

Effects of Head Extension or Lowering in Singing and Strategies for Optimum Head and Neck Posture

For singers, their body is their instrument and posture is one of the important elements of vocal physiology (Peultier-Celli et al., 2022). A healthy head and neck posture is needed to align the body in such a way that the muscles can move without tension permitting the larynx to function smoothly (Cardoso, Lumini-Oliveira and Meneses, 2019).

In this paper I intend to explore and examine the importance of head posture and the effects of head elevation or lowering in the human voice. I am a singer and a voice teacher. Often in my studio, I observe students tending to raise their chin and head up as if they are trying to 'reach' for their high notes, especially I observe this with students who are untrained and are beginners (Dimon and Brown, 2018). As they tend to rise in pitch, along with the chin going higher, there is a tendency to stick to chest registration and the volume level going higher. Being a classical singer myself, I have been taught and I practise and teach not to raise the chin up high and to lower the lower jaw while moving to higher pitch to create a richer sound. Though these are the experiences of my practice, through this study I seek to face my own bias and look at this with more scientific evidence and perspective, so that my teaching practice would be evidence based voice pedagogy as suggested by McCoy and Ragan (2018).

POSTURE

The general consensus across a number of studies (Knight and Austin, 2020; Rootberg, 2007; Staes et al., 2011) about healthy posture is that it helps in the overall balance to establish a tonus and provide an ease of movement (Rootberg, 2007). The total forces acting upon the body should equal zero, to establish equilibrium or balance in the muscles (Schneider, Dennehy and Saxon, 1997). When the body is aligned optimally, it requires minimal energy for neuromuscular functioning without straining or limiting the tissues (Kendall, 2005).

Most voice pedagogues' advocacy (Chapman, 2017; Dimon and Brown, 2018; McKinney, 1994; Miller, 1986) for postural balance comes from the fact that postural imbalance could influence the extrinsic laryngeal muscles and the soft tissues of the pharynx (Wilson Arboleda and Frederick, 2008). It can result in disproportionate adjustments in muscle tension leading to

injuries, pain and discomfort (Cirilo et al., 2021). Some have noted that if the postural imbalance happens at the cervical area it can affect the positioning of hyoid bone and hence can affect the position and functioning of the larynx (Nacci et al., 2012). Studies (Peultier-Celli et al., 2022; Scotto Di Carlo, 1998) have affirmed the importance of cervical stability and its influence on the movement of the larynx.

A healthy postural alignment is defined as a posture where a vertical line passes through the external ear, anterior to the shoulder joint, slightly behind the hip joint, before the knee joint and slightly anterior to the ankle joint (Florence Peterson Kendall, 2005). There are four natural curves - the lordosis (forward curve) at the cervical (neck) and lumbar (back) regions and the kyphosis (backward curve) at the thoracic and sacral (end of the spine) regions (Wilson Arboleda and Frederick, 2008). If any of these curves are more pronounced it results in malalignment. With the imbalanced head posture, cervical lordosis is affected which could adversely affect phonation (Cardoso, Lumini-Oliveira and Meneses, 2019).

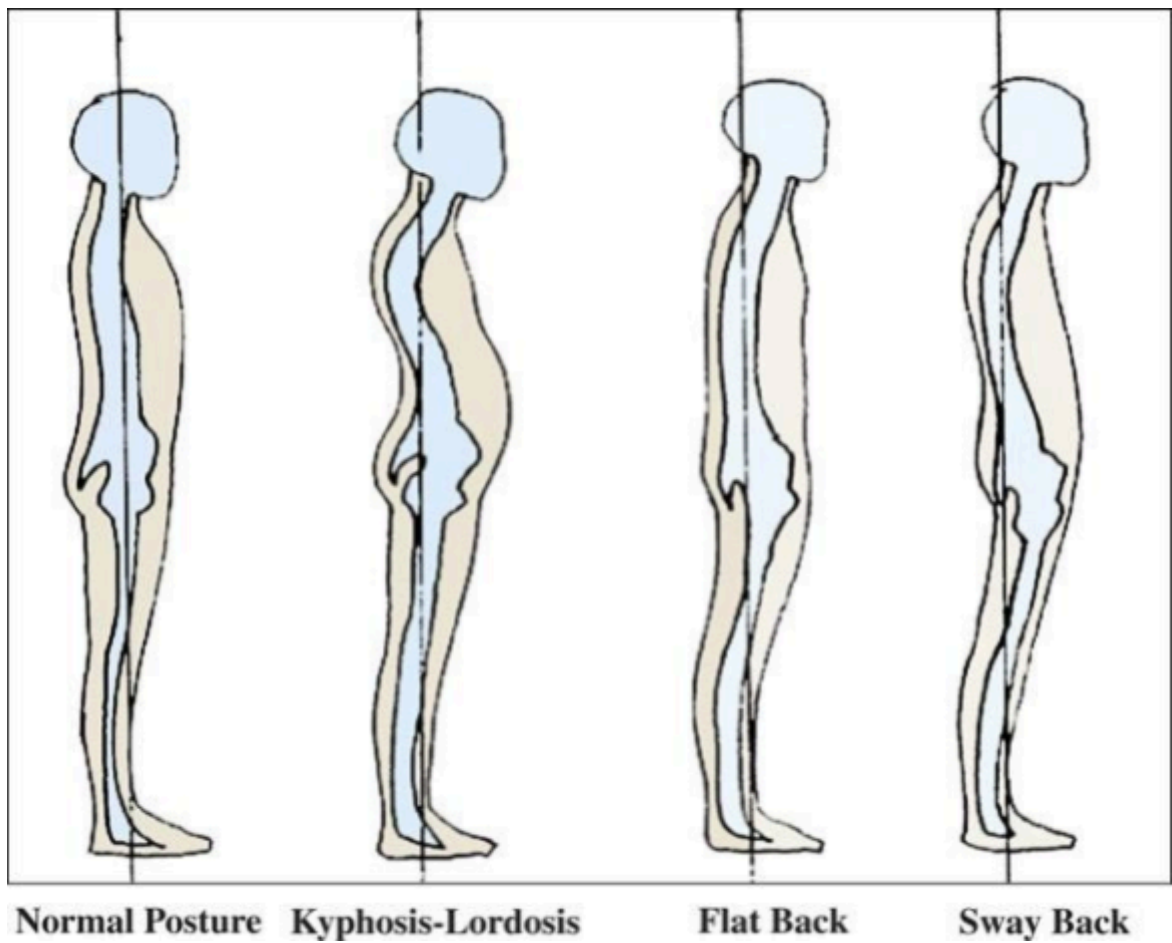


Figure 1: Normal alignment with 3 deviations from Wilson, Arboleda and Frederick (2008).

The way in which each malalignment affects the head posture is given in the table below and any of these singers with these postures may require corrective measures.

Table 1: Effect of postural imbalance on head and cervical spine (Czaprowski et al., 2018).

Posture	Head	Cervical Spine
Normal Posture	Remains horizontal; Eye level corresponds to horizontal plane; Chin is placed above the sternum.	Normal curve.
Lordotic Posture	Neutral	Normal curve i.e. physiologically convex anteriorly (lordosis)
Kyphotic posture	Protracted (forward disposition of head)	Extended upper part (Hyperlordosis) Flexed lower part (Hypolordosis or Kyphosis)
Flat back posture	Neutral or protracted (forward)	Extended upper part (hyperlordosis) Flexed lower part (hypolordosis)
Sway back posture	Protracted head	Extended upper part (hyperlordosis) Flexed lower part (hypolordosis)

HEAD POSTURE AND CERVICAL DEVIATIONS

A study by Miller et al., (2012) which involved humming low and high pitches shows that the very act of humming results in changes in craniocervical angles hence affecting the normal posture. Another study done by Miller et al., (2014) with a mixed group of singers and non-singers where, increased kyphosis (backward curving) of cervical spine on increasing pitch was observed along with other factors. The same study also found that on lowering the pitch, increased lordosis of cervical spine was observed. With a head extension of 20 degrees, increased cervical lordosis was observed (Hellsing, 1989). All these studies indicate a prevalence of certain levels of cervical abnormality in singers.

These observations correlates well with the finding by Honda et al., (1999) who states that the regional cervical lordosis or kyphosis results in the fine tuning of F0 (fundamental frequency) in singers. The study noted that the head posture can influence the cervical spine resulting in the widening of the pharyngeal space which was also affirmed by other studies (Hellsing, 1989; Muto et al., 2002). The resulting vocal tract configuration by the altered cervical spine can be used by singers for producing certain voice quality (Guzman et al., 2013) depending on the genre of music (Guzman et al., 2015). There are other studies (Honda et al., 1999; Scotto Di Carlo, 1998) which indicate that deviations in cervical lordosis can negatively influence the control of pitch regulation and the ability to fine tune the phonation process and could result in

dysphonia (Cardoso, Lumini-Oliveira and Meneses, 2019) or increased vocal effort in phonation (Gilman and Johns, 2017). Another study noted that opera singing places huge demands on cervical spine (Johnson and Skinner, 2009) and there are cervical abnormalities found more in singers than in non-singers (Scotto Di Carlo, 1998).

From the above observations one can say that vocal and postural alterations co-occur in singers (Cirilo et al., 2021). As long as the deviations in the cervical lordosis are not significant, singers can use the changes in the cervical spine curvature to make changes in voice quality (Honda et al., 1999; Johnson and Skinner, 2009). Though the extent to which deviations in cervical lordosis would be allowed and is healthy is a matter of debate and warrants further research and study.

HEAD POSTURE AND MUSICAL STYLES

The view that the chin should be parallel to the ground (Schneider, Dennehy and Saxon, 1997) is proposed and adopted by many voice pedagogues and that the singers should maintain a levelled head position (Chapman, 2017; McKinney, 1994; Miller, 1986), neither lifting up nor lowering it. Interestingly this levelled positioning of chin and head is generally adapted by classical singers (Amarante Andrade, 2012) for whom a more homogenous sound quality is preferred which can be achieved by the lowering of the larynx position (Amarante Andrade and Švec, 2014).

On the other hand, non classical singing styles do not require a homogenous sound but in fact it celebrates the breathy, distorted and the so called 'affected voices' (Wendler et al., 2013) and hence do not require a levelled head position. A comparative study by Amarante Andrade and Švec, (2014) between classical and non-classical singers showed that most non classical singers adapted an elevated head position for higher notes (between A4 to C5) while the classical singer opted a neutral head (5cm) position.

The proponents for 'neutral head' position (Schneider, Dennehy and Saxon, 1997; Wilson Arboleda and Frederick, 2008) also do so for the reasons of balance between the muscle actions. The head balance is brought about by the muscles at the back of the neck (extensors) and the front neck muscles (flexors) (Rootberg, 2007). Another aspect that is considered is cervical stability as the neutral head position helps in the cervical and laryngeal mobility (Scotto Di Carlo, 1998). Lowering head could result in the lowering of the larynx (Honda et al., 1999), and so pedagogues who opt for lowered larynx do so not only for resonatory and muscular

tension aspects, but also to intentionally avoid the excessive vocal folding (vocal folding is the degree of depth of vocal fold contact (Vilkman et al., 1996) thereby enabling the vocal folds to move into the head voice which involved lesser vocal folding (Dimon and Brown, 2018).

On the contrary, people who adopt 'raised head' position, often do so because of the technical demands of the style, especially manifested in non-classical singing styles (Bartlett, 2014). It is also because of their viewpoint that raising of head releases the grip on larynx and allows it to do what it is supposed to do freely (Austin, 2012).

From the above studies I infer that the prevalence and practice of a certain preferred head position over other positions is also dependent on the style of music a singer is trained in and is performing and hence one should look at head positioning through the lens of the style of music being performed (Amarante Andrade and Švec, 2014).

HEAD POSTURE AND PITCH:

Hong et al., (2015) has shown that external laryngeal muscles play an important role in control of pitch and that upward laryngeal movement has a greater contribution to pitch raising than the CT muscle. Another endoscopic study by Guzman et al., (2013) which assessed a group of rock singers with pop singers showed the prevalence of high vertical laryngeal position. Since vertical movement of the larynx is considered as an important pitch controlling component (Honda et al., 1999), and is influenced by the head position (Honda et al., 1981; Vilkman et al., 1996) we can infer that these non classical singers adopt an elevated head position for singing high notes. Hence one can say that the raising of head up (head extension), results in the movement of stretching of frontal neck muscles and other extrinsic laryngeal muscles (Vilkman et al., 1996) which can be used as a tool for pitch change.

With head extension, the lower frequency harmonics are more sensitive to changes in head positions (Knight and Austin, 2020) and hence greater head extension results in higher low frequency amplitudes (0 - 2kHz). According to the study, it could be used to boost the overall loudness of the voice and may be a helpful resonance tool for female singers in higher ranges and boosting the fundamental frequencies, which is a helpful pedagogical tool. This also confirms my observation why singers tend to go louder as pitch ascends.

HEAD POSTURE AND VOICE QUALITY:

Head extension/ depression is reported to have an effect on the singing voice quality (Knight and Austin, 2020). The study showed that the more extended the head was, the lower the singing power ratio (SPR) was. SPR ratio is a comparison of the highest amplitude partial (2-4 kHz) and the highest amplitude partial (0-2 kHz). With head flexion there is a loss in the lower frequency partials leading to higher SPR. SPR has been shown to be an indirect way of measuring the voice quality (Omori et al., 1996). The same study also suggested that higher SPR might imply the presence of singers' formant (or the ringing quality) in the voice, which is higher in trained singers compared to untrained singers (Watts and Blanton, 2006).

Hence while teaching styles of singing where increased energy in the singer's formant is required and where consistent tone quality is of paramount importance, in my opinion, head flexion could be considered as it decreases the low partial amplitudes, thereby increasing the SPR value which influences the vocal quality (Knight and Austin, 2020). However one should be mindful to the extent to which head flexion could be done, as lowering the head affects the lower partials leading to decreasing volume levels, according to the study.

STRATEGIES AND PEDAGOGICAL IMPLICATIONS:

1. ***Wearing of heels*** tend to lower their heads both while singing or being silent (Rollings, 2018). Since wearing heels results in a lowered head position, this may be a helpful tool for styles of singing that require a more consistent tone, especially classical styles (Amarante Andrade and Švec, 2014). However adjustments may be required if a singer is singing non classical styles of music, keeping postural balance and stylistic aesthetics in mind along with the singer's comfort. Refer Figure1.
2. ***Performing on a raked stage***, wearing heavy costumes like heavy hats and wigs, headgear, masks and asymmetries in the head, neck and shoulder can affect the head positioning (Chapman, 2017). Performers can adjust spinal curvatures as given in figure 2 with slightly bent knees, posterior pelvic tilt, and head lowered position.

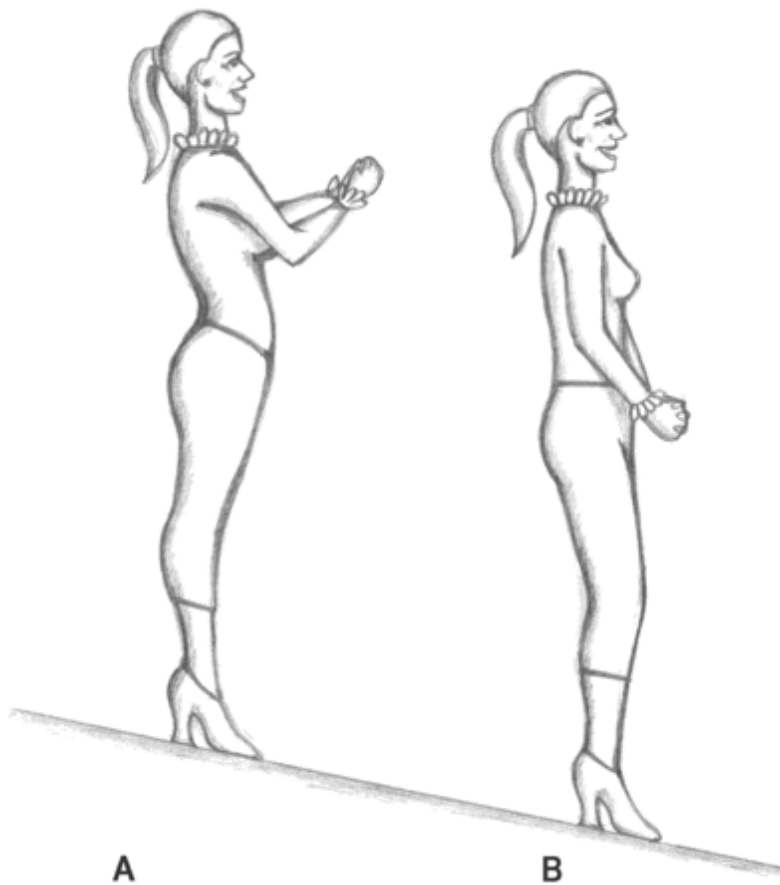


Figure 2: *Postural adjustments while performing on a raked stage or while wearing heels (Chapman, 2017).*

3. **Neck thrusting:** It is the forward disposition of the head wherein the ears are forward of the shoulders. Singers who are habituated to this posture tend to elevate their head in an upward direction to straighten their gaze (Bougie, 2012).



Figure 3: *Normal cervical curvature (Left); Forward head posture (Right)*

Forward head posture (FHP) is characterised by the increased cervical curvature (Gonzalez and Manns, 1996) and may develop pain (Gustafsson et al., 2017; Kang et

al., 2012). FHP can be caused by using technology like mobile phones and laptops and singers should be mindful of their postures.



Figure 4: *Postural corrections while using electronic devices*

4. **Usage of the microphone** and its positioning with relation to mouth can also influence head posture of singers; some singers use instruments on stage which can also affect their posture (Amarante Andrade and Švec, 2014). Being aware that the vertical plumb line is passing through the external ears and midway through the shoulders (Wilson Arboleda and Frederick, 2008) is important for singers.
5. One has to be **mindful of the vocal styles** and its demands and accordingly position their head. Commercial contemporary singing demands specific vocal textures and timbre which may require certain head postural adjustments that will result in higher larynx, greater adduction and pharyngeal compression (Sundberg, Thalén and Popeil, 2012) whereas classical singing may require a neutral or lower larynx position which helps in the 'voice-covering' while ascending in pitch.
6. Maintaining the level of the head facilitates the **shift to head voice registration** as observed in classically trained singers (Dimon and Brown, 2018). This could be used as a tool for singers who desire exploring their head voice.
7. **Using mirrors for monitoring posture:** Chapman (2017) recommends using mirrors in the vocal studio. This creates a postural awareness in students and they can monitor

their postural alignments and make remedies for themselves, especially for classical studies. I have found this to be very helpful in my own studio practice.

8. **Balanced act model of singing**

In a recent article, Edwin (2022) suggests a balancing act model, where a singer could use hyper (excessive head extension, with a specific application to this paper), hypo (excessive head lowering) and balanced exercise ('just right level' that is helpful for the singer to bring about the desired stylistic effect). He states that this could be a great pedagogic tool to identify both extremes as well as the balance between the extremes. In my opinion, I think it would also help singers to learn and use techniques from other styles which they might not have considered otherwise.

However, since the activity of all the neck muscles are elevated substantially when singing at the highest pitch (Pettersen and Westgaard, 2004), one should also be mindful in balancing between hyper and hypo muscle tension (Cardoso, Lumini-Oliveira and Meneses, 2019; Sielska-Badurek et al., 2017), vocal effort (Gilman and Johns, 2017), aesthetics and individual sound preferences (Schutte and Miller, 1993) while making singing choices.

9. **Exercises for head balance:** Cervical stabilising exercises have shown to improve postural alignment in classical students (Staes et al., 2011) and may be helpful for singers who express neck pain, stiffness, cervical malalignment (Wilson Arboleda and Frederick, 2008)

Figures 3,4,5 & 6: Courtesy - Wilson Arboleda and Frederick (2008).

Exercise 1: Suboccipital stretch - Stand against the wall with a rolled towel behind the back of the neck. Tucking the chin, press the towel with the back of the neck and hold for 20 to 30 seconds for stretching the base of the skull.

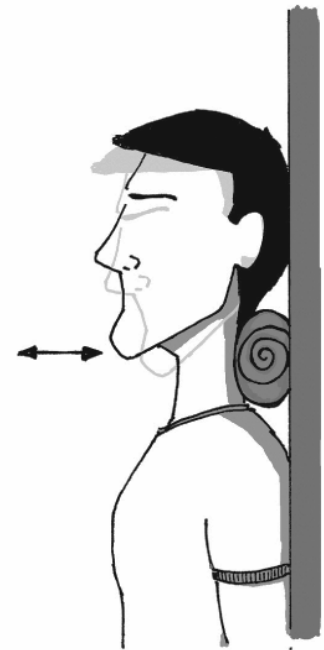


Figure 5: Suboccipital stretch



Exercise 2: Infrahyoid group - Open the lower jaw while resisting its motion with the fist under the chin. Hold for 3 to 5 seconds.

Figure 6: Infrahyoid group

Exercise 3: Neck flexors - In a lying down position, this exercise is done by lifting the head up and bringing the chin to touch the chest without thrusting it. This would ensure the strengthening of the muscles of the neck.



Figure 7: Neck flexor strength

Exercise 4: Neck retractor strength -

this exercise strengthens the upper cervical spine. Lie face down, with a towel under the forehead and arms on the sides. Lift the head up with the chin either in tuck or not and hold for 3 to 5 seconds, without lifting the shoulders.

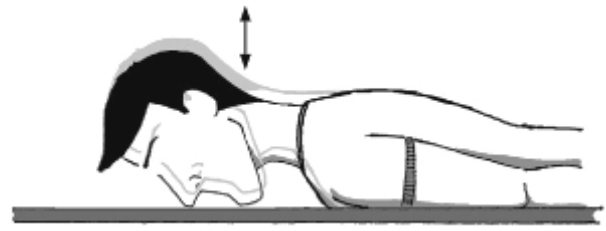


Figure 7: Neck retractor strength

Cervical Mobilisation Exercises:

By applying exercise physiology training principles, postural alignment can be improved which may positively influence the vocal performance (Schneider, Dennehy and Saxon, 1997). These exercises are for the muscles around the neck.

Exercise 5: Neck Flexion - Keeping the palm on forehead and chin tucked downward, one has to move the neck muscles forward while resisting with your hands the forward flexion.

Exercise 6: Neck Extension - Hold the back of your head with your hands. Move the head backwards and resist the backward movement of head as with your hand.

Conclusion:

Posture plays an important role in a singer's performance and health. From this study a few things I have inferred. The act of singing involves changes in the cervical spine which can be brought about by many factors. Postural imbalance in the head can influence cervical spine, vocal quality, timbre, pitch and laryngeal height. Overall, the head extension/lowering could be used to either boost the lower fundamental frequency and be used as a tool for increasing the loudness. It can also be used to enhance the singer's formant and may help in the shaping of voice timbre.

It is difficult to conclude at this point of study that any of these positions is 'the best' posture. One has to look into this matter with a more flexible view that accommodates and provides a pedagogical help for learners of all vocal styles of singing keeping the technical and artistic demands in mind and not to look at this as one size fits all approach (Edwin, 2002; Wendler et al., 2013).

Part II - Critical reflection

Formulation of a research question is to investigate a topic of uncertainty and bring more clarity and insight into the topic under consideration (Ratan, Anand and Ratan, 2019). Initially when I started this paper, I wanted to explore the topic of 'the effect of chin raising/ lowering on voice production'. Being a classical singer myself, I must admit that I had my own personal biases toward this topic at the start of the study. However I decided to explore and evaluate the influence of neutral or lowering of the chin while singing higher range notes through the scientific lens. I also wanted to study the effectiveness and applicability of this technique across the genres, through the existing literature.

In my study I mostly considered peer reviewed journal articles as they are the most credible sources (Eaton, 2018). As I began my search for sources, I found that there weren't many sources regarding the involvement of chin in singing. I found that my research was too narrow because of the limited availability of sources on the subject. This led me to consider broadening my scope of investigation (Agee, 2009) and change the topic to 'The effects of head extension/lowering in singing'.

As I studied, I searched for articles that were directly linked to the head movement; articles that discussed about the relationship of head movement to postural balance and muscle tension; articles that connected the effects of head positioning with different singing styles; articles that discussed about the effects on external laryngeal muscles and larynx and the physiological exercises relating to posture and head balance. These helped me to look at the effects of head positioning from various angles. It also made me realise that more study is needed in each of the related fields to have a more comprehensive understanding of the topic, which I found would require more time.

There were few limitations in my study regarding the access of resources, especially studies by Estill voice method, as there weren't so many articles in the journals regarding that. Also due to time constraints, I wasn't able to study in depth about the Feldenkrais method, Alexander method or CVT method, which I think would have added more value to the study of this paper.

One of the things I noted was the lack of longitudinal study on this subject as longitudinal studies are helpful in understanding the long term effects of a particular phenomenon (Caruana et al., 2015; Keeves, 1987). A comparative longitudinal study on the effects of head posture (elevation/ lowering) in singers from different musical styles(classical and non- classical) would

be very helpful in understanding the long term effects of lowering or raising of head on various vocal aspects.

My perception that classical singers do not raise their head was challenged by the findings in these studies (Honda et al., 1999; Johnson and Skinner, 2009; Scotto Di Carlo, 1998). They generally lifted the chin and there were cervical abnormalities in singers. Studies (Amarante Andrade and Švec, 2014; Gilman and Johns, 2017; Knight and Austin, 2020; Rollings, 2018) showed that the head level was not too depressed i.e touching the chest. A somewhat elevated level of head positioning was observed in all these findings. This prompts me to consider that some amount of head elevation is present even in classical singers. In fact, a study by Knight and Austin (2020) with a pool of classically trained singers ($n= 20$) showed that the mean habitual head position of females was 8.19° and 9.94° for females and not 0° . This signifies a marked level of head elevation even in classical singers but lesser compared to non-classical singers (Amarante Andrade and Švec, 2014).

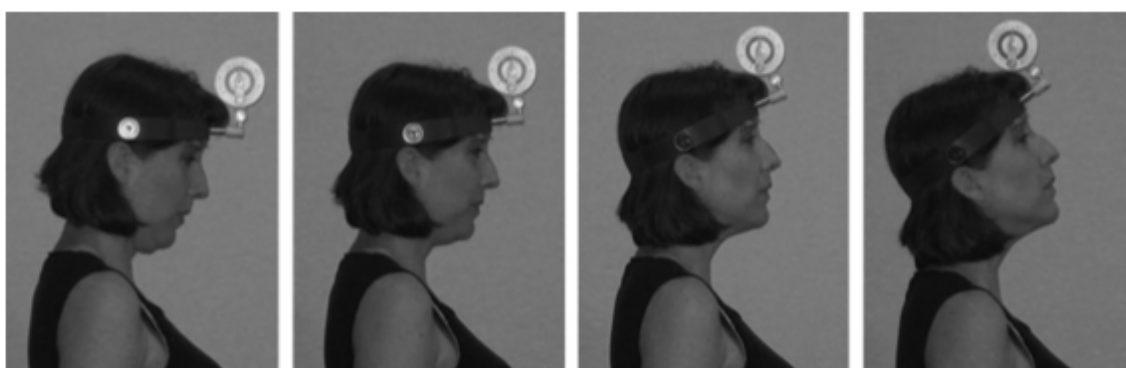


FIGURE 1. The four experimental head angles, -15° , 0° , 15° , and 30° .

Figure 9: From Knight and Austin (2020).

During the process, I found it difficult to read the articles through a digital platform. The visual screen was making my eyes tired and felt physically draining. So, I printed it all and I felt a transformation in my curiosity and interest in reading the papers. I was able to underline and read it any time (not dependent on the internet facility) and had more focus. However, I did struggle to maintain a journal or a note keeping method during this process, which is something I look forward to learning in the future.

One of the postural deviations I learnt in my study was 'forward head posture (FHP)'. While the term FHP is common in the field of physiotherapy it is defined differently in Alexander technique. In medical sciences, FHP is defined as the extension of the head forward in relation to the neck (Gonzalez and Manns, 1996). But in Alexander technique, a 'forward and up' head posture generally means that the head balances in relation to the spine (Rootberg, 2007).

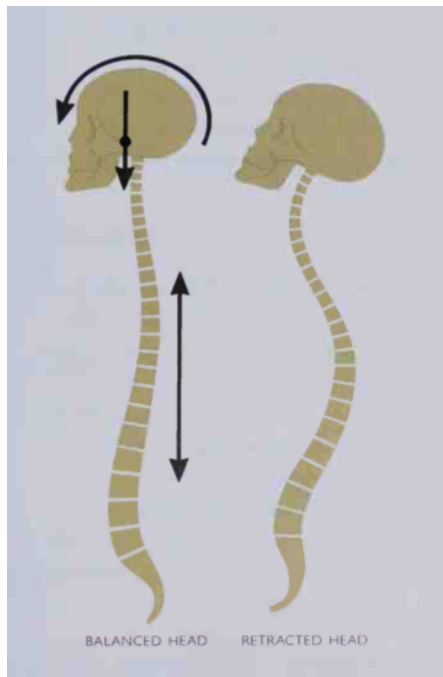


Figure 10: Head forward and up (Glynn Macdonald, 1998)

During this study I have had a significant shift from being rigid on my experiential knowledge to a more fact based knowledge and embracing the beauty and stylistic preferences in other singing styles. However, to find a balance between the stylistic choices and the vocal health is still difficult. When I began the research, there was a strong tendency to resolve the research questions and find a resolution. But as I studied further into the topic there are so many variables that one needs to consider in helping singers and I wonder if it is possible to give a one fit solution for all. Rather, I think it is alright to struggle with the irresolution and learn to take it case by case, student by student, and to find a more middle way of functioning that is helpful for each individual (Edwin, 2022).

Studying the effect of head posture and balance has made me more aware of the physical implications of imbalance. I am more careful when I am at my laptop or using my mobile phone now than before. This paper has also made me realise the importance of continual learning, reading, researching and contributing to the wider world, which I have included in my professional development plan.

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PROFESSIONAL DEVELOPMENT PLAN

	Activity	Objective	Action	Time frame
Training	Sign up for 'Estill online foundation course'	To learn the voice figures of Estill method by attending an online training program.	Find out from the Estill website the online programs available for the Indian subcontinent.	Begin by July 2025 Finish the course: Before December, 2025
	To sign up for 'Certificate for Music Educators'	To continue to grow in the field of teaching vocal music and increase my academic credentials.	Find out a list of institutions offering an online CME program and get acquainted with the requirements of the course.	In the year 2025
	To complete the music educator programs for vocal teachers offered by ABRSM.	Primarily to grow in perspective as an educator especially as a voice educator. Also to complete the already signed up program and to complete.	To start chapter 1 of the program by next week.	By June 2024
	To learn German and Italian. To complete a basic A1 level.	To be able to be confident in reading and pronunciation of German and Italian so as to be able to help my students who are learning classical music. It will also give me a greater sense of confidence in singing and teaching.	Enlist the institutes that offer language courses.	Begin by April 2025 Finish by Dec ember 2025
	Understanding note taking methods for research.	I would like to come up with better methods for the note taking process for the articles that I am reading.		

	To read books and journals articles	To make academic reading as part of my lifestyle. To develop a habit of reading and updating my knowledge.	Buy the book 'Estill voice figure' and read 1 journal article.	Ongoing. To read 3 articles a week.
Developing professional skills	Designing a basic curriculum for training aspiring singing teachers.	To learn how to teach and train singers who want to become voice teachers.	To write and create the first draft of the curriculum outline and its contents.	Start by May 2024 and complete the writing by June 2024.
	To learn choir conducting techniques	To be able to conduct our school choir more effectively with appropriate gestures.	1. Find and watch relevant choir conducting teaching videos 2. Order and read book on basic conducting techniques	Ongoing
	Research on doctoral level programs	To further improve my knowledge and have options for future learning pathways.	To search for institutions that offer online and research based doctoral programs and shortlist them. Study their requirement criteria.	Ongoing. To shortlist the institutions the offer doctoral programs by the end of August 2024.
	Singing	To keep the artistic side of me alive and contribute with my voice.	Start learning classical arias from opera and oratorio.	Ongoing. Begin by April 16 the first aria.
	To seek for collaborations	To seek collaborations with other artists and singers for singing. To start working on a project for a recording or concert with another artist.	To shortlist a few singers and ask for their consent for collaboration.	Ongoing. To start with 1 project by June 2024.
Content creation	Writing	To start writing articles about singing for my students and common people in simpler	Start with 1 article	Ongoing. To write one article every month.

		language and to spread the vocal knowledge to others.		
	Recording	To sing and record arias, songs and exercises which are often used in the studio and share it with students as a practice tool.	Listing out the songs to be recorded and starting off with Vaccai exercises.	Ongoing. Each month 1 recording. Begin by May 2024.

