (1994:143) also mentions the limited articulators, which include the glottis, epiglottis and larynx, and the fixed articulators which include the teeth, alveolar ridge, hard palate and pharyngeal wall. Together the movable, limited and fixed articulators work in cooperation with each other to produce vowels and consonants.

In order for singers to have excellent diction, they must be equipped with sufficient articulation skills, according to Bickel (2008:86), which include the correct pronunciation of each vowel and consonant regardless of the language they are singing in. To assist the singer to achieve this, a phonetic alphabet system known as the International Phonetic Alphabet (IPA), which consists of symbols representing each distinct sound that exists in all spoken and sung languages in the world, was devised in 1886 and last updated in 2005 (O'Connor, 2017d:2). The IPA gives the singer the ability to learn the pronunciation of vowels and consonants, as well as the proper inflection of the words of any language without necessarily having to learn the language. Various sources are available that provide detailed explanations of the IPA for

the primary singing languages with regard to structure, vowels, consonants, diphthongs, glottal stops and liaisons, among other things.

3.7 Registration

According to O'Connor (2017e:1), one first has to determine what a vocal register is before one can understand the process of registration. When singing, the vibratory pattern of the vocal folds changes as pitch rises or falls. Within each register these vibratory patterns of the vocal folds are executed in such a way that the tones produced contain the same vocal quality, regardless of the pitch. When register transitions occur, a subconscious adjustment is made within the larynx and an audible change in vocal quality occurs. This is known as a transition point or the vocal *passaggio*.

Registration is explained by McKinney (1994:93) and Ware (1998:113) as the process during which these vocal registers are combined and produced in the same way, resulting in the same tonal quality, while eliminating audible changes to ultimately achieve artistic singing. Brown (1996:52) and David (1995:56) explain that registration is closely related to resonation and tone placement, coordinating and integrating all the contributing elements of the vocal range, effectively resulting in a smooth transition between the registers, which is the main quality of sufficient registration. Other qualities of sufficient registration include the ability to move through the transition points in the registers without a disconnection or break, maintaining a consistent tone quality throughout the registers (Dayme & Vaughn, 2008:297; McKinney, 1994:113).

Students are often confused by the terminology created by voice experts, but Ware (1998:113) clarifies this by explaining the difference between 'register' and 'registration'. Ware and O'Connor (2017i:1) both explain the term 'register' as a distinct and consistent vibratory pattern resulting in a unique characteristic tone quality, whereas the term 'registration' is explained by Ware and McKinney (1994:9) as the process of combining more than one register and producing the tone without any audible changes in the quality to ultimately achieve artistic singing. According to speech pathologists and vocal pedagogues, the vocal folds are capable of producing at least four distinct vibratory patterns, but when explaining registration to students, most singing teachers divide these vibratory patterns into three registers for both male and

female voices. The male voice registers consist of the chest, head and falsetto registers and the female voice registers consist of the chest, middle and head registers (Dosher, 1994:178, 183; O'Connor, 2017i:1).

With regard to laryngeal behaviour, Dosher (1994:174) and Ware (1998:118) state that registration can be distinguished as either heavy or light registration. Heavy registration is characterised by thick vocal folds, the firm closure of the glottis, a highly contracted thyro-arytenoid muscle and a relaxed crico-thyroid muscle, whereas light registration can be characterised by thin vocal folds, the incomplete closure of the glottis, a more inactive thyro-arytenoid muscle and a contracted crico-thyroid muscle.

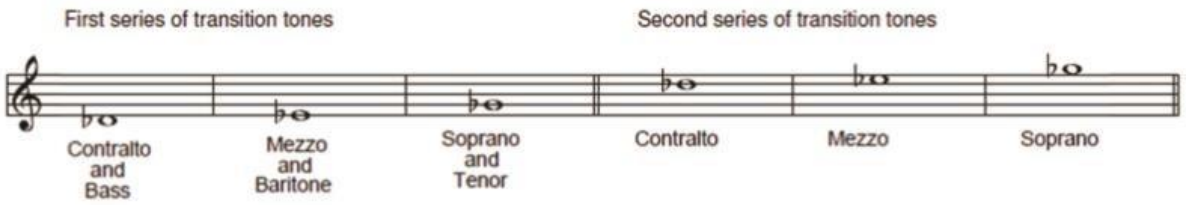
When moving from one register to another, the singer encounters the *passaggio*, which according to Mason (2017:1) and O'Connor (2017i:1) refer to a transitional point in the voice which consists of a series of notes. Both male and female voices have transitions across their ranges, the male voice consisting of only one and the female voice of two (Nair, 2007:565). The following terminology refers to the various *passaggi* encountered in the male and female registers.

Primo passaggio refers to the first transitional point in the voice. O'Connor (2017i:1) states that it marks the end of the chest register and the beginning of the *zona di passaggio* in the male voice or middle register in the female voice. It is considered a predictable point at which the beginner or adolescent singing student is likely to experience difficulties where the chin and larynx are raised, which negatively affects the tone quality (Mason, 2017:1; Miller, 1986:116).

Secondo passaggio is located between the middle register or *zona di passaggio* and the head register, and is the second transitional point in the voice (O'Connor, 2017i:1). Miller (1986:116) adds that it lies at pitches of approximately a fourth above the comfortable speech range of an octave.

The *zona di passaggio* mentioned above is also known as the *zona intermedia*, which refers to the pitches between the *primo* and *secondo passaggi*. This range requires more efficient breath management and is often referred to as the 'calling voice' (Miller, 1986:116; Nair, 2007:567).

A variety of charts indicating the pivotal points in registration changes can be found in the literature. The following example from Rautenbach (2013:82) is based on the average transition pitches mentioned by McKinney (1994:113) in his diagram.



Music example 1: Average transition tones in the male and female voices
Source: Rautenbach, 2013:82

Jones (2017a:1) emphasises the importance of understanding the concept of *passaggio* due to its impact in creating an artistically beautiful tone quality. Gazzola (2011:1) agrees and adds that to achieve a smooth transition between the various *passaggi*, the singing student must learn how to control and allow the larynx to gradually make changes of either elongating or shortening the vibratory patterns of the vocal folds while ascending or descending in pitch – a process known as static laryngeal functioning.

3.8 Vibrato

Vibrato is defined as the rapid vibration of a vocal tone and a natural, regular fluctuation or pulsation in pitch, loudness and timbre resulting in a rich, flexible and tender tone (Vennard, 1967:235; Tulloch, 1993:1750). Vibrato is an alternating pulse created by the balance between muscle systems in the larynx. This pulse responds to tension and subglottic pressure as a natural reflex to protect the vocal folds. The oscillation of a single pitch occurring in vibrato varies no more than a semitone or a third of a whole tone and the ear usually recognises this variation in pitch as a characteristic tone quality rather than pitch deviancy (O'Connor, 2017b:1; Ware, 1998:180).

Large and Shigenobu (1976:44) describe the vibratory process as the modulation of frequency and amplitude which results from movements created by the laryngeal musculature. Sataloff

(2008:15) explains that in the singing process, the vibratory movements include the separating as well as the colliding of the vocal folds as explained in the section on phonation.
Vibrato occurs in the singing voice when there is an audible alteration of the note that is being sung as a result of free oscillation of the vocal folds (Jones, 2017b:1). These frequencies should not exceed a semitone higher or lower from the pitch centre. The presence of vibrato in the singing voice is believed to be indicative of a healthy and trained voice (Sell, 2005:117). Vocal pedagogues such as Gazzola (2011:1) and O'Connor (2017b:1), among others, generally agree that the presence of vibrato in a voice is a sign of vocal maturity and freedom of vocal production, as it adds warmth to the voice and improves intonation.

As mentioned earlier, vibrato occurs in the voice when there is an audible alteration in pitch as a result of an alternating pulse in the laryngeal muscles as the muscles of the larynx respond to tension and subglottic pressure. This reaction occurs naturally to protect the vocal folds. Most voice scientists, according to O'Connor (2017b:1), consider the purpose of vibrato as a relaxant principle during intense vocal activity.

Gazzola (2011:1) states that vibrato is not only a function of the larynx, as these vibrations are transferred to the tongue, epiglottis and pharyngeal wall. This activity is considered to be an important component of the relaxant principle mentioned above as a result of coordinating breath energy with vocal fold responses. O'Connor (2017b:1) adds that small movements of the tongue and jaw can also be detected as a consequence of the intrinsic muscles of the larynx. Regardless of the oscillatory movements of the intralaryngeal areas, the position of the larynx remains stable during vibrato.

There are several ways of achieving a vibrato-like effect in the voice by means of manipulation, but this exposes the singer's lack of technical skill and increases the probability of incurring injuries by developing bad vocal habits and faults which could take years to correct (O'Connor, 2017b:1). Thus, vibrato cannot be learned but is rather a natural result of balance in the voice of a skilled singer (La Fond, 2011:1). In order to produce a natural vibrato by the free oscillation of the vocal folds, Jones (2017b:1) is of the opinion that an open pharynx must be maintained together with a healthy closure of the vocal folds by means of a steady breath flow and sufficient phonation.

3.9 Conclusion

In this chapter the complex functions and processes of the foundational aspects of classical singing technique, namely dynamic body alignment, breath management, phonation, resonation, articulation, registration and vibrato, were discussed in some detail. The production of a classical vocal technique demands respect for the body and vocal tract, which is why it is important for teachers to be able to communicate this information to their students to cultivate respect for the process.

Chapter 4 The diagnosis of vocal faults

4.1 Introduction

The understanding of the meaning of a vocal fault will remain subjective without thorough knowledge of the research results and findings contained in the literature on vocal pedagogy. There are various methods to choose from when diagnosing a vocal fault. This chapter provides clarity on what is considered a vocal fault in classical singing technique. Various methods of diagnosing a vocal fault will also be discussed. The symptoms and causes of vocal faults will be addressed according to their relation to the physical processes involved in the production of classical vocal technique as described in the literature.

4.2 What is a vocal fault?

McKinney (1994:13) defines a vocal fault as an incorrect manner of approaching or executing an element of the singing process, which may result in temporary or permanent vocal damage. Poor execution of vocal technique can also be the result of misconceptions or a lack of understanding of what the requirements for good vocal technique are (O'Connor, 2017a:1).

There are three categories of vocal fault, which are classified according to the related properties of musical sound, the vocal mechanism involved, or the physical processes involved in the act of singing. For this research study, the last approach will be investigated to give a clear understanding of how these vocal faults originate with regard to the foundational aspects of the act of singing. I concur with Miller (1996:9) when he emphasises the importance of a practical and goal-oriented approach such as this, where vocal faults are diagnosed, prescriptions for corrections are supplied through understandable and manageable communication and measurable results are produced. This approach assesses vocal faults by determining whether the functionality of the physical elements involved is used either insufficiently or excessively, also known as hypo- and hyper-functionality (McKinney, 1994:17).

4.3 How to diagnose a vocal fault

There is general consensus in the field of vocal pedagogy that diagnosis and prescription form the basis and are the two main requirements of teaching the technique of singing. Diagnosis and prescription can only be applied by weighing their potential consequences and desired outcomes against what one knows about both the physiological and the acoustic functions of the classical singing voice (Miller, 1996:7).

McKinney (1994:16-17) states that vocal faults can be diagnosed by any of the following three methods: firstly, by diagnosing the vocal faults relating to the elements of vocal sound such as pitch, intensity, duration, timbre and resonance; secondly, by diagnosing the vocal faults relating to the particular vocal mechanism involved, such as the tongue, jaw, lips or soft palate; and thirdly, by diagnosing the vocal faults relating to the physical processes involved in the production of vocal sound such as respiration, phonation, resonation or articulation.

Three observational aspects are mentioned by Patenaude-Yarnell (2005:489) which contribute to the above-mentioned methods of diagnosing vocal faults, namely informal observation of a student by the voice teacher, self-evaluation by the student and a systematic analysis made by the voice teacher which includes recognising symptoms of vocal faults, determining their causes and devising cures. McKinney (1994:15) agrees and describes these contributing aspects. He states that informal observation includes observing the student's dynamic body alignment, the occurrence of tension or anxiety, the quality of the student's speaking voice and the eloquence of delivery, the freedom of expression and mental alertness. During the self-evaluation process, the student employs guided reflection of perceived faults and future goals. The final aspect, systematic analysis, which centres on the student's performance, is followed by an assessment in which the teacher's clinical expertise is applied to the performance, the faults are identified and a roadmap for the correction of these faults is devised.

The internal process of voice production is invisible to casual observation, which is why University College London (2015:1) and Cantona (2012:1) highlight the importance of including 'proprioception' as a contributing aspect, which also assists in diagnosing vocal faults using the above-mentioned methods. We cannot observe or feel how the voice is being created, which creates a disconnect between the singer and his or her voice. 'Proprioception' is the sense of awareness of the positions and movements of neighbouring parts of the human body. The

two types of proprioceptors, namely the ‘exteroceptors’ and ‘interoceptors’, provide information to the brain about how much tension or pressure is being applied to the organ involved, as well as how quickly it is changing (Ingraham, 2013:1).

4.4 Faults related to dynamic body alignment

Bickel (2008:29) mentions that without correct dynamic body alignment, other foundational principles such as breath management will fail to function appropriately and will therefore affect the singing voice, preventing it from performing as it should. According to McKinney (1994:40), there are two main types of faults regarding posture or dynamic body alignment, namely alignment faults and tensional faults. Frequently encountered faults regarding dynamic body alignment are discussed in the section below.

4.4.1 Symptoms and causes of alignment faults

McKinney (1994:40) considers the following visibly recognisable positions of the body as symptoms of incorrect alignment: head or chin tilted in any direction; raised shoulders or one lower than the other; a collapsed chest resulting in a slumped posture; an emphatic curving of the small of the back; one hip more prominently thrust out than the other; knock knees; and a lack of balance due to the feet being too close together or too far apart.

The word ‘posture’ often creates the wrong image in a person’s mind as it is often associated with the shoulders being back and standing up straight (Dayme & Vaughn, 2008:280). Though this is not necessarily wrong, it can produce unnecessary postural or dynamic body alignment faults and often results in people pushing their heads forward and having very tense upper backs which inhibit the whole body’s ability to function efficiently, especially when singing.

The sedentary lifestyle of the majority of people often results in a slouched posture regardless of whether the person is standing or sitting, according to Patenaude-Yarnell (2005:491), and can therefore be considered the main cause of alignment faults. In youths, bad posture is often attributed to children mimicking the poor posture or dynamic body alignment they see on television in order to fit in with the image of their peers.

4.4.2 Symptoms and causes of tensional faults

Bickel (2008:29) states that the body needs a certain amount of tension to function properly; however, tensional faults refer to excessive tension in the body, thus unnecessary tension. Dayme & Vaughn (2008:281) add that tensional faults can be a result of bad habits acquired in everyday life, such as sitting in a chair for too long or imitating role models. They identify a head hanging forward as a symptom of tensional faults as this position drains the energy of the singer, putting strain on the muscles that keep the head up.

According to McKinney (1994:42-44), body positions are in a sense at odds with each other because different muscles have different functions, such as opening and closing the hand. Opposing muscles must be in equilibrium for a good posture to be attained. He indicates shaking, trembling, stiffness and rigidity in any part of the body as important symptoms of tensional faults. Too much tension in the muscles will cause them to start protesting or shaking, whereas too little tension will cause a slumped posture. Trembling or shaking is caused by tensing a muscle for too long, which makes it protest. Rigidity can be the result of either the singing student attempting to meet a challenge with sheer muscle power, or the student's personality, such as insecurity or being naturally highly strung.

4.5 Faults related to breath management

Vennard (1967:18) mentions that no matter how well a person sings, if a singer's breathing can be improved, so can their singing. Breath management is therefore a crucial aspect of the singing foundation which must be properly mastered – if it is incorrectly implemented, the vocal production will suffer (Bickel, 2008:43).

Two main faults in breathing for singing are identified by Patenaude-Yarnell (2005:491, namely: breathing too shallowly, which usually occurs in beginner singers, and breathing too deeply, which usually occurs in more advanced singers. McKinney (1994:56), on the other hand, identifies four faults related to breath management, namely upper-chest breathing, rib breathing, back breathing and belly breathing. He also identifies other faults relating to breath management: hypo-functional breathing and hyper-functional breathing. Frequently encountered faults regarding breath management will now be discussed in the section below.

4.5.1 Symptoms and causes of breathing too shallowly or deeply

The two main symptoms of breathing too shallowly or too deeply are audible as well as visible. Breathing in too shallowly or too deeply can be identified by the audible evidence of the singer being out of breath (Patenaude-Yarnell, 2005:489), despite the singer's effort to inhale a sufficient amount of air to sustain the voice, as well as the exaggerated visible movement of the chest and shoulders during the inhalation process (McKinney, 1994:56).

The causes of such faults, according to O'Connor (2017c:1), can be narrowed down to the singing student's lack of understanding why breath management is considered a foundational aspect of the singing process. Singing students often do not understand the important connection between the inhalation and use of air and how it affects the sound that is produced, as well as the concept that the inhaled air fuels the voice.

4.5.2 Symptoms and causes of upper-chest breathing

Upper-chest breathing can be identified when there is a visible and uncomfortable movement of the chest during inhalation and exhalation (McKinney, 1994:56) and also when the chest is not relaxed (O'Connor, 2017c:1). Upper-chest breathing is often employed when the singer needs to fill the lungs with air in the shortest amount of time. McKinney (1994:56) and Patenaude-Yarnell (2005:492) agree that most people resort to this type of breathing due to their sedentary lifestyles as well as certain cultural aspects.

4.5.3 Symptoms and causes of rib and back breathing

During rib and back breathing, the movement of the diaphragm is limited according to McKinney (1994:57-58). Rib and back breathing are often used as they are associated with good posture, especially as some students are encouraged by their teachers to pull their shoulders back as far as possible. Another symptom of rib breathing is visibly apparent when the singer is forcing the ribs in an outward movement during inhalation, causing the elbows to move along with the rib cage. Similar movement occurs during back breathing, but with the focus on back expansion during inhalation.

4.5.4 Symptoms and causes of belly breathing

Symptoms of belly breathing are discussed by O'Connor (2017c:1) and McKinney (1994:59), who state that in belly breathing an unnecessary amount force is used during exhalation. This

causes the belly to protrude unnecessarily, resulting in the singer appearing to become shorter the longer he or she sings.

Belly breathing is used by singers who believe that they are creating more space for their lungs by pushing out their stomachs and that this allows more air into the lungs (O'Connor, 2017c:1). By pushing the stomach out, the singer hinders the upward movement of the diaphragm during exhalation (McKinney, 1994:60). Smith (2007:41) explains that belly breathing is the result of restraining the breath, which causes the abdomen to be pushed out, preventing the diaphragm from freely returning to its relaxed position, which in turn prevents the air from leaving the lungs.

4.5.5 Symptoms and causes of hypo-functional breathing

Hypo-functional breathing occurs when the singer is not demanding enough of the breathing as well as the support mechanism (McKinney, 1994:62). O'Connor (2017c:1) mentions that symptoms of hypo-functional breathing include not having enough breath to sing through a phrase as well as not having a steady flow of air during exhalation.

Hypo-functional breathing is caused by the singer not taking in enough air because he or she lacks understanding of the demands of the singing process (McKinney, 1994:61) and that singing requires more breath management than speaking (O'Connor, 2017c:1). According to Smith (2007:35,37), hypo-functional breathing can also be the result of misguided instructions by the singing teacher, who uses expressions such as "suck in your gut" or "hold in your stomach" or "support the tone from your diaphragm". These expressions often result in excessive or increased air pressure. Smith (2007:40) also points out that misunderstanding the release of the sound can contribute to insufficient support, as it is often assumed that when releasing the sound, the whole body must relax, i.e. the chest or thoracic cavity must collapse.

Hypo-functional breathing is caused by not controlling the air as the singer exhales, and thus just expelling it will prevent the singer from having enough air to complete a phrase (O'Connor, 2017c:1). This is why the respiratory phase is a crucial factor in the singing process (Smith, 2007:37). Dayme & Vaughn (2008:290) add that collapsing the chest after each exhalation also inhibits the singer's ability to sing through a phrase and prevents the air from being steadily exhaled. If the muscles of inhalation and exhalation are not balanced, the breath comes out in spurts instead of in a steady flow (McKinney, 1994:62).

4.5.6 Symptoms and causes of hyper-functional breathing

Hyper-functional breathing occurs when the singer is demanding too much of the breathing and support mechanism (McKinney, 1994:63). Patenaude-Yarnell (2005:491) adds that hyper-functional breathing can be caused by incorrectly assuming that the length of a phrase that is to be sung is directly proportionate to the amount of air you can inhale. McKinney (1994:61), Patenaude-Yarnell (2005:489) and Smith (2007:41) agree that the fear of not having enough breath in a performance, or running out of breath when singing a phrase, is one of the main contributors to hyper-functional breathing, as the abdominal muscles are tightened in an attempt to hold back the air 'saving it for later'.

4.6 Faults related to phonation

According to McKinney (1994:82), there are two types of vocal faults related to phonation, namely hyper-functional and hypo-functional phonation. The symptoms and causes of these two phonation faults is discussed in the section below.

4.6.1 Symptoms and causes of hypo-functional phonation

As the sound gets louder, the mucosal wave continues to enlarge until it looks almost like a whiplash across superior surface of the vocal folds, which Cleveland (1999:33) states is a prominent symptom of hypo-functional phonation. Other causes of hypo-functional phonation are mentioned by McKinney (1994:82-86), which include insufficient dynamic body alignment, hypo-functional breath management, the absence of a suspension phase, the use of wrong tonal models, the inability to recognise good quality, the lack of artistic involvement in the music and timidity.

McKinney explains further that hypo-functional phonation is caused when there is not enough activity of the laryngeal mechanism and an incomplete closure of the glottis. It is most commonly found in beginners and less experienced singers. This results in a breathy sound due to the air escape and lack of breath control. Other audible symptoms include a soft sound and inefficiently produced sound.

Cleveland (1999:33) explains that hypo-functional phonation can also be the result of greatly increased airflow and the singer's desire for the sound to be louder. However, the loudness of the sound is limited since only so much loudness can be derived from vocal folds that are not

capable of complete closure. Other causes of hypo-functional phonation from a physiological point of view are also mentioned by Cleveland, which include arytenoids that appear to be more than one millimetre apart, the inability of the vocal folds to close completely along the medial edge, and when the mucosal wave is greater than with normal voice production because of high airflow.

4.6.2 Symptoms and causes of hyper-functional phonation

McKinney (1994:82-92) states that symptoms of hyper-functional phonation include a 'straight tone', reduced or no vibrato and no natural fluctuation of the voice. According to Cleveland (1999:33), hyper-functional phonation can result in voice fatigue due to the apparent opposing contraction between the glottal opening and closing mechanism. The loss of vocal range may occur due to simultaneous breathiness and forced closure of the vocal folds. Furthermore, hoarseness results because of possible shearing forces within the folds due to the high airflow. The vocal folds may ultimately swell because of these shearing forces.

Hyper-functional phonation is caused when the singer demands too much of the laryngeal mechanism, which is most commonly found with more experienced singers. This results in a tense, tight and strained sound due to excessive tension in the vocal folds and other laryngeal muscles (McKinney, 1994:82-92). Other causes of hyper-functional phonation mentioned by McKinney include the singer often being in a noisy environment, which often leads to him or her speaking too loudly, the voice being incorrectly classified, postural tension, wrong tonal models and the incorrect use and management of breathing.

One of Cleveland's (1999:34) main concerns is that hyper-functional phonation can be destructive to the singer since it imposes limitations on the mechanics of voice production during singing.

4.7 Faults related to resonation

According to McKinney (1994:134,138), there are two types of vocal faults related to resonation. The first are those faults related to nasal resonance, which includes hyper-nasality and hypo-nasality. The second type are faults related to the timbre of the voice, which includes

a sound that is too bright or too dark. The symptoms and causes of the faults related to resonation is discussed in the following section.

4.7.1 Symptoms and causes of hypo-nasality

According to Carter (2017:1), the primary symptom of hypo-nasality is when the singer sounds 'stuffy' or as if he or she has a blocked nose. Both Carter and McKinney (1994:135-136) state that hypo-nasality occurs when there is a lack of nasal resonance in the singing tone due to an obstruction in the nose, enlarged adenoids, or when the nasal port is not sufficiently closed by the rising of the soft palate. This results in a de-nasal sound which is also referred to as 'post-nasality' or the nasal 'honk'. This sound also often occurs as a result of inactive palatal muscles or use of the wrong tonal models.

4.7.2 Symptoms and causes of hyper-nasality

Brown (1996:82) states that there is a distinct difference between nasal resonance and nasality. Nasal resonance in singing is desirable and occurs when the resonators are well balanced, the throat is free from tension, and there is sufficient glottal adjustment. Unwanted nasality on the other hand occurs due to the lowering of the soft palate when vowels are sung, which results in a tight, high-pitched sound. This is regarded as a primary symptom of hyper-nasality. Ware (1998:142) adds that nasality should not be completely eliminated, because it is required when uttering nasal consonants such as [m], [n] and [ŋ].

Another prominent symptom of hyper-nasality is identified by Carter (2017:1) and McKinney (1994:134-137): this is a high-pitched speaking voice that is difficult to understand, especially the vowels, with the nasal cavity dominating the tonal result. This creates a forced, tense sound which is often referred to as a nasal 'twang' or 'forced nasality', and occurs when there is constriction in the pharynx, which creates tension and forced vibration in the nose. Difficulties regarding phonation, dynamic body alignment and breathing may also contribute to hyper-nasality.

4.7.3 Symptoms and causes of a sound that is too bright

The symptoms of a sound that is too bright have been identified by McKinney (1994:138-139) and Tamplin (2012:1), such as no vocal focus, a lack of balance between the mouth and pharynx as resonators, exaggerated mouth movements, pulling back of the lips and excessive tension

within the lip, tongue and jaw muscles. Jones (2008:1) agrees and also regards the inability to sing high and soft, a throaty tone, the lack of a legato line and a forward-thrust jaw position as symptoms of a sound that is too bright.

According to McKinney (1994:138-141), a sound that is too bright can be caused by a lack of space in the pharynx, tension in the walls of the pharyngeal resonator, too much emphasis on the mouth as a resonator and wrong tonal models. Bickel (2008:24) agrees and adds that the size of the mouth is greatly affected by the position of the jaw. Therefore, causes of a sound that is too bright are often directly related to the mouth cavity.

4.7.4 Symptoms and causes of a sound that is too dark

Symptoms of a sound that is too dark are discussed by McKinney (1994:138) and Jones (2008:1), such as a lack of balance between the mouth and pharynx as resonators, a widely stretched throat and an overly heavy approach when singing. Jones continues by stating that a sound that is too dark can be caused by a depressed larynx, whereas Brown (1996:80) suggests that a pulled-back tongue can result in a pinched sound and the cancellation of overtones, also resulting in a sound that is too dark. Other causes are mentioned by McKinney (1994:141-142), such as when too much emphasis is placed on the pharynx as a resonator, a flabby surface of the pharyngeal walls, the overuse of the 'yawning' muscles, a lack of oral space and the use of wrong tonal models.

4.8 Faults related to articulation

According to Fisher & Kayes (2016:43, 56), faults relating to poor articulatory habits can be caused either by unwanted tension or the lack of understanding of the symbols of the phonetic alphabet and their application. The symptoms and causes of faults related to articulation are discussed in the following section.

4.8.1 Symptoms and causes of poor articulatory habits

Patenaude-Yarnell (2004:494) states that symptoms of poor articulatory habits include diphthonged vowels, harsh consonants, unmatched vowels, unclear diction, inaudible text and an uneven tone. Another prominent symptom includes incomprehensible text due to a misunderstanding in reading the phonetic writing of the text (Fisher & Kayes, 2016:43).

Several factors can contribute to poor articulatory habits as mentioned by Patenaude-Yarnell (2004:494) and McKinney (1994:141), such as cultural differences which influence the speech patterns and inflections of the mother tongue of the singer, for example the audible difference between the American ‘r’ and the British ‘r’. Tension in any of the primary (tongue, lips, lower jaw, soft palate) or secondary articulators (glottis, epiglottis, larynx) as well as the lack of tonal adjustments within phonemes restricts the optimal functioning of the vocal mechanism, which could also lead to insufficient articulation in singing. Fisher & Kayes (2016:56, 58) agree and state that they consider the primary causes of poor articulation to be the presence of tension in the tongue and jaw, and a lack of understanding of the symbols of the phonetic alphabet when studying new music. McKinney (1994:149) continues by adding that singers are very often unaware that they are articulating words phonetically incorrectly, especially the articulation of allophones and phonemes.

4.9 Faults related to registration

The primary fault related to registration is the failure to efficiently transition between the different registers (Mason, 2017:1). This inability is often referred to as a ‘register break’, which occurs in the singing voice (O’Connor, 2017d:1). The symptoms and causes of inefficient registration is discussed in the following section.

4.9.1 Symptoms and causes of inefficient registration

McKinney (1994:113) as well as Dayme & Vaughn (2008:297) state that symptoms of inefficient registration include a clearly audible break or lift in the singer’s voice or an audible uneven sound between the bottom and the top registers, as well as audible tension in the voice. McKinney (1994:85) continues by mentioning the ‘mutational chink’ as a possible cause of inefficient registration, which refers to a developmental period that most young singers experience at some point in their vocal career. During this period, the interarytenoid muscles cannot, or do not, close the back of the glottis completely. This results in a gap in the vocal processes of the arytenoid cartilages. Luckily this period in the vocal career is only temporary, therefore inefficient registration can be improved in time.

4.10 Faults related to vibrato

Vocal experts all mention various types of faults related to vibrato, but most refer to the following four faults related to vibrato as the most frequently encountered in the training of the classical singing voice: the diaphragmatic vibrato, the vocal wobble, the straight tone and the overly fast vibrato. Symptoms and causes of these faults are discussed in the following section.

4.10.1 Symptoms and causes of diaphragmatic vibrato

According to Jones (2017b:1), a diaphragmatic vibrato occurs when the diaphragm deliberately pulsates during a sustained tone in order to produce a false vibrato. O'Connor (2017b:2) explains that this can be caused when the singer deliberately pushes on the abdomen with the hands below the sternum or by including panting exercises in their vocal warm-ups in an attempt to train the abdominal muscles to pulsate independently. Gazzola (2011:1) says that this results in a wavering sound more similar to a tremolo. Other symptoms of diaphragmatic vibrato identified by O'Connor (2017b:2) include breathlessness, light-headedness, rhythmic inward and outward movements of the stomach, as well as a lack of controlled breath management during the process of phonation.

4.10.2 Symptoms and causes of a vocal wobble

Jones (2017b:1) describes the vocal wobble as an overly wide vibrato which results in a variation of pitch, whereas O'Connor (2017b:2) describes it as an 'educated yodel' at the vocal fold level. The vocal wobble is also referred to as a 'vocal trill' (Gazzola, 2011:1) or a 'laryngeal vibrato' and is the result of excessive laryngeal movement. Using the laryngeal muscles to such an extent may cause voice deterioration over a period of time. According to Miller (1997: 94), the vocal wobble often occurs in aging voices due to natural loss of muscle. Jones (2017b:1) attributes the causes of a vocal wobble to the misuse and lack of vocal technique, including misconceptions such as that squeezing of the vocal folds will lead to the development of vibrato and that breathing management is used when the singer attempts to physically control the flow of air by means of inconsistent resistance.

Visible movements in the front of the neck caused by a prominent and moving larynx can be regarded as the primary symptom of a vocal wobble, states O'Connor (2017b:2), who explains that this often occurs as the result of pitch-matching vocal exercises, which increase in speed

as the singer matches the pitches played on the piano. Friedlander (2012:1) is of the opinion that this would result in a slow, tremolo-like sound with pitch variation occurring between two notes. Other symptoms of a vocal wobble include a visibly shaking diaphragm and tension in the tongue.

4.10.3 Symptoms and causes of a straight tone

A straight tone in singing results when there is a lack of vibrato in the voice (Jones, 2001:1) and is often a quality most choir directors demand from their singers to assist in tuning. This straight tone is caused by creating tension in the vocal folds to prevent them from vibrating and restricting air flow through them. This tension can be vocally destructive. Other causes of a straight tone include the singer attempting to transition from chest register to head register by means of belting, squeezing the vocal folds, a raised larynx and a lack of understanding of how vibrato is developed in the voice. Friedlander (2012:1) adds that straight tone singing may be the result of either vocal fatigue or of singing with resistance. Vennard (1967:205) identifies a spread sound that is thin, dull and light with a lack of warmth in the voice as a primary symptom of a straight tone.

4.10.4 Symptoms and causes of an overly fast vibrato

An overly fast vibrato can be described as a rapid tremolo-like pulsation on one pitch, resembling the bleating of a goat and therefore is often referred to as a ‘bleat’ vibrato or ‘tremolo’ vibrato (O’Connor, 2017b:2). An overly fast vibrato, according to Jones (2017b:1) and Miller (1997:96-97), can be the result of tension in the tongue, a raised larynx, the vocal folds not closing sufficiently after inhalation or a lack of breath management. Friedlander (2012:1) adds that an overly fast vibrato can also be regarded as a result of poor resonance and phonation. Symptoms of an overly fast vibrato include pitch problems (Jones, 2017b:1), the singer visibly shaking, a nervous tone (Kirkpatrick, 2008:552) and tremolo-like vibrato (Miller, 2004:127).

4.11 Conclusion

In this chapter the foundational aspects of the classical singing technique, namely dynamic body alignment, breath management, phonation, resonation, articulation, registration and vibrato, were discussed in detail with regard to the diagnosis of related faults. The singing teacher has a tremendous responsibility regarding the diagnosis of a vocal fault, as he or she

must to be able to identify specific symptoms. To be able to determine the cause of each vocal fault, the teacher must have a thorough understanding of how sound is produced by classical vocal technique. Causes of vocal faults are related to hypo-functional or hyper-functional activity, the use of wrong tonal models and/or a misconception of the technique of producing a healthy classical vocal sound.

Chapter 5 Correcting vocal faults

5.1 Introduction

There are various methods to choose from when correcting vocal faults. In this chapter, correction of vocal faults is discussed according to their relation to the physical processes involved in the production of vocal sound as described in the literature. A description of desirable qualities of these aspects is also provided to assist in the remedying of each of these faults.

5.2 How to correct a vocal fault

McKinney (1994:13) states that when approaching the correction of any vocal fault it is essential that the singing teacher must have a clear concept of what is regarded as good vocal sound. While sufficient vocal technique indicates the absence of vocal faults, it is unfortunately not typical. Vocal faults can usually be heard if not also seen (Rock, 2005:20). Therefore, it is essential for the teacher to have a clear understanding of the foundations of healthy vocal technique in order to apply this knowledge in a lesson. This will enable the teacher not only to recognise a vocal fault when it occurs, but also to understand the cause of the fault and identify corrective procedures, because all aspects of the singing process are interlinked and interdependent (Boytim, 2003:57).

Ultimately, it is important to understand that the skill of listening with a critical ear is one that develops through experience. The teacher as well as the student must have patience and perseverance as the teacher indirectly guides the student towards establishing good vocal technique primarily through a clear concept of the desired vocal sound (Boytim, 2003:56; Miller, 1996:6–7). Once a student understands how vocal sound is produced and what sound production entails, the correction of vocal faults can be approached by employing appropriate methods.

According to Moore (2009:1), tension in the body and vocal mechanism is regarded as one of the most frequently encountered vocal faults among singing students which is caused by nervousness or other intense emotions. Arnold (2016:1) agrees and explains that the Alexander

Technique, which will be discussed later in this study, is considered an effective practice to assist in the correction of vocal faults with regard to removing tension from the muscles involved in the singing process. In the use of this technique the student is made aware of unconscious harmful habits and advised on how to eliminate them, and has it explained how the body works (Miller, 1996:9; Rock, 2005:21). Ballou (2014:1) adds that the student should practice to become consciously aware of the sense of proprioception when preparing to sing, as it can result in additional support and freedom of movement which will ultimately assist in improving sound and stamina. To assist in creating this awareness, Albrecht (2003:18) suggests an exercise attributed to castrato singer Farinelli: inhale for eight slow counts while raising the arms to shoulder level, hold this position for another eight counts and exhale on a hiss or voiced buzz for as long as possible. This will assist in activating the breathing mechanism and deep breathing.

5.3 Desirable qualities of the foundational aspects of the singing voice

5.3.1 Dynamic body alignment

Correct dynamic body alignment includes the sensation of being flexible and buoyant, having stable overall balance, a 'lift' in the rib cage, shoulders hanging loosely and an upright head aligned with the spine. Dayme & Vaughn (2008:280) state that the alignment of the chest, larynx and throat is the starting point for healthy singing. Correct dynamic body alignment should ultimately create confidence and must aid in securing a positive reception from the audience (McKinney, 1994:33). Only if the skeletal framework and muscular components such as the breathing mechanism, resonators and vibrators can carry out their basic functions efficiently without tension can this be accomplished.

Ware (1998:49-50) states that the physical appearance of a singing student with the correct body alignment should be graceful and attractive and continues to say that desirable qualities of correct body alignment are that the knees must be flexible and unlocked, the posterior slightly tucked in to avoid swayback, a comfortably high chest and the shoulders hanging loose without any rigidity.

5.3.2 Breath management

According to O'Connor (2017c:1), the most descriptive term to use for appropriate breath management is *diaphragmatic intercostal breathing*. Patenaude-Yarnell (2005:489) states that the qualities of sufficient breath management include a constant flow of breath while executing an even tone. Breath management should be executed with a clear, steady and focused air flow. The entire range of the voice should be freely produced, with the end of phrases sung effortlessly and without audible breathing sounds (Patenaude-Yarnell, 2005:489). McKinney (1994:55) agrees and is of the opinion that these qualities can be achieved by attempting to imitate the action of smelling a rose and ensuring that the chest is comfortably expanded during inhalation – it should be kept comfortably high before, during and after breathing.

5.3.3 Phonation

The qualities of healthy phonation mentioned by McKinney (1994:77) include a loud, clear, freely produced sound which is pleasant to the ear and consists of a continuous flow of energy when moving from one note to the other. The tone produced should be rich, resonant, vibrant, dynamic and expressively flexible. According to Cleveland (1999:33), correct and flowing phonation occurs when there is minimal or no space between the arytenoid cartilages and when the vocal folds close along the medial edges.

5.3.4 Resonation

The qualities of sufficient resonance are described by Brown (1996:83) as a firm ringing sound that can be achieved by striving for a sound that is dynamic, clear, expressively flexible and vibrant. McKinney (1994:77) agrees and describes the quality of good resonation as a tone which is freely produced and pleasant to the ear with a continuous flow of energy when moving from one note to the other. It is vibrant, expressively flexible and clear. According to Malde (2009:521), success in resonance as part of the singing process is greatly dependent on awareness and attention to detail.

5.3.5 Articulation

Crannell (2001:3) states that the primary function of speech is to communicate, therefore the most sought-after quality of sufficient articulation is that it must be clear and understandable. McKinney (1994:150-159) adds that there must be a balance between the tonal quality and the phonemic identity in the performance.

5.3.6 Registration

According to Randomski (2006:1), a smooth transition between the *passaggio* areas of the singing voice while maintaining a relaxed and neutrally positioned larynx is the most desirable quality of good registration. Hession (2010:1) mentions bright resonance throughout the vocal range, whereas O'Connor (2017e:1) describes an even tone without an audible break when transitioning between the registers.

5.3.7 Vibrato

Vennard (1967:235) regards the qualities of a healthy vibrato as an audible, natural and regular fluctuation in the pitch, timbre and intensity of the singing voice. O'Connor (2017b:1) agrees and adds that a steady flow of breath must be maintained. Most importantly, the student must understand that vibrato is not something that should be forced, and that it only occurs as a result of a healthy vocal technique.

5.4 Corrective procedures for vocal faults related to dynamic body alignment

5.4.1 Alignment faults

According to Bickel (2008:29), correct balance and dynamic body alignment should be maintained even when the student is not singing, the purpose of which is to ultimately strengthen the muscles that are responsible for maintaining correct dynamic body alignment when the student is singing. This can be achieved by standing with the feet slightly apart with unlocked, relaxed knees, the chest lifted comfortably high, the spine upright but not stiff, the neck relaxed and free and the head aligned with the body so that it can roll easily in any direction. Free and balanced alignment allows the singer to remain flexible enough as the body constantly adjusts to the function or purpose it fulfils while executing and maintaining a beautiful tone (Bickel, 2008:29; Rock, 2005:4).

Dayme & Vaughn (2008:280) state that the alignment of the chest, larynx and throat is the starting point for healthy singing, and they emphasise the importance of these components being balanced, free and flexible. Bickel (2008:29) agrees that a singing student must strive for the sensation of being flexible, stable and balanced, and adds that the head must be in an erect position, thus allowing the jaw to move freely.

Other corrective procedures mentioned by Dayme & Vaughn (2008:282-283) and McKinney (1994:37-40) include the following: When teaching, it is preferable to use words associated with good alignment such as buoyant, erect, free-to-move, vibrant, flexible and balanced. The weight should be evenly distributed between the feet, which are slightly separated with one foot slightly in front of the other, and balanced on the centre of the soles. The shoulders should be rolled up and dropped down, thus settled into the sockets and kept still without tension or rigidity. The arms and hands should hang freely at the sides and the hips and buttocks should form a vertical line as closely as possible. There should be a spinal column stretch with the head directly in line with the body, not hanging forward or tilting. This can be achieved by imagining a broad back. The lower abdomen should be pulled in gently, but not too much as this might result in tension. The upper abdomen must be free to move at all times.

Visnic (2011:1) presents the following figure to encourage the improvement of muscle balance and stability during performance:

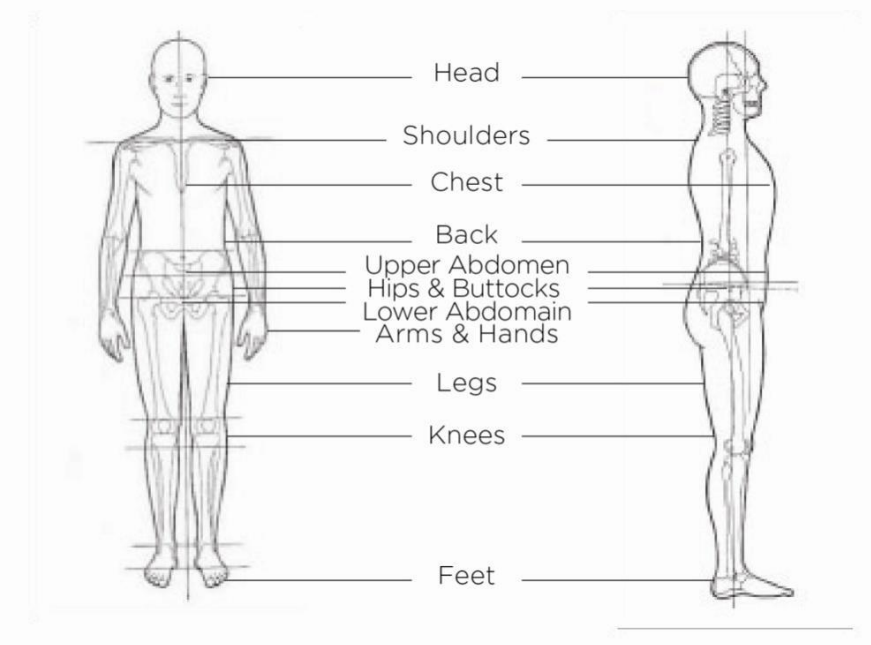


Figure 6: Correct dynamic body alignment
Source: Visnic 2011:1

Ware (1998:49) and Dayme & Vaughn (2008:282) agree that posture or dynamic body alignment should not correspond to the idea of standing with the back against the wall, but should rather be imagined around a centre axis or core of the body. The Alexander Technique is based on this principle of dynamic body alignment conforming to the core.

5.4.2 Tensional faults

According to Bickel (2008:29), to ensure that the muscles are relaxed and flexible before the singer starts to sing, relaxation and stretching exercises should always be done prior to warming up the voice or attempting any vocal exercises. Corrective procedures for rigidity are referred to by McKinney (1994:43-44), such as instructing the students to draw arches in the air with their hands and letting them sing while moving, to prevent them from reverting back to a rigid state. The student should focus on keeping the legs free to move and flexible by ensuring that the knees are slightly bent to prevent them from locking while singing. Wherever there is tension in the body, the teacher must locate it, make the student aware of it and encourage relaxation techniques so that unnecessary tension is eliminated. Also, to assist the student not to be intimidated by the teacher, a friendly and caring environment should be created in the singing classroom.

According to Smith (2007:37), one of the most productive methods to assist in establishing correct dynamic body alignment and improving alignment as well as tensional faults is the Alexander Technique. Bickel (2008:30-39) recommends exercises such as rib cage stretches, head and shoulder rolls as well as knee and leg flexes to ease tension. The so-called rag doll exercise is also prescribed for tensional faults and is described as follows: position the hands above the head and collapse down like a rag doll and expel all the air. When necessary inhale again, focusing on feeling expansion while rolling the spine up, vertebrae for vertebrae, ending with balancing the head on top.

5.5 Corrective procedures for faults related to breath management

5.5.1 Breathing too shallowly or too deeply

The muscles of inhalation and exhalation should be in balance, and by making students acutely aware of this will help them to achieve the desired balance (Patenaude-Yarnell 200:490). According to McKinney (1994:53), students learn to employ this balance through trial and error; however, in time the correct sensations will become habit.

Bickel (2008:43) states that the breathing process can be practiced separately from singing, as well as in combination with *vocalises*. These vocal studies are not only designed to strengthen and develop vocal production, but also assist in the development of the abdominal muscles,

thereby aiding not only in sufficient breath management, but also in developing strong and reliable vocal technique. O'Connor (2017c:1) adds that keeping the chest comfortably high and keeping it and the rib cage from collapsing after each exhalation will regulate the breathing of a singer, allowing him or her to sing through a phrase with enough air. This is also known as *appoggio* breathing, which will be discussed further on in this section. Students should be aware that this is an extension of the natural breathing process and not an alternative to it.

5.5.2 Upper-chest breathing

According to McKinney (1994:49, 57) and O'Connor (2017c:1), corrective procedures for upper-chest breathing include ensuring that correct dynamic body alignment and breathing techniques are established and practiced correctly by consciously focusing on inhaling through both the mouth and nose. This will allow the chest to stay still and relaxed. Pushing out the epigastrium should only be considered as an alternative in extreme cases of upper-chest breathing.

5.5.3 Rib and back breathing

Rib breathers should avoid pulling in the upper abdomen, whereas back breathers should be encouraged to feel an expansion in the front, according to McKinney (1994:58). Unnecessary tension should be eliminated and students must become consciously aware of not replacing one bad habit with another. Smith (2007:37) adds that these faults can be eliminated by establishing proper dynamic body alignment.

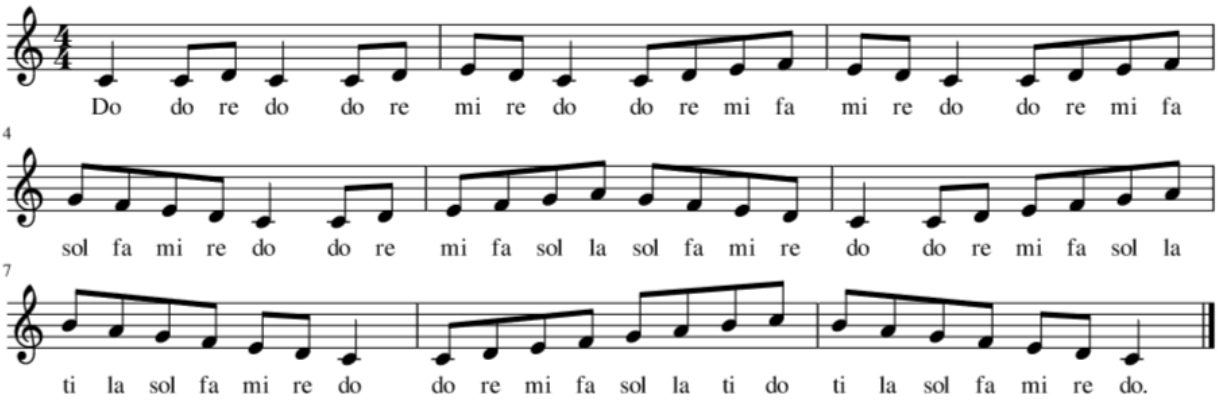
5.5.4 Belly breathing

To correct belly breathing, O'Connor (2017c:1) suggests that the student should not place the focus solely on the belly during the breathing process, and unnecessary muscle effort should not be used during exhalation. Smith (2007:37) adds that the natural breathing process can be understood when observing a sleeping baby's breathing and how its stomach naturally "pooches out". Smith also emphasises the establishment of proper dynamic body alignment for optimal singing.

5.5.5 Hypo-functional breathing

The student should be allowed to experience the various stages of breathing, namely inhalation, suspension, controlled exhalation and recovery. These stages should be explained and

demonstrated to the student by the teacher (McKinney, 1994:48). The following vocal exercise will assist the singer with becoming aware of these stages. The student should attempt to sing each exercise in one breath, however if another breath is required, the singer should stop completely and take a new deep breath before continuing.

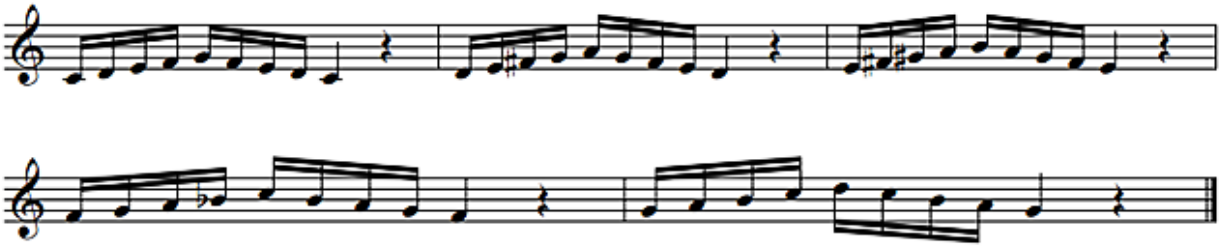


Music example 2: Singing a long phrase using solfege
Source: Faint, 2010:7

The student should also be made aware of where to feel the expansion in the body, e.g. the rag doll exercise (Patenaude-Yarnell, 2005:490). To assist with hypo-functional breathing, Albrecht (2003:18) suggests the following exercise that will aid proper inhalation of the breath and the expansion of the breathing muscles: the student is instructed to interlock the fingers of the hands below the waist in front of the body and inhale slowly for four counts, pulling the hands apart with the elbows out.

5.5.6 Hyper-functional breathing

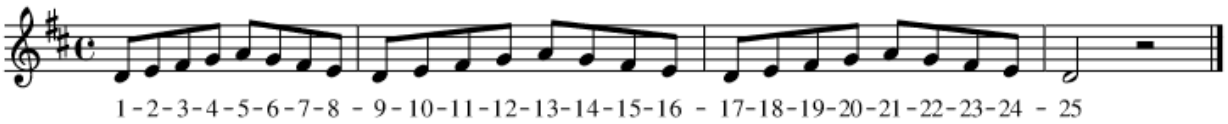
Instruct the student to breathe in slowly through the nose because, according to O'Connor (2017c:1), inhaling through the nose takes longer to fill the lungs. This will allow the student to relax and be made aware of pacing the breath. The following vocal exercise will assist with this and should be sung on a burble. A burbling sound is achieved when the inhaled air is expelled through relaxed lips, as if blowing bubbles under water. Singing on a burble is beneficial for assisting with hyper-functional breathing as it can only be executed when there is a steady air flow during exhalation. After the exercise has been sung on a burble, the student can sing the exercise again, but this time on a vowel.



Music example 3: Singing on a burble

Source: Eychaner, 2012: 6

Albrecht (2003:18) suggests sniffing three times with proper stance and then holding the breath for one more second. Sniff three more times and release a yawn-sigh, using an open throat and full body involvement. Another exercise that assists in correcting this fault is to instruct the student to take a comfortable, deep breath and count for certain lengths of time, while encouraging them to let the air out steadily (Patenaude-Yarnell, 2005:490).



Music example 4: Singing a long phrase by counting

Source: Benson, 2017: 6

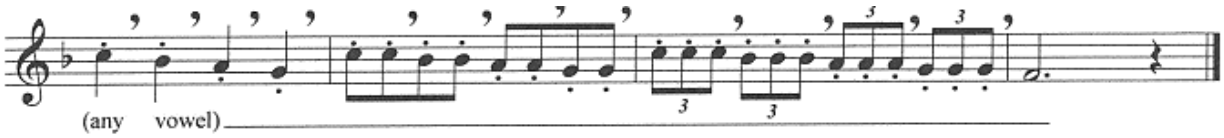
5.5.7 Appoggio breathing

O'Connor (2017c:1) explains that *appoggio* means 'to support' or 'to be in contact with'. According to Marek (2007:74), the *appoggio* breathing technique focuses on breathing in through the nose and mouth simultaneously and involves slowing down the ascent of the diaphragm for better breath management, thus lengthening the breath cycle when singing. O'Connor agrees and adds that *appoggio* involves gaining better control over the breathing mechanism by training the muscles to avoid the rib cage from collapsing as it would during normal speaking. This is achieved by maintaining an elevated posture of the rib cage and the sternum, which is connected to the rib bones by the cartilage. Marek also states that during *appoggio* breathing, the singer can avoid excessive subglottal pressure by not overinflating the chest when inhaling and by focusing on the sensation of a column of air.

5.6 Corrective procedures for faults related to phonation

5.6.1 Hypo-functional phonation

Corrective procedures to assist in hypo-functional phonation include the establishment of sufficient breath management and proper dynamic body alignment (Smith, 2007:37). According to McKinney (1994:89-92), the teacher should encourage the student to sing louder, as if having to reach the back row of an audience, and instructing the student to imitate an appropriate opera singer or vocal model. McKinney recommends that vocal exercises should include frontal vowels such as [ɛ], [i], and [æ], as well as nasal consonants such as [m], [n] and [ŋ]. The use of descending five-note scale passages is also beneficial, and O'Connor (2017g:1) suggests performing them staccato to assist in the training of the adductor-abductor muscles.

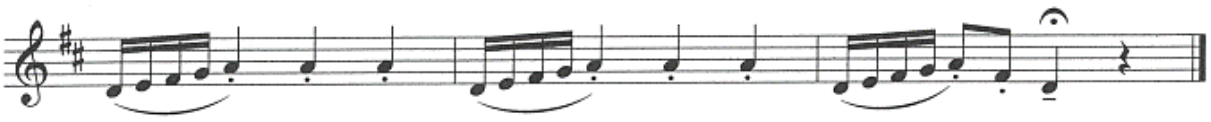


Music example 5: Descending staccato passage

Source: Eychaner, 2012: 6

5.6.2 Hyper-functional phonation

McKinney (1994:87-89) prescribes the following procedures to aid in the correction of hyper-functional phonation: When warming up the voice, loosening-up exercises for the whole body should be included, and vocal exercises such as the following should make use of back vowels such as [a], [o] and [u].



Music example 6: Vocal exercise using back vowels

Source: Eychaner, 2012: 10

O'Connor (2017g:1) states that a 'beginning of a yawn' position must be established, which incorporates a dropped jaw and a raised soft palate. In addition, the teacher should assist students to eliminate excessive laryngeal tension by reminding them that the phonatory process is controlled by the whole body support system, and not the glottis.

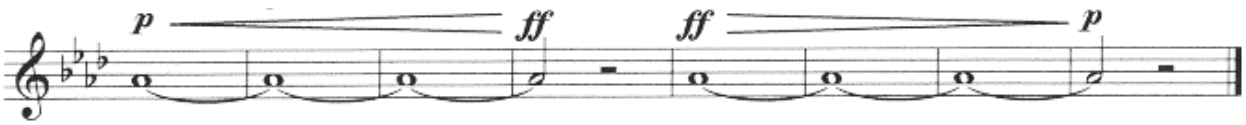
5.7 Corrective procedures for faults related to resonation

5.7.1 Hypo-nasality

Corrective procedures for hypo-nasality include making the student aware of the damaging effects that hypo-nasality has on the voice, according to O'Connor (2017g:2). When hypo-nasality occurs, McKinney (1994:137-138) suggests that a new approach to exercise the palatal muscles should be introduced by incorporating words such as 'ding', 'voom', 'zoom', and 'bum' in vocal exercises. Albrecht (2003:29) suggests singing the following phrase slowly on one note to assist students to direct the sound forward in the mouth: 'Ming-ing-ing-ing-ing, mee-nee who are you?'.

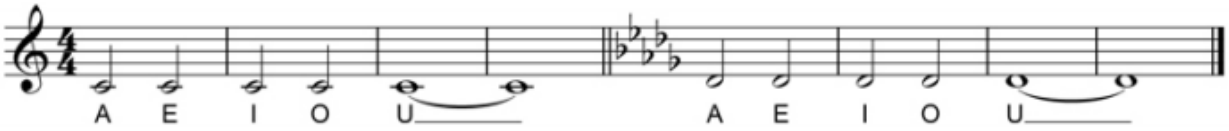
5.7.2 Hyper-nasality

The first step in correcting faults related to hypo-nasality according to O'Connor (2017g:2) is to make students aware that they are adding an undesirable quality to their vocal sound – students often create this sound because to them they sound better or they are trying to imitate the wrong tonal models. McKinney (1994:135-137) suggests encouraging and assisting students to develop a new tonal model. Other corrective procedures include loosening-up exercises for the whole body when warming up the voice. Also, the student must concentrate on relaxing the jaw, neck and throat as well as directing the tonal sensations to a new location. Babusek (2015:1) recommends including exercises such as sustaining a vowel sound and then slowly occluding the nostrils.



Music example 7: Sustaining a vowel sound on a single note

Source: Eychaner, 2012: 5

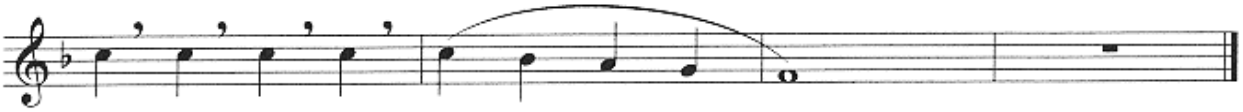


Music example 8: Sustaining a vowel sound on various notes

Source: Faint, 2010: 2

5.7.3 A sound that is too bright

Corrective procedures for a sound that is too bright include making the student aware of relaxing the neck, throat and articulators (McKinney, 1994:139-141). This will assist with the establishment of the 'beginning of a yawn' position, which incorporates a dropped jaw and a raised soft palate. Brown (1996:80) adds that tension should be removed from the resonating chambers and the contributing resonators such as the jaw and tongue by including loosening-up exercises for the whole body when warming up the voice. McKinney suggests that the teacher must instruct the student to imagine a deeper and richer sound and include back vowels such as [i], [e] and [æ] during vocal exercises such as the following.

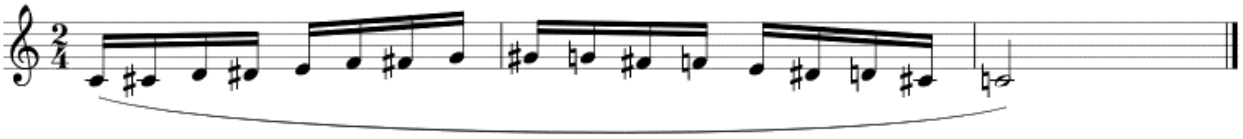


Music example 9: Descending passage sung on back vowels

Source: Eychaner, 2012: 6

5.7.4 A sound that is too dark

Corrective procedures for a sound that is too dark include determining whether the student is aware that he or she is making this sound (McKinney, 1994:141-142). The student should be encouraged to practice in front of a mirror and note the movement of the facial muscles, jaw and tongue to create awareness of this behaviour. A breathy dark sound can be eliminated by explaining the tonal limitations that are created by making such a sound and by assisting the student to develop a new tonal model. Tonal sensations should be redirected by focusing on feeling the vibration in the front of the face by means of incorporating frontal vowels such as such as [ə], [o] and [u] in vocal exercises.



Music example 10: Ascending chromatic scale using frontal vowels

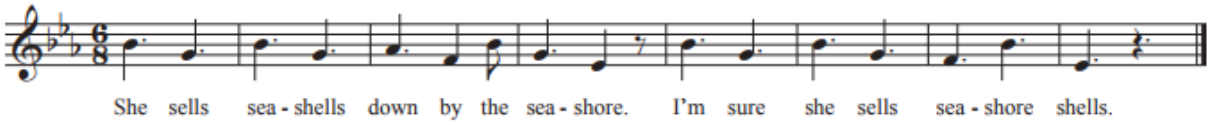
Source: Adams & Loney, 2014: 13

5.8 Corrective procedures for faults related to articulation

5.8.1 Poor articulation

To create awareness of incorrect articulation, Gour (2012:1) and Patenaude-Yarnell (2004:494) suggest encouraging the student to practice in front of a mirror and observe how the mouth is moving. Other methods to create awareness include demonstrating or providing the student with a suitable vocal model to imitate, or to let the students record themselves and make notes while playing back the recording. By means of this self-evaluation the student can decide which words, letters or syllables need to be emphasised. Gour also stresses the importance of gaining more focused control over the tongue and its movements and suggests strengthening exercises for the articulatory muscles such as chewing gum, sucking through straws, and running the tongue along the walls of the mouth.

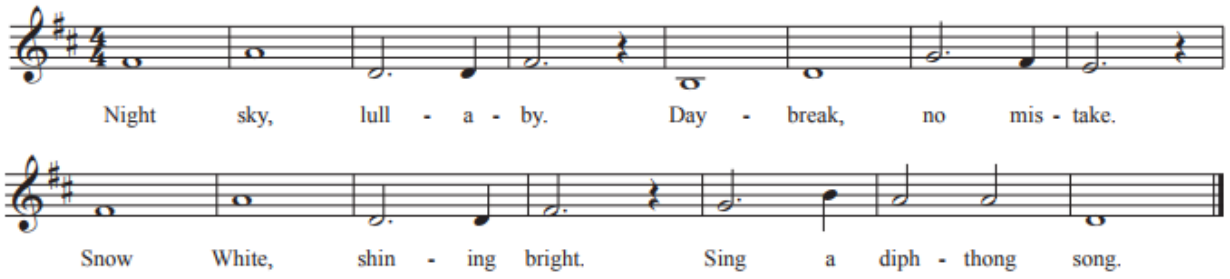
Marshall (2015:1) states that good articulation is interdependent on other aspects of the singing process such as how well the voice was warmed up, whether the student has a relaxed dynamic body alignment and whether breath management is performed sufficiently. Marshall (2015:1), Gour (2012:1) and Suzy (2016:1) agree that the incorporation of tongue twisters in vocal warm-ups are beneficial in assisting with faults related to articulation as it also aids in the development of muscle memory. Other vocal warm-ups to consider include lip buzzes and tongue trills.



Music example 11: Tongue twister to improve articulation

Source: Beck, 2013: 9

McKinney (1994:143-145) on the other hand emphasises the importance of the student understanding the difference between vowels and consonants. The IPA can be used by singers who are singing in the primary singing languages to assist in the pronunciation of specific characteristics and formation of vowels, consonants and diphthongs, among other things. The following vocal exercise contains several words with diphthongs and should be sung sustaining the primary vowel sound for the majority of the note's duration before gliding to the secondary vowel sound.



Music example 12: Singing diphtongs

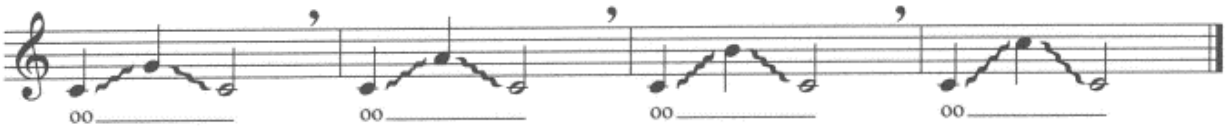
Source: Beck, 2013: 12

5.9 Corrective procedures for faults related to registration

5.9.1 Inefficient registration

According to O'Connor (2017e:1), inefficient registration and register breaks can only be corrected by developing flexibility of the laryngeal muscles. Therefore, corrective procedures for inefficient registration include creating awareness and changing the singer's perceptions of the sound that they are producing by means of recording and playback and allowing the opportunity for self-evaluation (Dayme & Vaughn, 2008:297).

Albrecht (2003:91) maintains that exercises on 'Yoh' assist in smoothing register breaks as the opening 'ee' sound before the 'y' allows the tongue to move upwards and forwards, thus creating more space in the pharynx. Hession (2010:1) recommends high-octave slides and arpeggios, which will allow the singer to be more aware of the higher range and increase vocal control, and O'Connor (2017e:1) recommends ascending and descending five-note chromatic scales to assist in eliminating register breaks in the *primo passaggio*. These scales can be sung at different paces and O'Connor suggests adding glides between the notes when scales are performed at a slower pace to assist in retraining the adjustable movements of the larynx. Deva (1997:1) states that tension in the voice must be avoided at all times, and that the singer must trust the process of correcting inefficient registration by means of consistently applying these approaches to eliminate old habits.



Music example 13: Ascending and descending vocal slides

Source: Eychaner, 2012: 8

5.10 Corrective procedures for faults related to vibrato

5.10.1 Diaphragmatic vibrato

This type of vibrato is difficult to repair as this pulsating habit becomes a deep muscle memory for the lower abdominal muscles. However, O'Connor (2017b:2) believes that it can be corrected over time through proper vocal rehabilitation exercises and by ensuring that the student is taught to understand vibrato and its purpose. O'Connor advises against pushing on the diaphragm with the hand to create a vibrato-like sound as it does not assist the abdominal muscles to create a natural vibrato and will result in tremolo-like sounds. To stabilise the shaking of the diaphragm, Jones (2017b:1) suggests memorising the sensations of the body when a hissing sound is produced and then imitating these sensations while producing a tone.

5.10.2 Vocal wobble

Corrective procedures suggested by O'Connor (2017b:2) include keeping the larynx stable and avoiding trilling as it will affect the singer's pitch. To achieve this, Jones (2017b:1) recommends exercises that demand sufficient breath management and support, such as vocalises or exercises on 'ng' to assist in developing a clear focus in the voice, or sustaining a hissing sound. This will make the singer aware of which muscles to use to prevent holding back the breath pressure and to support the tone.

Albrecht (2003:10) and Mayer (2010:1) agree that the inclusion of exercises that release tension in the tongue will assist in keeping the larynx stable, which will consequently aid in the correction of a vocal wobble. Singing on consonants supported by diaphragmatic impulses will assist with this as well as with activating diaphragm movement and improving diction. If the wobbling vibrato is a result of singing softly and weakly for years, Gu (1995:149) suggests exercising the chest voice in the lower range.

5.10.3 Straight tone

To assist in correcting a straight tone, Jones (2017b:1) recommends vocal studies as part of the warming up repertoire and suggests that the student should imitate the sensation of the Italian 'u' vowel to promote a balance in the supporting muscles as it allows a healthy adduction of the vocal folds. According to Blyth (2013:56), breath management can be improved by employing *messa di voce* exercises, starting and ending with a breathy tone.

Kirkpatrick (2008:555) maintains that to improve the laryngeal position and encourage adduction and greater muscle activation in the torso, the student can be instructed to pick up something heavy. I strongly disagree with Kirkpatrick on the use of this exercise as I believe that research has progressed with regard to activating the torso muscles and strengthening the core, such as Pilates exercises, as suggested by O'Connor (2017b:2).

5.10.4 An overly fast vibrato

According to Kirkpatrick (2008:555), an overly fast vibrato can be corrected by making the student aware that he or she must consciously sing softer, and by employing sighs and decrescendos in vocal exercises. Because there is excessive air pressure during an overly fast vibrato (Schmidt, 2014:1), the student must first learn how to inhale deeply and slowly without an aggressive approach. This will also allow the diaphragm to be more flexible. Schmidt also recommends encouraging students to shift their focus from trying to impress the audience with vocal skill, to calmly focusing on the text interpretation and emotional expression of the music.

5.11 The Alexander Technique

5.11.1 What is the Alexander Technique?

As mentioned earlier in this study, opposing forces are at work during the singing process, which may result in undue tension. A corrective procedure that can be employed for the release of tension is the Alexander Technique which, as explained by David (1995:18), aids students who experience difficulties in releasing tension that affects the foundational aspects of the singing process, especially dynamic body alignment and breath management. Problems due to tension also contribute to neck, back and shoulder pain.

5.11.2 The Alexander Technique as a corrective procedure

By employing the Alexander Technique as a corrective procedure, students are made aware of their subconscious movements which contribute to their recurring difficulties. The technique focuses on understanding and creating awareness that the relationship between the head and spine is crucial, as only when the neck muscles are free from tension and do not overwork will the head balance lightly on top of the spine. This relationship ultimately determines the body's overall coordination (Arnold, 2016:1). It is essential that breath management be executed correctly, without any unnecessary tension, in order to produce a healthy and pleasing vocal tone.

Ware (1998:44-45) summarises this technique by explaining that a human being should be treated as a whole entity, because if there is excess tension anywhere in the body it will interfere with all the functions of the rest of the body. The human body is directed by 'primary control', which refers to the balanced relationship between the head and the neck and the relationship of the head-neck position to the rest of the body. The singer must understand that many faults that occur are a result of how they do what they do, as often what feels familiar feels right. Therefore, what is habitual feels familiar.

An Alexander lesson focuses on the constant process of adjusting the body accordingly as one sings through the music and assists in eliminating unnecessary tension within the body. This is achieved by re-educating students and making them aware of their current condition after an assessment has been made of what needs to be changed. The student consequently learns to bring unconscious habits under conscious control.

5.12 Conclusion

In this chapter the foundational aspects of the classical singing technique, namely dynamic body alignment, breath management, phonation, resonation, articulation, registration and vibrato, were discussed in detail with regard to corrective procedures for vocal faults according to their relation to the physical processes involved in the production of vocal sound. There must be a delicate balance between the various intricate functions of the singing process to create a healthy classical vocal sound. For each vocal fault there are corrective procedures to assist in improving classical vocal technique.

Chapter 6 Summary and conclusions

6.1 Introduction

This chapter includes a summary of the various research findings with regard to the research questions stated in Chapter 1. Following an in-depth investigation into the available literature on the foundational aspects of classical vocal technique, as well as the diagnosis and correction of vocal faults that link to these aspects, the study has led to a number of conclusions which will also be discussed in this chapter. Topics encountered that can be recommended for further study are also suggested.

6.2 Summary

6.2.1 Vocal technique for classical singing

Vocal technique for classical singing consists of seven interdependent aspects, namely dynamic body alignment, breath management, phonation, resonation, articulation, registration and vibrato. Each of these aspects is responsible for specific processes that contribute to the production of the singing voice.

As singers, we cannot take our instruments apart to examine them and then reassemble them after inspection, thus a sense of awareness is crucial during the training of the classical singing voice. A thorough understanding of how the foundational aspects contribute to the singing process will not only create awareness of how intricate and delicate an instrument the voice is, but will also assist in developing the singer's proprioception to make him or her aware of the sensations that occur when minor adjustments are made not only in the vocal tract, but also throughout the whole body as a unit.

It is essential for students to understand that there are differences between speaking and singing and the production thereof. Singing requires a more detailed and focused approach as it demands more from the body and mind with regard to all the foundational aspects involved. Students must also understand that vocal technique for classical singing is something that cannot be forced and does not happen instantly, but will develop over time as a result of dedication and healthy vocal instruction.

6.2.3 The diagnosis and correction of a vocal fault

It is important to understand that a vocal sound is not always produced correctly in accordance with a proven healthy vocal technique for classical singing. Vocal faults are directly linked, or can be traced directly to the foundational aspects of classical vocal technique. The human body creates the singing voice and physically, taking into consideration that every person is built differently, there is only one correct way for these aspects to function in order to create what is desired without harming or damaging the voice. If the processes of these aspects do not function efficiently, the singer will not only risk incurring injuries, but nothing else in the performance will function as it should due to the interdependent relationship of these aspects. Together the processes of the foundational aspects produce vocal sound for classical singing.

Corrective procedures are mainly focused on creating a healthy balance between the various processes of the foundational aspects of classical vocal technique to prevent them from being either hyper- or hypo-functional. Various muscular and skeletal alterations can be made in order to correct vocal faults, but this requires expert and careful guidance. Therefore, the diagnosis of vocal faults is first and foremost dependent on the voice teacher.

Desirable qualities of classical vocal technique can be very subjective when the student does not have the appropriate vocal models. Methods of diagnosing and correcting vocal faults must be determined by a voice teacher who not only acts as a vocal instructor, but also as a vocal model for the student by demonstrating desired vocal qualities. The teacher must be equipped with the knowledge to explain the functions of the foundational aspects to the student in an uncomplicated and understandable manner.

When students are equipped with the knowledge and understanding of these aspects and the processes involved in singing, they can eventually make a self-evaluation based upon what is the best technique to produce the desired vocal sound. Students must learn the importance of developing their own voice instead of attempting to imitate a wrong tonal model and prioritising this need above vocal health.

6.2.4 Frequently encountered vocal faults

Vocal faults occur when sound is produced in such a way that it can cause temporary or permanent damage to the voice and occur when the foundational aspects involved in the act of singing are incorrectly employed. Vocal faults are related not only to the internal functions that

occur in the vocal tract when sound is produced, but also to the functions of the rest of the muscular and skeletal framework of the body. These functions can either be used excessively, which is classified as hyper-functional behaviour, or insufficiently, which is classified as hypo-functional behaviour.

Tension in any part of the body or vocal tract is the most important element in jeopardising all the aspects of the singing process. It can be created subconsciously and unintentionally, for example by imitating the wrong vocal models or feeling intimidated, and can occur due to poor habits caused by a sedentary lifestyle. Tension has a massive impact on the singing voice, as it causes many faults.

6.3 Conclusions

The interdependent foundational aspects of the classical singing voice consist of complex and intricate processes that singing students need to understand in order to produce a vocal sound that is not only beautiful but is produced in such a manner that it does not cause any harm to the voice. By understanding these processes, students will also realise the physical demands that they put on their bodies when singing. Therefore, the concept of proprioception plays a vital part in the diagnosis and correction of vocal faults as the internal processes of voice production is invisible to casual observation.

Vocal faults can often be the result of an overuse or underuse of a specific function, thus corrective procedures aim at creating a balance within the functions of the foundational aspects of the classical singing voice. The use of wrong tonal models is also a regular cause of vocal faults; therefore students must inform their teachers of the vocal models that they use. This will assist the teacher to diagnose vocal faults. Consequently, it is beneficial if the teacher can demonstrate desirable qualities and corrective procedures, who thus stands in as a vocal model. Teachers must recommend appropriate vocal models to their students to prevent them from imitating unsuitable models and developing bad habits.

Student-teacher relationships are vital for the diagnosis and correction of vocal faults in the training of the classical singing voice, because the teacher is responsible for communicating important but complex information regarding the foundational aspects and needs to be able to

communicate this information to the student in an understandable manner. Although the teacher makes a systematic analysis and other observations during lessons, the opportunity for self-evaluation by the student must also be provided. The teacher must also provide a safe, approachable and unintimidating environment for the student. Therefore, warming up exercises are beneficial not only for the body and the singing process, but also for the mental confidence that the student needs to develop so that full participation can take place during lessons without any hold-backs.

The Alexander Technique is highly recommended by many vocal pedagogues as an approach to assist with the correction of vocal faults, especially with regard to dynamic body alignment and breath management, as it contributes to the elimination of unhealthy habits and helps to release internal and external tensions in the body. It must also be communicated very clearly that classical vocal technique is not a quick-fix or something that students can apply as an add-on to their current singing technique, but is rather a quality that develops over time as a result of dedication, healthy vocal production and correct vocal instruction.

6.4 Recommendations for further research

During the research of this topic, several issues arose, some of which could only be referred to and briefly discussed due to the limited scope of this study. The following topics may be considered for further research:

- The adolescent male changing voice
- Classical vocal technique versus contemporary vocal technique
- The four schools of singing
- The role of technology in the 21st century and its effects on singers
- The challenges of singing in a foreign language
- The effects of straight tone and choral singing on the soloist voice.

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