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Module BMPF7008 Work based learning project

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Project Proposal

Researching the acoustical impact that Cervical/ Lumbar imbalance leave on singers suffering with Lordosis/Kyphosis

1.The Context

In recent years a number of studies has emerged addressing the importance of holistic therapies such as musculoskeletal therapy for singers and their effect on the voice production. This ongoing research is showing the usefulness of manual therapy such as stretching and corrective movement for the pain management in singers (Cardoso et al., 2017; da Cunha Pereira et al., 2018; Rubin et al., 2007). The general statistics dealing with patients suffering with both spinal issues and voice loss, show the need for further investigation on the subject (Carneiro & Teles, 2012; Franco et al., 2014; Karulkar et al., 2021). The current situation is that of singers suffering from slight postural imbalances such as Cervical Kyphosis and Lumbar Lordosis do not find specific localised treatment that is aimed for a patient who suffer with spinal issues. These imbalances which do not allow the singer to achieve an optimal posture, create havoc on the sound production due to cervical restrictions (Sabatucci et al., 2015). Although postural awareness has been addressed in research, remedial rehabilitation has been non-specific (Cardoso et al., 2019). The aim of this research is to observe the behavioural impact spinal issues such as Cervical Kyphosis and Lumbar Lordosis and how they might influence the singer's acoustics.

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2.The Justification

Current studies focusing on the importance of posture in singers, seem to provide statistics and do not suggest any rehabilitative exercises that can be introduced together with singing (Lloyd et al., 2017; Rubin et al., 2004).

Having worked in the industry for over eight years, I have observed a variety of singers suffering from such conditions without finding any sufficient remedy from the medical route that can help them directly with their singing performance.

Therefore, I am undertaking this research to understand how simple stretches can free up spinal tensions created by cervical/ lumbar imbalances and monitor any acoustic changes via computerised readers such as Voce Vista

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3. The intended Impact

Making the singers aware of postural alignment is key when dealing with foundational issues. By designing simple stretches taken from (Spence, 2008) Postural Restoration Institute (Hruska., 2020) yoga poses (Lloyd et al., 2017) and simple stretches, I aim to monitor the participants' acoustical patterns. I believe that a broader observation and awareness of these two conditions can be of benefit by providing any structured guidelines, which can aid to release discomfort in performers suffering from these specific conditions (Carman, 2004; Chopp-Hurley et al., 2018; Lloyd et al., 2017).

Commented [PA4]: Using the research to develop and evidence strategies.

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4. The outlined intent.

- A number of six participants will be chosen via snowball surveys (Allibang., 2020).
- A blog post will be created and posted on social media channels.
- A questionnaire will be given to the participants chosen by a cross section and on basis such as issues with the: spine, voice ranges, sex, breath issues and other conditions that apply to this study (Kaplan, 2004).
- I will design methods for both virtual and in person students.
- A variety of photographs and measurements will be requested from the participants, such as the length of the spine, hip to shoulder, ear to jaw on both sides. Side jaw/ TMJ (temporomandibular joint) issues will be observed. **Invalid source specified..**
- Each session will be approximately 30 minutes weekly for five weeks.
- After the five weeks a new questionnaire will be given to the participants to update any progress.
- Voice efficiency such as duration of power will be monitored via voce vista- like programmes.

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Commented [PA11]: Cross section of population of interest

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5. Ethics

- The research will be conducted with the participants' written consent regarding assessing the spine and the surrounding areas.
- Sound evaluation and photographic evidence will be used for the research's use only and strict confidentiality will be adhered to. In these ways I will make sure that there will be positive implications (Denscombe, 2014).
- The methods designed and used will be non- invasive and tailored for each participant to maintain moral values and dignity (Allibang, 2016).
- Therefore, following these principles, I will make sure that the results will be as unbiased as possible for a more transparent statistic. Any possible result will be communicated with the participants and each participant will remain anonymous to comply with the confidentiality clause. Being an insider researcher might create conflict due to familiarity and due to the sensitivity of the subject (Saidin, 2017; Costley, Elliott, & Gibbs, 2010).
- The participants might find the picture taking/ measuring invasive even if they conduct them themselves (virtually) (Stirling, 2019).
- However, knowing that I am a practitioner myself might put their mind at ease, due to the knowledge on the subject. I need to be aware of all possible outcomes than the results that I envisage upon the project.

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6. Personal learning outcomes

- To be able to design simple stretches that can be incorporated with singing exercises.
- Deepen my knowledge on the importance of postural alignment and its effect on sound production.
- Better understanding of available therapeutic methods and practices.
- Further my knowledge on the function of the cervical spine and if it might impact the singer's acoustics. I aim to create simple stretches that can also help other teachers, when faced with any of these issues in their students.

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Project Report

Project Title: Researching the use of simple stretching exercises and observing their acoustical impact that Cervical/ Lumbar imbalance leave on singers suffering with Lordosis/Kyphosis.

Introduction

Researching the possible impact that spinal misalignments might leave on singing which is reflected on to the singing's acoustics has been in interest of mine, for a long time. This is because I have personally suffered with cervical lordosis and rib misalignment which created difficulty in voice production. I started researching the importance of alignment maintenance and rehabilitation exercise to sing pain free.

The project aims to examine a group of six professional singers from a cross section of backgrounds:

- assess their posture,
- analyse their voice's acoustical frequency using PRAAT (phonetic analysing software)
- introduce weekly rehabilitative exercises that they can add to their singing practice
- and monitor if/any changes.

Were there any acoustical changes? Was the singer able to replicate the exercises without assistance?

How can these rehabilitative exercises evolve and become more integrated with the daily singing practice routine?

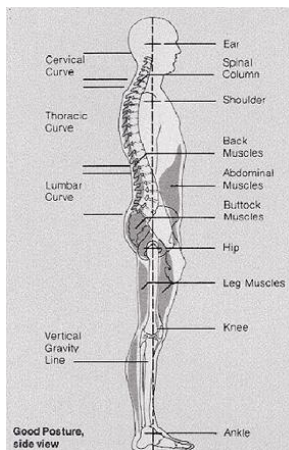
The learning outcomes of the project include:

- Understanding the dynamic patterns of the participants' alignment and address if/any common misalignment factors.
- Create different postural and alignment exercises that can be done without any assistance, and which target a variety of spinal issues.
- Observe the behaviour the rehabilitative exercises might have on the voice.

Literature review

Postural Alignment

When targeting the spinal issues such as Kyphosis/ Lordosis, I was aware of the notion of posture and its direct importance with singing as a fundamental factor amongst pedagogues and singers (Rubin et al., 2004a). This is because alignment in singing is usually associated with the idea that it is muscularly achieved through proper singing technique (Bruno et al., 2009). Although this is somewhat true and the correct training enables a method of engaging/contracting the muscles, due to the activation of abdominal muscles we know that posture has a direct correlation to the foundational aspect for efficient sound production (Knight & Austin, 2020; Whiteman, 2015). The anatomical elements in the body requires a certain strength and stamina in order to maintain structure. For example, Miller (2004) describes this ideal posture as holding oneself in a noble way, aligning and stacking the head, neck and torso on top of each other. (McKinney, 1982) also asserts this by stating the importance of not allowing the shoulders to droop forward. One key factor in posture and singing is the distance between the chest (torso) and the pelvis (ÖZGÜR, 2020). Miller (2004) Bunch (2009) Chapman (2016) all assert that a singer needs to maintain the ribcage optimally without collapsing it upon expiration. This helps in optimising the position of the diaphragm, which is key in enabling the singer to manage breath.



The figure 1 below shows the profile of what is classified as optimal alignment. (Physiopedia, n.d.)

The literature regarding the importance of alignment for singers is truly vast and studies have been made observing a myriad of postural changes, such as seated versus standing, and the assessment of head flexion in opera singers (Asher, 2009; Knight & Austin, 2020; Bruno et al., 2009; Johnson & Skinner, 2009b; Longo et al., 2019; Rubin et al., 2004a; Sabatucci et al., 2015; Sundberg et al., 1991).

The common factor found in both singing literature and the anatomical journals is that the spine is mobile and an optimal posture contributes to a better function of organs (Salomoni et

al., 2016). One must note that although postural alignment is key in singing, the idea of optimisation of the spine is subjective to each individual, and it seems that due to its complexity, most singing teachers tend to generalise the idea of what is an optimal standing posture (Wilson Arboleda & Frederick, 2008). Even more so, the pedagogical nature of the skill seems to suggest that the student's ability is monitored through the efficiency of breath management and the strength of the acoustical core of the sound (Salomoni et al., 2016). Other studies monitored posture through factors such as measuring lung capacity (Iwarsson et al., 1996, 1998; Leanderson et al., 1987) and also the position of the diaphragm (Bordoni, 2020b, 2020a; Bordoni & Zanier, 2013; Cloward, 1988). Therefore, the notion of posture is correlated to singing due to optimisation of the aligned organs to an efficient managing of breath which is essential for singing (Miller 2004).

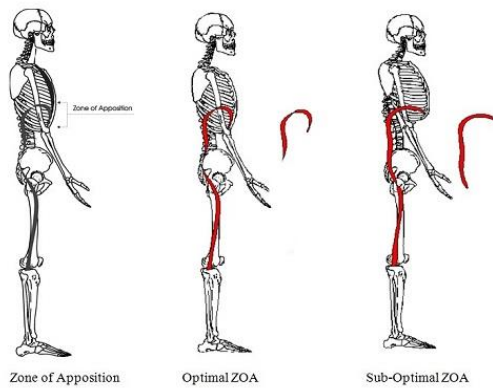
Phonation is solely dependent on the efficiency of air and therefore the intensity of the sound seems to be determined by the efficiency of the postural alignment. An interesting finding is that it seems that during phonation, the phonetic action takes over the body's control in assessing the posture because phonation is created on an exhale not an inhale (Bruno et al., 2009). Therefore, this suggests that the posture in singing is key to create a controlled efficient deflating action. In singing the diaphragm seems to synchronically move with the rib cage to reduce lung volume through phonation (Traser, et al., 2017: 69-77). Even more so, the air flow can determine the postural malalignment and other issues. Hruska (2008) states that:

'Posture is the reflection of patterned airflow'.

Airflow is a reflection of the "position" of many systems that are regulated, determined and created through limited functional patterns. These patterns reflect our ability and inability to breathe, rotate and rest symmetrically.

Whilst a functioning posture and breath management determined the efficiency of sound in singing, in *Postural Restoration Institute*, the optimal alignment is measured by the bodily patterns and if the breath is in its aligned functional line (see figure 2.). The functioning line is the aligned pattern that enables the Zone of Apposition (ZOA) which is the balanced position between the diaphragm and the mediastinum (chest), (Hruska 2020).

Figure 2. below taken from (Hruska, 2008) shows the Zone of Apposition in optimal position and in suboptimal placement.

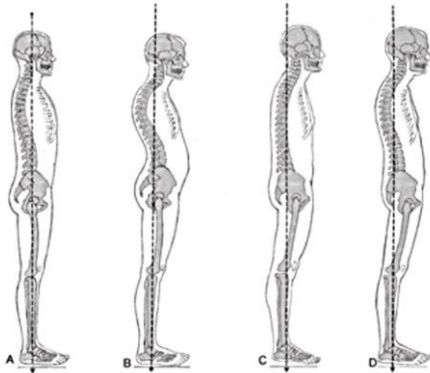


The misaligned body and the impact on the voice.

This notion of the Zone of Apposition is an important factor for singing because it revolves around the position of the diaphragm, which is the phrenic muscle that controls the expiration and therefore controls the phonation in singing (Hruska, 2008). The diaphragm's position is closely connected to postural stability and the decline in ZOA which is connected to abdominal muscular weakness will flare the ribs which leads to pelvis malalignment (Karimi et al., 2021). The modern lifestyle requirements seem to challenge the ideal postural alignment, making it hard to attain and maintain (Bruno et al., 2009). One of the most common spinal disabilities diagnosed globally in a wide range of societies, deals with chronic lumbar (low back) pain (Karimi et al., 2021). Both conditions are spinal curvatures that contract and compromise the body in order to function (Sparrey et al., 2014).

Lumbar lordosis is when the lower part of the spine curves and arches the back thus restricting the diaphragm which affects the inhalation muscles. Kyphosis is when the chest is sunken and the upper back curves, thus inhibiting the chest muscles to breathe and function freely (Calais-Germain, 2016, p. 58). Figure 3. shows the differences in postural mal alignments (vocalzone, n.d.).

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I have understood that the position of the spine and the position of the diaphragm work in tandem. This is because the rib malalignment in patients with lordosis and/or kyphosis have shown the direct connection with their difficulty in managing breath (Hodges & Gandevia, 2000; Salomoni et al., 2016). In a study regarding the movement of the rib cage and the diaphragm in opera singers showed the kinematic behaviour of the spinal position and how the posture affected the whole body (Peultier-Celli et al., 2022). Therefore, it is essential for a singer to address any spinal issues because of the complexity of the spine which affects the position of the diaphragm, the position of ribcage and its direct relation to the pelvis (Cantrell, 2011).

Even more so, the diaphragm has a direct connection with the cervical spine (the spine in the neck region) because the diaphragm's position is attached to the spine via nerves and therefore any spinal issue such as Lordosis and/or Kyphosis will impact it (Bordoni et al., 2016; Kocjan et al., 2017). Therefore, it is important that a singer (and/or a singing teacher) to be aware and try to maintain an efficient alignment because even a slight imbalance such as a head posture can challenge the breath and obstruct the airway and the pharynx (Knight & Austin, 2020).

The sensitivity of the spine does not only affect the breath and the diaphragm but a patient suffering with a decreased curve in the back (lordosis) might find the complete opening of the mouth challenging, which is directly impacted by the decrease in the full spinal's range of motion (Cryns et al., 2021). Moreover, studies suggest a cervical kyphosis impacts and decreases the pharyngeal space, thus inhibiting the singer's ability to resonate efficiently (Johnson & Skinner, 2009a; Randall et al., 2017; Ray et al., 2018; Scotto Di Carlo, 1998b, 1998a). A study showed the negative diaphragmatic impact that a cervical issue had on a singer, cutting her career short, due to her inability to manage breath (Cloward, 1988).

However, these spinal issues do not appear independently and most patients suffering with a cervical kyphosis, usually has a compromised torso, and patients suffering with lumbar lordosis tend to suffer with a stiff forward tilted pelvis (Been & Kalichman, 2014; Gadia et al., 2019; Ogura et al., 2021; Singla & Veqar, 2017; Sparrey et al., 2014).

Rehabilitation for singers with Kyphosis and lordosis

Recent research findings regarding therapeutic methods such as physiotherapy, yoga, Pilates and Alexander technique have shown positive impact in alleviating the strenuous muscular effect that a compromised posture creates (Bruno et al., 2009; Cardoso et al., 2017; Carman, 2004; Green, 1998; Lloyd et al., 2017; Mezzedimi et al., 2019). The therapies were mainly used as a tool in restoring the body. For example, a study dealing with the use of physiotherapy in singers dealing with Kyphosis and Lordosis showed that the alignment is not necessarily linked to their level of skill but mainly linked to the repetitive (adaptive) use of the maladaptive position. Therefore, the spinal imbalances can also be a lifestyle contributing factor. The common localised therapies applied to patients with lordosis and/or kyphosis were physiotherapy and manipulative techniques which were beneficial in restoring alignment (F. Staes. Lieve., 2011).

Furthermore, singers that practised holistic based activities such as Alexander Technique, yoga, and Pilates improved their postural awareness and adopted a better one. A pre-Pilates technique that helps the patient recognise his starting position is called imprinting (Asher, 2009; Green, 1998; Mezzedimi et al., 2019; van der Linden et al., 2011). Similarly, to the principles in PRI, Pilates aims to observe the bodily patterns and strengthen the weak ('core') muscles (Cuddy & Gaskell, 2020; Green, 1998). Studies show the similarities found in Pilates, Alexander technique exercises and the singing technique. However, the exercises seem to be usually practiced independently to singing.

One common drawback that I gather from all of these holistic techniques is the inability to be done in a singing practice room unaided. Most practices such as yoga, Alexander Technique and Pilates are beneficial to the singer yet there seems to be a missing practice that incorporates the static movements and the singing. Most simple stretching exercises (Dayme, 2010) seem to be quite generalised and not targeted to singers with a kyphosis and or lordosis (Schneider et al., 1997). I have also found that most pedagogues would feel helpless in trying to help students with these spinal issues. This is mainly due to the complexity of the anatomy and the limitation that some practices have gathered (Chopp-Hurley et al., 2018; Cuddy & Gaskell, 2020; Hunt, 2010).

Methodology

The aims of this mixed methods work-based project are to examine the behaviour of spinal and postural issues in professional singers, introduce simple rehabilitative exercises that can be done whilst singing and observe any possible changes in the acoustical patterns. Choosing an ethical method to gather data is always subjective because appropriate methods are totally dependable on the researched matter (Costley, Elliott, & Gibbs, 2010). Using the Qualitative research method, I could address the participant's ability and their feelings in doing the exercises whilst the quantitative methods allowed me to acknowledge how many of the participants have a multitude of spinal issues (Allibang, 2016). By revolving my project around mixed methods, I aimed to achieve more possibilities in which I can assess my research and results. Since my proposed area of interest is quasi-medical and based on specific individuals, I had to approach subjects by targeting focus groups and conducting questionnaires, interviews and by drawing results by recording the weekly observations.

The targeted focus groups and blog posts attracted a variety of participants from different backgrounds and countries. The participants were new to my practice, and in order to understand their professional background, a detailed CV was one of the requirements to take part in the research. All research is subject to criticism and both criticism and critique are considered good practice (Saidin, 2017). The researcher must always keep in mind to be careful when asking questions to avoid bias, to be aware of any issues and to record correctly all feedback from the participants. Ultimately, it is vital for any researcher to treat the participants with dignity and respect, avoid any bias or judgement in order to attain the best possible research process (Costley, Elliott, & Gibbs, 2010).

A valid method in which data can be recorded is interviews and this is a great way in recording perception (Rubin & Rubin, 1995). Interviews can be structured or semi structured. The difference between the structured and the semi structured interviewing process is mainly the way the process is conducted (Williamson & Johanson, 2018). All of the participants had spinal issues and in my research the interviews were mainly under the structured category because I was asking the same questions to all participants. Due to the nature of my research, I chose the structured interview method so that I can focus on a small variety of spinal issues.

The advantages of a structured interview are that results can be easily classified, but the disadvantage was that the results were restricted. Even though, the semi or non-structured interview method can create a variety of flexible results, they create difficulty in managing outcomes (Berg, 2001). Although the structured interview method, was practical to manage, the outcomes should not be pre assumed of before conducting the research. (Denscombe, 2014) stated that in using the pragmatic paradigm as a research method, one is aiming to

achieve a positive outcome and should only use this type of paradigm as a means of cross referencing (Morgan, 2014).

Simply having more results or different kinds of results does not inherently improve your work; in addition, you must bring those results together in a way that demonstrates the value of your additional effort. Hence, research projects that use multiple methods are not automatically preferable to studies that use just one method.

I consider the mixed method as a useful process because the researched subject requires various ways of gathering data from participants. Since mixed methods make use of a variety of approaches, I would be able to obtain a better perception. However, one drawback of mixed methods is the number of different approaches can lead to a lengthy and a complex research method (Creswell 2014).

Clearly, an important issue when conducting research is the way how outcomes are recorded. The method of recording outcomes falls under the terminology of **descriptive design**. The gathered data is usually done in a numerical manner (quantitative) such as when using questionnaires, observations, surveys and interviews. (Allibang, 2016) By utilising a descriptive design method, the researcher is only gathering information without any direct say in the matter. For example, if I use the questionnaire on a number of voice students suffering with spinal issues, I will only understand the importance of the matter through the resulting statistics. Therefore, the use of the descriptive manner of conducting this type of research is to obtain a general understanding and not to observe individual cases. The methodology of this descriptive design is used to govern the existing situation via a quantitative and/or qualitative manner. Another descriptive way in which I used to gather data is through the computerised programme PRAAT. I inserted short simple voice clips in the computerised programme and the data was gathered from a spectrographic analysis. The spectrogram wave can be classified as both descriptive design and also as a sampling method. There are two main types of sampling methods, which are probability and the non-probability (Allibang, 2016; Berg, 2001). When using any sampling method, it is important to keep in mind that it is impossible to sample everyone on the planet and therefore, the chosen results are not conclusive (Kaplan, 2004).

The recorded information showed on the spectrogram was a good indication of the change in air flow. A disadvantage presented by this type of sampling was the small number of participants being sampled, and that the PRAAT method is complicated and time consuming. However, being an insider researcher, I was able to familiarise with the programme and gather the information needed. An insider researcher is generally committed because of the familiarity of the organisation. Therefore, an insider researcher generally benefits from it himself (Saidin,

2017; Costley, Elliott, & Gibbs, 2010). One disadvantage of being an inside researcher whilst gathering both the spectrographic samples and the questionnaires, was to avoid bias to come to immediate conclusions. I had to make sure to look out for a variety of possible findings. (Costley, Elliott, & Gibbs, 2010).

Findings

The research was carried out via snowball sampling method by creating a post on social media asking for the participation of singers who have been suffering with any spinal issues. The communication was posted on a variety of chat rooms, blogs and singer related pages. Social media has been a great tool to reach out for a variety of singers across the globe, and from different backgrounds and stages in their careers. Another plus was that the research was conducted virtually and therefore it allowed the cross section of singers to participate, which would have been limited if conducted in person. A questionnaire was given to those who showed interest and explained further what the research was going to entail. After, explaining the process to those interested, six participants, of whom four female and two males, were able to commit themselves to the six-week process. The age ranged from 25 to 50 years and all have been working for over five years. All of them had professional classical singing training and are currently active performers.

Questionnaire findings

The questionnaire was created to gather some general information regarding the participant's musical training, and their perception of pain without being too medical or intrusive. The questionnaire consisted of eleven, mainly yes or no questions. I made sure that it could be completed in a few minutes, that is straight to the point so that it does not overwhelm the participant (Bell, 2005).

Only 20% of the participants mentioned that they have occasional back pain, whilst 80% mentioned that the pain was chronic. 70% of the participants reported that the spinal pain affected their use of voice, and the other 30% stated that the voice was mainly affected when they suffered fatigue or stress. All of the participants claimed to have shoulder and neck tension and all of them are having frequent chiropractic treatment, physiotherapy and Alexander Technique sessions. All of the participants have had their pain and issues checked with a health care professional and they all mentioned that the pain still persevered.

An advantage of doing a short questionnaire is that it created a concise overview of the main spinal issues that these participants suffered from, and the statistics were gathered anonymously (Bell, 2005). Therefore, I could observe the percentages as an insider

researcher but without being involved in the findings. It is quite clear that all of them are aware of their pain and their spinal limitations and although they are getting therapeutic remedies, they feel that more could be addressed regarding the pain/ singing connection. One disadvantage that the questionnaire presents is that due to the concise research, the questionnaire only involved six participants and the questions asked were generalised and not specific to each individual, thus creating a limitation and a restriction in the findings. However, it gave me a good overview on how I can manage the sessions.

The Sessions.

All sessions were held virtually and on a one-to-one basis. This enabled complete anonymity and flexibility in the availability and the privacy for each participant. I made sure to be aware of any medical conditions and of any of their variety of spinal disorders which resulted to be from mild (muscular tension) to quite severe (chronic scoliosis). One non-invasive, risk-free spinal examination that was done virtually, is called: gait assessment. This type of assessment is generally used by *Postural Restoration Institute*, *Chiropractors*, *Physiotherapists* and General Practitioners (Manickam & Gardiner, 2021; Rahmatalla et al., 2005; Sweeting & Mock, 2007). This simple examination is in two parts and it addresses firstly the movement of the foot on the floor and secondly the phase which includes a swing ensuring the forward movement (Manickam & Gardiner, 2021).

People suffering with lordosis and/ or kyphosis would usually show a constricting movement in the swinging phase (Hruska 2020). Therefore, this assessment gave me a clear indication of any imbalances and enabled me to carefully choose exercises.

One must keep in mind that gait assessment is not localised and can be affecting one area but compensating another (Sweeting & Mock, 2007). Therefore the participants were assessed on their walking pattern, on their ability to move (transfer weight from one leg to the other) and also on the ability to do static movements. Each patient was asked to do a variation of the movement. I ensured that each movement was simple, risk free and could be executed without any aid. Although the examination exercises seemed easy to execute, most participants found that they preferred to balance on one leg more than the other. 80% preferred the left whilst the other 20% preferred the right. Similarly, to the gait movement, the stance shows the pelvis position in paused action and when the participants were asked to notice the preferred front leg, 80% preferred the left, and 20% preferred the right.



Figure 4. Shows the stance exercise.



Figure 5. shows the balancing pose in a semi rounded back squat.

I also noticed that the 20% that were preferring the right, mentioned ongoing chronic spinal conditions. One patient has been suffering with thoracic scoliosis for over twenty years and the other patient mentioned a hernia on the left lumbar side of his spine. These observations surely add complications to the gait position but were only drawn as information and not as concluding results as more tests would be required to investigate further. These quite basic

movements such as static stance revealed the participant's preferred side, their ability to transfer the weight of the body, the activity of their pelvis and the movement of the legs (Manickam & Gardiner, 2021; Sweeting & Mock, 2007). However, in the *Postural Restoration Institute*, it is mentioned that due to the diaphragm being positioned on the right-hand side of the torso, most common patterns lead to a weakness in the right glute muscle, thus making the patient more stable on the left (Hruska 2017).

According to a lecture dealing with voice and respiration, an anterior pelvic malfunction inhibits vocal oscillations and restricts laryngeal freedom. (Hruska 2021). Being aware of this finding I was fully observant of the patient's gait and pelvis position and designed exercises to be able to monitor this. Assessing the pelvis position is more complex and ideally a full examination includes full gait assessment and Pelvis drop position (PADT) check. However, this could not be examined during this research due to the virtual nature of the project. An informed practitioner can immediately understand pelvis and stance behaviours from simple observations. Such observations include monitor the shoulders and the symmetry of the knee caps, during and without movement.



Figure 6. Shows the ability to rotate shoulder blades inwardly.



Figure 7. shows the patient lift the arm by keeping the spine neutral.

Being aware of the complexity of the pelvis and the myriad of issues it can cause I made sure to assess the gait in every single session and create varieties by using this simple assisted squat as a basic exercise. Therefore, I added other basic tests such as balancing on one leg, check the shoulder mobility and the symmetry of the jaw opening (Forthomme et al., 2008; Karimi et al., 2021; Quek et al., 2013).



Figure 8. shows the one leg balance, which indicates the nature of pelvis position.



Figure 9. shows the jaw opening test.

In physiotherapy and rehabilitative biomechanics, the nature of the position of the pelvis is understood by observing the distribution of the weight in the legs (Adams, 2004; Almeida et al., 2013; Cazden, 2019). Therefore, this simple squat with a round back, which creates the least spinal impact, can show the distributional patterns where the patient holds the weight of his body. In my findings 80% of the participants put the majority of their weight on the heel, which usually contributes to the lordosis. The other 20% who put the weight on the toes tend to have a more kyphotic spinal nature.



Figure 10. Shows the simple squat with a round back.

Furthering my understanding of the participant's lumbar/ pelvis position, I introduced the balancing exercise. When asked to stand comfortably on one leg, all of the participants had issues maintaining the posture and they were all unstable on one leg more than the other. The 80% who preferred the left leg could sing a simple phrase in this position but had breathing issues when they sang on their least preferred leg. Therefore, this could be indicative of the changing position of the diaphragm and its connection to the pelvis/spinal orientation.

The stability exercise is a non-invasive and a low impact way of understanding the patient's spine and pelvis connection. Patients suffering with severe lumbar lordosis were almost unable to balance on the leg. This is because a common pelvis position is in a tipping forward placement thus disabling the glute muscles to efficiently balance the pelvis (Hruska 2017).

According to *Postural Restoration Institute* this pelvis tipping forward is called a PEC (Posterior Exterior Chain), which indicates the forward placement of the pelvis (Hruska 2017). This position of the pelvis constricts the movement of the torso thus flaring the ribs out and the person is left feeling supported by the heels as if he is about to tip backwards (Savage et al., 2021). Therefore, I introduced a functional squat, which is a squat with a round back whilst reaching with the hands as if to grip a low shelf (Figure 11.)



Figure 11. shows a functional squat.

(Hruska, 2008)

By making sure that the shoulders are still in neutral position, 85% of the patients could feel a more connection to the breath and more grounding in their sound. 100% of them felt an immediate improvement of their sound and the PRAAT showed a bigger foundational wave.

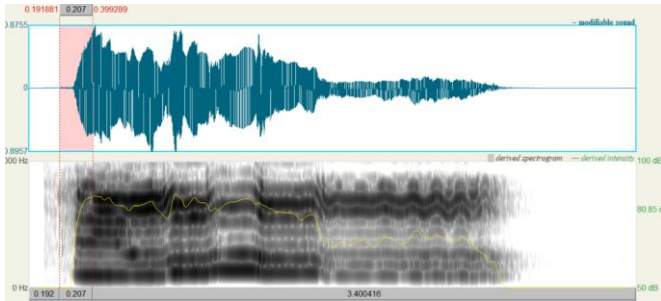


Figure 12. shows the compromised wave and instability of foundation

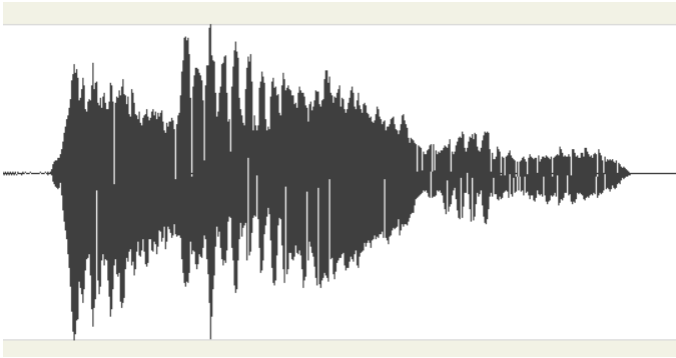


Figure 13. shows a foundational improvement in the sound.

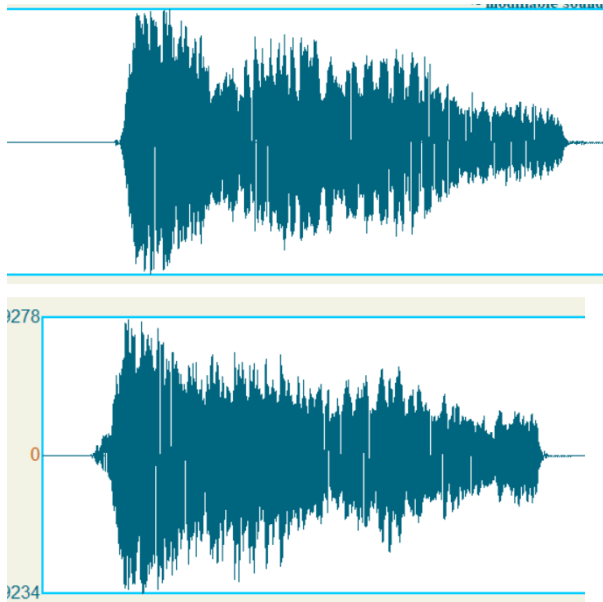


Figure 14. shows the difference in sound maintenance with the exercise and without. The second wave shows more foundational stability.

Due to the nature of these simple but effective exercises, I was keeping them in a beginner stage so that the participant would not feel overwhelmed. However, I asked an advanced participant to do the simple squat whilst introducing the resistance of a Pilates ball between the thighs. She immediately felt an increase in the breath support and the sound wave was significantly different. By simply introducing a new secure (ground), the pelvis was able to neutralise and the glutes took on the load, thus ensuring a better breath management (Savage et al., 2021).

After two sessions the participants were familiarising with the new grounding feeling and therefore I could further my spinal assessments. All of them had mentioned tightness in the shoulder and neck regions. I introduced shoulder mobility exercises to examine the shoulder movement and its independency from the torso. Simple exercises (Figure 6. Figure 7.) such as opening and closing the arms (figure 13), show the shoulder blade mobility and any kyphotic influence. This is because the shoulder blade is independent from the torso but works in tandem (Block & Khandelwal, 2010; Singla & Veqar, 2017; Wilding & McCambridge, 2021). Furthermore, in the *Voice Box Resonation* lecture, the importance of shoulder mobility, was given primal importance due to the possibility of collapsing onto the laryngeal area, thus creating more dysphonic symptoms (Hruska 2020).



Figure 14, shows open and closing of arms without arching the back.

I created exercises that aided shoulder mobility allowing more thoracic movement. These exercises were conducted against a wall (a surface) and variations were created according to the participant's issues. The exercises showed that 100% of the participants felt more vocal freedom and could manage their breath more efficiently, due to the feeling of having more thoracic expansion.



Figure 15 show the patient in the squat position whilst sliding the arms slightly against the wall without compromising the torso.

Discussion

This work-based research gave me the opportunity to gain insight on how students can benefit from simple exercises that are designed to be incorporated with their singing practice. It made

me aware of the current issues that classical singers, who have spinal issues, face and what treatment is accessible to them. All of the participants are observed by holistic practitioners and physiotherapists independently of their singing lessons, yet all of them reported great benefit from the basic exercises I introduced them to. At first, I was going to ask them to take pictures of their posture as additional information but I decided to use the gait exercise instead. This made the practice less invasive and lessened the responsibility of storing personal information. I was constantly asking the participants of any questions so as to ensure that their input is valid.

It is interesting how two sceptical students changed their idea to a positive one when they started to feel more bodily engaged and more efficient in singing. It came apparent to me that even though the exercises were simple and almost the same ones applied to all participants, I had to constantly modify to ensure that the participant is getting the full benefit.

All participants felt immediate improvement and the PRATT spectrogram shows the changes in breath management and intensity of tone. A drawback that the computerised programme presented is its complexity. I felt the need to be more knowledgeable about reading spectrograms and frequencies, which presented to be time consuming and quite complicated. Moreover, having multiple recordings weekly for all participants became a bigger task than anticipated.

A drawback is that the research as conducted for a short period of time (5 weeks) in which it is too short for muscles to adapt a new posture. Therefore, a longer research period could be more conclusive. Moreover, the research consisted of only six participants and although they were from different countries in different career stages, the research would eventually require a bigger participation.

One advantage was that all students felt more bodily aware and that help is available to aid with their vocal/ spinal frustrations. All of the participants felt a better sense of vocal freedom and they all mentioned that five sessions were not enough for their issues but gave them an insight on possible rehabilitative practices. Furthermore, they all agreed that they are interested in furthering their sessions and they would be interested to have longer in person sessions.

This research made me aware of the vulnerability of working performers due to the difficulty of the job and the need for anatomy rehabilitating vocal pedagogues. The vast literature led me to understand that the majority of the findings revolve around rehabilitative exercises or rehabilitative treatment that are independent of the singing/ or cannot be incorporated with the singing practice due to the machinery involved. The majority of the literature that dealt with rehabilitation of the singing posture spoke about stretches, done independent of the singing.

Whilst interviewing some singing teachers, they made me aware of frustrations they come across due to their lack of knowledge on the subject which makes them helpless in trying to help the students with spinal issues.

One research finding was the need for stretches and simple poses for singers that can be done to enhance their ability to maintain the phrase which will help them to build vocal stamina. It seems that performers who suffer with lordosis/ kyphosis cannot deal with spinal rehabilitation whilst singing efficiently. This is an assumption concluded from the participants and not concrete evidence. However, all of the participants were eagerly practising into their poses which gave them immediate ease.

Conclusion

My main aim was to design simple exercises that can be practised and incorporated into the singing, and which are simple and risk free so that any teacher can use on the students. However, the exercises are still being developed and a further investigation is needed to create a more concrete practice for a wider range of spinal issues.

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Appendix

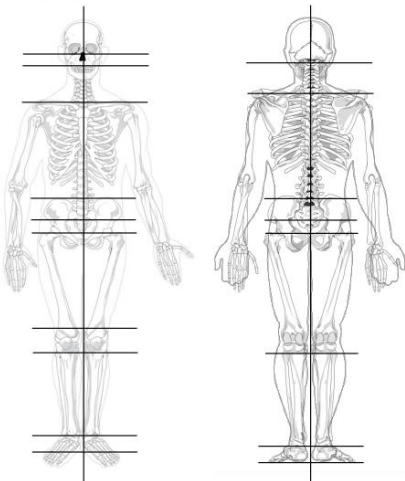
Chiropractic Posture Chart

Date: _____ Doctor: _____

Patient's Name: _____ Ref #: _____

Date of Birth: _____ Age: ____ Gender: Male ☐ Female ☐

Insurance Details: _____



Standing Posture		
Body Parts	Scoring	
	L	R
Head		
Neck		
Shoulders		
Upper Back		
Lower Back		
Spine		
Torso		
Abdomen		
Hips		
Knees		
Ankles		

[Medical Forms \(freeprintablemedicalforms.com\)](http://freeprintablemedicalforms.com)