

Amanda Murphy

1817271

University of Wales Trinity St. David.

An investigation into the extent to which singing can facilitate the management of a hearing impairment: An exploration into the benefits and challenges of singing within a range of contexts.

1. The Portfolio

Introduction and Rationale

This study will be focusing on research sourced from the literature that I intend to examine focusing on the field concerning, the extent to which singing can facilitate the management of a hearing impairment whilst also investigating the benefits and challenges of singing within a range of contexts. The primary purpose of this research will be to expand my present knowledge of the topic area through the acquisition of further significant data recently published. Thereafter the objective is to employ this acquired knowledge within my professional to achieve greater beneficial outcomes for my hearing impaired singing students.

Previous studies that I have identified and analysed focusing on this topic have permitted me to form the primary groundwork needed to establish a starting point for this research study. Throughout this process gaps within the literature emerged and were noted, subsequently stimulating my interest to explore certain avenues in more detail including uncharted areas on my part.

In order to understand my fascination for this study topic firstly it is necessary to illustrate my hearing background as well as my professional teaching and music profile. I am a post – lingual bilateral hearing aid user which is a consequence of being diagnosed as having a hearing loss in both ears after I learned to talk (Centers for Disease Control and Prevention, 2020). Due to my hearing loss I regularly misunderstand words and sounds, and I strain to hear if there is extra background noise even more so in noisy environments (Action on Hearing Loss, 2020). As a result of my hearing loss I additionally experience Tinnitus¹ in both ears which is an unfavourable nuisance in my everyday life. Developing a moderate hearing impairment in my early twenties is attributable to what is known as a dominant mutant gene. This gene is a type of hereditary deafness which is acquired from a parent and

¹ Tinnitus is the perception of noises in the head and/or ear which have no external source. Individuals living with the condition may have to endure a ringing, buzzing, hissing, whistling or other noise. The sensation can be constant or intermittent and it can vary in volume (British Tinnitus Association, 2021).

can be found in a family for generations (Hallowell, 1970; Shearer AE, 2017; Action on Hearing Loss, 2020). In this case I received the gene from my father and equally he received the gene from his father .

As I teach Contemporary Commercial Music (CCM) singing style, I work within diverse contexts with varied age groups. These include mainstream primary schools, a special needs school, universities, a community choir, corporate team building vocal workshops and lastly within my own private teaching practice. Let it be noted that due to the recent pandemic of COVID - 19² on occasions I have been required to transfer my lessons to an online teaching platform. Lastly, alongside of teaching I am also a professional singer who performs with bands, choirs and within the recording studio.

Due to teaching singing in a number of different settings for a wide range of ages, this requires me to teach individuals, whilst recognising a mixture of abilities and levels which can include those who are hearing impaired individuals. My current teaching approach is majorly influenced by empirical studies on this specific area of practice. This is a reflection of my personal understanding and experiences as a singer with hearing loss and using hearing aids. However, additional components that shape and guide my teaching process can incorporate my former teaching training, both within the mainstream and special needs educational sector. Ultimately, it is vital to utilise scientific evidenced pedagogy concerning physiology, anatomy, function, acoustics for the 21st century teacher (Chapman, 2017, pg. 352).

In the final part of my previous research study I discovered that I overlooked certain areas of interest linked to this subject matter. These unexplored areas could possibly prove significant for the enhanced function of teaching hearing impaired students within my practice. Formerly I was unable to investigate these matters of interest any further

² Coronavirus 19 disease is an infectious disease caused by a newly discovered coronavirus (Who, 2021).

due to time restraints, work load, and lack of resources. I now aspire to examine these areas of the literature for this current research study, with the possibility of navigating in the direction of newfound information and building upon my present knowledge. In return I look to obtain a clearer interpretation of the hearing impaired singer in a range of contexts, as well as documenting the challenges and benefits encountered. It is essential that singing teachers are competent and understand how to instruct these singers of the new generation (Leborgne & Rosenberg, 2014). Furthermore it is the responsibility of the singing teacher to assist the student in developing an appropriate technique to ensure a healthy instrument that befits their musical style and physical abilities (American Speech – Language – Hearing Association, 2005; Roy et al., 2012). In this sense I wish to determine strategies for the singer in order for them to achieve expectations and goals when singing with a hearing loss.

Within my teaching practice there are often occurrences where an issue or concern may arise in relation to the hearing impaired singer. Generally I will endeavour to guide and support the singer to find the best solution to these issues and concerns. This is done through my own personal experience, empirical based information in conjunction with the limited scientific knowledge that I have acquired through previous research studies. On the occasions that I am unable to assist the student and I am uncertain of how I might be able to help remedy the problem, I have discussed these hindrances with other professional vocal pedagogues. Regrettably time and again they too appear apprehensive on these matters relating to hearing impaired singers. On reflection of these events I consider that I am incapable of resolving these issues, and become disheartened and subdued. I view them as obstacles that set me back as a teacher in my teaching practice. Graves (2002) states that reflection is not as straightforward as recognising issues and forming solutions although these are important. Through reflection we learn to observe what is happening and we gain an awareness of what we have seen. Furthermore a continuation of my negative resisting and self - doubting thoughts could strengthen the obstacle in question. This could ultimately block my ability for development and growth as a teacher (McCarthy, 2017, pg. 179 in Chapman).

To extend my teaching knowledge and skills I consider it essential to expand my search of this study topic into disciplines further than vocal pedagogy. Chapman (2017)

affirms that professionals with an interest in voice studies are willing and able to support and share information with singing teachers thus there is no need for singing teachers to work in complete isolation. In the past multidisciplinary crossovers and alliances has proven highly informative and useful for both voice teachers and voice patients (Sataloff, 1992). Similarly collaboration between a variety of disciplines has allowed us to change the way we think, how we understand, how we practice, the way in which we assess, and overall, how we work and perform with the voice. This multidisciplinary crossover will continue to be a huge influence on voice pedagogy in the future (Chapman, 2017). A preliminary search of the study subject indicates that there is currently limited published studies and information available within the field of singing and voice . Owing to this I expect to access a varied combination of disciplines in the fields of Acoustics, Auditory Anatomy, Audiology, Engineering, Medicine, Music Education, Music Psychology, Psychology, Speech and Language, and Vocal Pedagogy. With the intention of executing a rich review of the literature throughout the disciplines, I endeavour to connect with any such data that may display suggestive or significant ideas associated with the subject matter. I anticipate that this could possibly lead me closer to gaining a more in - depth, clearer understanding of the hearing - impaired singer and the possible benefits and challenges encountered in a diverse number of settings and situations.

For centuries singing has been taught, with its pedagogy passed down through writings and by word of mouth. Over the past 30 years the teaching of singing has been altered and developed due to combining information from other disciplines including medicine, science and therapy. However, there is some misunderstanding between disciplines related to singing and its science. It is crucial as a voice professional to study the documented evidence and science collectively with a holistic awareness of the virtuosity of singing and its practitioners surrounding the artform (Chapman, 2017). Conversely the topic of singing and performing with a hearing impairment has relatively only gained appropriate recognition in recent years. I discovered in my previous research study linked to this topic that Marshall Chasin published the first book on hearing loss for musicians in 1996. Since this significant book publication, the number of published articles and media concerning hearing loss and music has gradually risen. Nonetheless the number of individuals with a hearing loss in the United Kingdom UK also continues to rise. In 2015 the

figure for people with a hearing loss within the UK stood at 11 million; that is one in six of individuals. This fact sees hearing loss as the second highest disability in the UK and one which is set to increase further. It is estimated by 2035 that 15.6 million individuals will have some form of a hearing impairment. This figure can be illustrated as one in five individuals in the UK (Action on hearing loss, 2020, Hearing Link, 2020). As the amount of people with a hearing loss increases, it becomes one of the most significant public health issues, both physically and psychologically (HAFM, 2019).

I appreciate the considerable amount of evidence represented in the literature relating to the positive health and well - being benefits of singing (Skingley and Bungay 2010; Cortés, 2013, 2014, 2015; Clift 2013; Williams et al. 2018; Dingle et al. 2019). On this point I am motivated to question whether singing can have similar health and well - being benefits for individuals with a hearing loss and if so what might the benefits be? Ideally my intention would be to examine the literature for answers to these questions for both the novice hearing impaired individual and also at a professional singer's level. Hereafter, I propose to investigate the challenges for these individuals within different contexts and various situations. As a final point I aspire to devise and develop a strategy that the hearing impaired individual can utilise in order to achieve maximum singing potential with realistic attainable goals.

Planned Programme of Study

The main aims of this project are:

- To investigate the extent to which singing can facilitate the management of a hearing impairment.
- To explore the benefits and challenges of singing for the hearing impaired and hearing aid users within a range of contexts and settings.

The objectives of this project are:

1. To study the benefits of singing for hearing impaired individuals and to identify the link between these benefits and challenges.
2. To identify any gaps in, and expand upon my current knowledge for the management of challenges encountered by the hearing impaired individual whilst singing.
3. To investigate recent scientific and empirical research that can be compared and evaluated to facilitate further significant developments to my research study
4. To devise a strategy that can be utilised to support my current singing students and generate/establish an awareness on this subject for future vocal pedagogy and for the broader community.

The chart below represents the proposed time for the research study

<u>Task</u>	<u>August</u>				<u>September</u>				<u>October</u>				<u>November</u>				<u>December</u>				<u>January</u>			
Contemplate Topic and agree it with tutor																								
Study rationale with aims and objectives written up																								
Source, read and arrange relevant literature for study subject																								
Write draft one and main body text and submit																								
Write critical reflection																								
Rewrites																								
Submission of full project																								

Literature Review Process

A literature review can be defined as “a comprehensive study and interpretation of the literature that relates to a particular topic” (Aveyard, 2010, pg. 5-6). To embark on a literature review, one must firstly decide upon a subject, identify and develop a research question to answer as well as investigating appropriate literature by means of a research paradigm or systematic method (Creswell, 1994, Burns, 1997, Aveyard, 2010).

Through a review of the literature I expect to develop upon my previous research studies linked to this topic. Additionally I anticipate the discovery of newfound ideas and information. In order to achieve this, it is necessary to view only relevant parts of the literature within the framework of other information and attempt to piece them together (Aveyard, 2010) as a (way) of response to the study question. I strive to locate reoccurring themes and wish to uncover and understand any gaps in the literature that could possibly fulfil the requirements of the study question.

Accordingly, this could beneficially assist with the practical application of teaching singing to hearing impaired individuals within my professional teaching practice.

A paradigm functions as a pattern or model which outlines basic theories and ways of thinking. As a theoretical framework it can impact how information within the research is reviewed and understood (Mertens, 2005; Bogdan & Biklen, 1998).

“Without nominating a paradigm as the first step, there is no basis for subsequent choices regarding methodology, methods, literature or research design” (MacKenzie & Knipe, 2016). Accordingly I consider that the interpretivist/constructivist paradigm will function well in parallel with this studies research question. I believe that I connected with the interpretivist/constructivist outline and the way in which the paradigm approaches the research with an aim and purpose to interpret the data from “the world of human experience” (Cohen & Manion, 1994, p.36). Equally I am motivated to use this paradigm, as the primary rationale for this subject study originates from issues arising within my teaching practice concerning both myself and my students.

Typically interpretivist /constructivists do not begin with a theory. They interpret and arrange the data significantly throughout the course of research and continually

formulate or improve a theory (Creswell, 2003). Through reviewing the literature with an interpretivist/constructivist perspective I anticipate it will provide me with a deeper understanding of the research problem, and hereafter permit me to develop and devise my own ideas and theories.

The interpretivist / constructivist identifies how their own individual history, background and, experiences can have an influence on the research. Creswell (2003, p.8) expresses how researchers depend on "participants' views of the situation being studied". My preliminary search of the literature displayed a number of documented interviews and observations concerning the study topic which illustrated participants experiences. I intend to apply these tools further within my study in addition to making use of supplementary tools including document reviews and visual data analysis. Usually the interpretivist/constructivist paradigm functions utilising primarily qualitative methods (Wiersma, 2000; Bogdan & Biklen 1998; Mertens, 1998; Burns, 1997). I will essentially employ a qualitative collection of methods exercising a secondary research approach of existing data in a systematic investigation.

“Without establishing the state of the previous research, it is impossible to establish how the new research advances the previous research” (Hart, 2001; Randolph, 2009). To that end I have formulated a collection of questions within categories that I expect will help me to construct and create an outline, in order to shape my literature review. Furthermore, I anticipate that the responses to these questions will guide me to develop a deeper awareness of the topic. Optimistically it will allow me to establish my own philosophies and theories while additionally achieving a comprehensive research study.

1. What exactly is hearing loss? What are the levels of hearing loss? What factors cause a hearing loss?
2. Can a hearing impaired individual sing? Can a hearing impaired individual who has never sung before learn to sing? Can a professional singer with a hearing impairment continue to sing?
3. What are the benefits of singing for health and well - being? Can singing benefit the hearing impaired and if so how can singing benefit the hearing impaired?
4. What are the challenges of singing with a hearing impairment? Can the challenges change in different contexts?
5. What is the connection between the voice and the ear? Is the voice affected whilst singing with a hearing loss.
6. What technology can help the hearing impaired singer and how can it help? Can technology be a hindrance for the hearing impaired singer?

A preliminary search of the topic in question reveals that there is an insubstantial amount of studies directly investigating this issue. Reviewing multiple disciplines may perhaps prove beneficial for this study as it could guide me into new directions of discovery and areas linked to the study subject matter. Multi - disciplinary crossover allows the researcher to examine further into specialised fields acquiring new knowledge and combining data (Chapman, 2017). Additionally, it allows the researcher to link and connect similarities and differences reflected in the literature between authors. From this the researcher can categorise links between ideas and practices (Hart, 1998), and acknowledge themes and gaps within the literature. The key disciplines I predict to investigate should be a unification of singing and music pedagogy, medical based disciplines including audiology, speech and language, psychology, engineering and acoustics. A plentiful selection of specialist disciplines from around the world will provide coverage of both scientific and empirical centred studies. Using both types of data for the use of my study could perhaps form a solid persuasive research study.

I will attempt to perform an extensive review of the literature for this research study. However it is also essential as a solo researcher to be realistic of the work load and the time frame in order to complete this study effectively. Utilising articles and books concerning guides to write a literature review have assisted with the planning and preparation of my literature review. Bell & Waters (2014), *Doing Your Research Project* book was straight - forward to read and understand. It devised practical guided steps from start to finish detailing how to accomplish a research study. Although I have previously performed literature reviews this book helped me to refine and refocus my research skills. Similarly I was directed by Cooper's Taxonomy of Literature Reviews table wherein he suggests using five characteristics in order to achieve a literature review successfully. These included focus, goal, perspective, coverage, organisation, and audience (1988, pg. 109). I conceive that my audience will be composed of specialised scholars, practitioners and the general public.

I utilised a variety of different sources to carry out this research study including books, ebooks, journals, articles, online content, Apple ios and Android applications. The books I used were principally from the vocal pedagogy disciplines whereas the ebooks I ordered were an assortment of multi - disciplines. These ebooks proved to be incredibly beneficial as I was able to examine the data and furthermore it enabled me to make notes and highlight information I considered to be significant. It led to an immense advancement in my research techniques as it enabled me to also export the notes into my data analysis and documentation programme.

I have aimed to incorporate only primary sources such as peer reviewed journals and articles into my study. However this proved to be very challenging due to the fact that a considerable amount of the information surrounding hearing impaired singers is empirical research from secondary sources. This data is located in education books, instruction books, training books, deaf organisational websites, deaf charity websites and online music programmes. By conducting a review of the literature the student gains awareness of the significant researchers in the subject area (Randolph, 2009). Throughout this research Marshall Chasin has been one of the major contributing authors that frequently appears within the literature.

With certain methods in place to locate important data and tools to assist with arranging the data, I was able to save time on this process and I essentially gained extra time to concentrate on writing my review of the literature. On numerous occasions I was required to alter and modify my electronic search as it appeared that there was not a substantial amount of sources to perform this study. In spite of this I continued to carry out an electronic search by constantly changing the search words ever so slightly. This ultimately proved to be successful and from here I could easily use citation chaining which enabled me to discover similar articles and papers. Checking the number of times a citation was used on a particular paper showed the papers significance and it seemed astute to use these sources.

Logging data and information for the literature review was uncomplicated to begin with as I chose to use my recently discovered programme Mendeley. Although uncomplicated it also had its drawbacks which included the time - consuming inputting of all my individually downloaded papers, citation and reference inserting issues due to technology platform restrictions. That being said I definitely saved a considerable amount of time and I now have all my notes and papers categorised in one location.

A review of the literature is a component of the researcher and learner's development, and is part of the progression into the field of expertise (Hart, 2001). LeCompte and colleagues (2003, pg.124) express with certain adjustments the literature review is a "legitimate and publishable scholarly document". As a final note I am intrigued by the idea that if my completed research work shows significant findings I will possibly be motivated to promote my work to a publishable standard.

Critical Reflection

For this research study I purposefully aspired to nourish my knowledge and understanding in the subject area and subsequently develop my skills and techniques as a singing teacher. This study was firmly centred around the issues concerning hearing impaired individuals which occurred within a range of situations in my teaching practice. Most of these hearing impaired students have a passion for music and the art of singing. Generally they choose to be involved in these activities purely for enjoyment and pleasure. Pink (2009, pg. 145) describes this as the "deep seated desire to direct our own lives, to extend and expand our abilities, and to live a life of purpose. " I believe in order to assist with my student's progress it was firstly necessary to acquire the information and skills needed to advance as a singing teacher for this specific area of teaching. Correspondingly reflection is recognised as an effectively useful tool that teachers can utilise to observe and gain awareness to improve their teaching practice (Graves, 2002).

Within my singing lessons and throughout the course of this research study I was guided by a number of reflective models that I considered very constructive. I originally began applying Schön's (1983) 'Reflection in Action' throughout my time spent with hearing impaired singers and singers without hearing loss. I endeavoured to become consciously aware of issues and phenomena occurring. Stemming from this I was able to comprehend what I 'did' and 'did not know' regarding techniques and information relating to the subject matter.

I was influenced by Borton's (1970) model and this directed me to reflect in a different way throughout altered stages of the study. I began with "What?" and attempted to work out what exactly I was looking to endeavour from a specific past experience. This allowed me to figure out the foundation of the issue that I would like to present. I believed that I needed to further my reflection as I sought a more in-depth detailed study. Integrating Rolfe et al's. extended framework reflection plan (2001) permitted me to gain more insight into my practice and ways in which I would approach and accomplish this research study. The three extended questions of "What? So what? and Now what?" provided me with progressively deeper, more informed action based reflections. Specifically taking the time to reflect and organising my reflections into questions and themes assisted me through the procedure of investigating, reviewing and amalgamating the data. These reflections potentially enabled me to achieve a complete comprehensive research review.

The key questions that I aimed to explore developed from my reflections included: How did I feel as a teacher within the situation? How did the student feel and react in the situation? What were the challenges encountered both for me and/or the student? Are these challenges encountered additionally in any other settings? How did the student benefit from the singing lesson or singing activity? How did the student feel after the lesson? How could I as a teacher improve the singing lesson? Are there any additional tools I could use to assist the hearing impaired student? Would other teachers and practitioners be interested in newly established knowledge?

Randolph (2009) notes that before beginning a research study it is important for the researcher to understand exactly where the intended review belongs within a gap. Once I was able to recognise this I began with roughly outlining my ideas, key words, questions and desired route for the study. I composed a 'to do list' in a research notebook that was assigned only for research notes, plans, timelines, ideas, thoughts and key information I intended to cover. Similarly, I utilised a journal that was chosen only for reflective work. This reflective journal would be employed throughout the research study as a means to document my journey as a researcher. It would contain detailed accounts of crucial moments that occurred. These narratives described both positive and negative encounters relating to the research itself and my personal experience as a teacher and researcher. The reflective journal proved extremely valuable towards the finished research stage. It enabled me to reacquaint myself with my previous reflections through the all the study stages and most importantly for the critical reflection.

Having invested in simple but effective tools such as highlighters, post - it notes, and a planning management board essentially improved my planning and analysis skills. I made use of books and websites including Bell et al. (2014) *Doing Your Research Project*, Scribber, and I continuously referred to my university study module handbook for guidance. These were all straightforward and uncomplicated which allowed me save time by reading resourcefully and effectively saving time in the long run.

Searching for relevant studies proved to be slightly more complicated. I chose to begin my search using various sources. These included books, ebooks, journals, articles, online websites, music programmes and applications on Apple devices and Android devices. Reviewing the physical books appeared to be an easy task of scanning through the contents page, choosing certain chapters that may prove to be of interest, underlining the relevant content and finally marking the pages with mini noted post- its. This however I realised was a time - consuming technique and as I had heaps of post - it notes it was genuinely an overwhelming amount of content to log and review. Reflecting now I consider that I should have reduced my choices to only the utmost noteworthy data that would support my research. Online searches for articles and journals at time grew difficult as there was little or no direct studies on

the studies topic. On numerous occasions I had to alter my word searches in order to find the information I needed. On occasions I would stumble upon another obstacle where I was unable to review particular papers and articles that I believed could be significant to my study as I required the authors authorisation. Instead of continuously searching for these types of papers and wasting time I essentially should have made a note of the source and progressed on to an alternative search.

Logging material for this study was organised through a programme called Mendeley. It was a paramount tool as a researcher for my study. Although the importing of documents was lengthy it truly saved me time for the extent of this study. I was able to access, categorise, analyse, review and evaluate the data effortlessly and successfully. The only downfall was I collected an excess amount of data due to it 'easiness'.

Using Schön's (1983) 'Reflection on Action' I judge that I could have managed my time better coinciding with the study timeframe. Full time teaching work both in person and online, side music projects, personal life and procrastination all contributed to the limitation of a generous timeframe. Throughout this study I have experienced an array of feelings including apprehension, panic, dissatisfaction, anxiety, dissatisfaction and being overwhelmed. Juxtaposing on further reflection I must not be disheartened as Bisson (2017) confirms that it is all part of the process for the development of a proficient teacher. My understanding is I will have further developed my knowledge and skills on the topic. Most importantly, I hope to have acquired additional information which I can apply to my teaching practice to direct my hearing impaired students to reach their potential and surpass their personal goals. This will be achieved through strategies that will support them in their progression as a learning singer and performer.

2.The Assignment

‘An investigation into the extent to which singing can facilitate the management of a hearing impairment: An exploration into the benefits and challenges of singing within a range of contexts.’

Introduction

In 2015 the global population was valued over 7.1 billion. From this number there was an estimated 15% of people with some form of hearing loss (EFHOH, 2015), signifying it is the world's most common chronic disorder (Hazard et al., 1990). 11 million of these hearing impaired individuals lived in the United Kingdom. That is represented as 1 in 6 people. By the year 2035 that figure is expected to rise to 15.6 million, reported as 1 in 5 people (Davis, 1995, AOHL, 2015). Consequently, hearing loss will then be identified as one of the top 10 disease problems in the UK (Mathers and Locar, 2006). With this vast number of hearing losses transpiring, it is crucial that there is support, assistance and resources to facilitate the management of a hearing loss (AOHL, 2013; AOHL, 2015). This will ultimately allow the hearing impaired and deaf to obtain a good quality standard of living and furthermore, encourage them to function and perform to their best ability (AOHL, 2015). Unfortunately hearing loss is an ‘invisible disability’ (Fulford et al., 2016), and can often be overlooked (AOHL, 2015). If it goes untreated and does not receive the deserved attention necessary, it can essentially cause a decline for the individuals health and well - being (Herbst, 1983; NCOA, 1999).

Action on Hearing Loss (2015, pg. 15) reported that in 2014 hearing loss research was substantially underfunded receiving a mere 1% of the total investment in medical research from public and charity funders. In comparison to other health concerns including cardiovascular and sight loss, hearing loss research was the lowest receiver for funding securing just £1.11 for every person affected with a hearing loss. If assessment and diagnosis are delayed the impacts become greater. In addition, it is a probability that the hearing impaired individual will be unable to

progress and improve upon their hearing. Similarly, Davis et al. (2007) state that the longer the length of time it takes for the person to receive hearing aids, the less likely they are to benefit from them.

Hearing loss and hearing aids can still be regarded with negative stigma. The hearing impaired individual can be stereotyped and categorised by what they can and cannot hear. Many people are embarrassed and afraid of allowing their hearing loss to be known, for fear of stigma alone can result in people avoiding discussions regarding their hearing issue and furthermore not seeking specialist assistance (Doggett et al, 1998; Southall et al, 2010; Fulford et. Al, 2015). By the same token people may be anxious and apprehensive to generate an awareness of their hearing loss issues as they believe it could affect their educational status (NDCS Scotland, 2014; NDCS,2015c) and their employment prospects.

It has been detected that hearing impairments can be the reason for loss of employment and also issues associated with achieving employment (Baker, 2006; Matthews, 2011). Research has revealed that people with hearing loss have known feelings of isolation at work. It is common that their hearing loss has challenged them in not completing their work and also prevented them from reaching their maximum capabilities (Arrowsmith, 2014). Notably with regards to attitudes and relationships at work, hearing loss individuals voice their concerns of how attitudes of employers can directly impact them thus, resulting in an individual leaving employment. This has been highlighted as the major issue with relation to employment (Baker, 2006; Arrowsmith, 2014).

Hearing research studies have exposed that early retirement in most cases has consequently been a result of hearing loss. It is clear that when employers in the workplace are unable to successfully support an employee with a hearing impairment it can accordingly create detrimental repercussions (Arrowsmith, 2014). It is essential that employers are well - informed and can facilitate up - to - date practical workplace support for people with hearing loss (AOHL, 2015).

I reflect on the subject of attitudes within the workplace and question whether hearing impaired musicians and singers working within the music industry have encountered and, experienced similar attitudes? Additionally, I contemplate are these musicians also afraid to disclose or admit they have a hearing loss for fear they may lose their job and/or livelihood? Chasin (2009) expresses that in many instances involving the musician and hearing loss, tinnitus and pitch perception issues are thought to be the causes linked to ending a career in music. Kathy Castellucci a professional singer employed by Disney World and Orlando Studios admits that when she was undergoing her hearing loss she experienced a range of different sentiments and episodes in her workplace. For a period of time, she was supported by both her co-workers and employers. However, she admits while enduring the struggle of performing with a newly developed hearing loss she was considered a liability and was regularly criticised for her performances. Gradually her supportive community became more absent. She professes that she “felt like an outcast among them” (AAMHL, 2006, pg. 61). Her singing career began to fail while her contemporaries kept excelling. Similarly, professional opera singer Janine Roebuck divulges how she concealed her hearing loss from colleagues, musicians and conductors for over 10 years. Struggling to adjust to her fading hearing she admittedly conveys how the stress and anxiety of performing and the demands of keeping up the charade became extremely overwhelming. These factors combined with not being able to hear her own voice and the orchestra impelled her to admit to her hearing loss. (Fulford et al., 2011; AOHL, 2017; UKDHM, 2018) .

A number of investigations have shown that musicians with a hearing loss deal with the issues in different ways. Some musicians believe it is best to conceal their hearing loss in order to continue with the music work they are undertaking. Anthony a professional musician in an orchestra decided it was best to hide his hearing loss for colleagues. He confesses “I haven’t told colleagues at large - and I sort of feel now that there’s no real need to, because what I want is to be able to carry on doing what I do as well as I can in the same way I have in the past” (Fulford et al. 2011). In contrast to this, other musicians recognise that it is more advantageous as a musician to disclose the hearing loss (Fulford et al., 2011). Richard Einhorn

a professional composer, classical record producer, and recording engineer expresses that there is more to be lost than gained in relation to not revealing a hearing loss. It is imperative for the the musicians progression and development (Einhorn, 2012 b).

Research studies demonstrate that singing has many positive benefits and can have impact a person significantly both in health and well - being (Clark & Harding, 2018; Chapman, 2017; Clements-Cortes 2014, 2013, 2012; Welsh, 2012; Moore, 2005). It is also displayed in the literature that persons with hearing loss can benefit both from listening and performing music (HAFM, 2019; Trenub, 2009; Prada, 2005; Gfeller et al, 1998). In this sense I enquire if it is possible for the hearing impaired individual to benefit from the act of singing? Ultimately, I wish to examine the idea that singing could assist with the management of a hearing loss. If this idea is absolute I shall subsequently question how this can successfully be achieved. There are a number of challenges and implications encountered with respect to hearing loss (Hazard et al., 1990; Mulrow et al, 1990; Dalton et al, 2003; Tambs, 2004; Chisolm et al, 2007; Monzani, et al., 2008; Ciorba et al, 2012). These can impact the individual both physiologically and psychologically. My intention is to firstly examine the challenges encountered for listening to and performing music with a hearing loss. Following this, I will investigate the challenges confronted when singing with a hearing loss. Finally, I shall look to explore suitable strategies that can be devised for the hearing impaired singer to overcome these challenges. This will allow the singer with hearing loss to experience the art of singing while additionally, obtaining the benefits of singing.

The Benefits of Singing

Participating in music and singing activities has been proven to have positive effects on health (MacDonald, 2012) and well - being (Prada, 2005). Recent research demonstrates that the act of singing is very beneficial for you (Hallam, 2009; Moore, 2005) and it is one of the most naturally positive acts humans can participate in (Welsh, 2012). Singing is a simple human activity that is vital for self-expression and self- exploration (Tomatis, 2004). Singing is essentially an “emotional musical vocalization with or without text. At best singing comes from feelings which communicate to other people's feelings. It has many forms and styles throughout the different cultures of the world” (Chapman, 2017, pg. 1). Moreover, singing can be beneficial for both health and well - being in any style of music. It is an artform that accepts everyone including the novice singer extending to the more experienced singer.

Singing for Physical Health

In the past singing teachers and students proposed that singing activities are helpful for health and well - being. Through multidisciplinary research it has now been established that singing can improve your health and fitness (Leborgne & Rosenberg, 2014; Chapman, 2017). Singing encourages many different positive responses that can essentially promote a healthy physical body. Regularly listening to and performing music and singing can create comprehensive connections to the brain. This can influence and encourage creativity and our skills for problem solving (Noice et. Al, 2013). We understand singing and brain development due to developments in science and technology. Consequently, this has enabled us to understand how the music exposure and the act of singing can affect the brain (Racette et. Al, 2006). People diagnosed with neurological conditions comprising of stroke, Parkinson's disease and dementia can benefit from singing. It has been confirmed that frequent singing can assist with these conditions and can improve social aspects, communication, friendliness, enhance mood and create a decrease in aggression (Särkämö et al, 2013; Myska & Nord, 2008). There are increasing amounts of studies to show how singing can expand our breath control (Graham

2012, Morrison & Clift, 2013), these contain information on lung conditions which mainly list singing for Chronic Obstructive Pulmonary Disease and asthma. Choir singing has demonstrated powerful effects for heart and breathing rates. This is due to the synchronisation in reaction to the music (Vickhoff et al., 2013). In addition, singing shows positive improvements in the function of immune system, which assists with prevention of disease (Clift, Rohrmann, Hodapp 2010; Grape et al. 2003; Kreutz, et al. 2004; Valentine & Evans, 2001, Beck et al., 2000). It is also likely that singing plays a part in helping to reduce high blood pressure (Valentine & Evans, 2001).

Singing for Well - Being

Research has demonstrated the positive effects that singing can have for singers of all ages and abilities in terms of self-confidence, self-esteem and community integration (Moore & Carlyon, 2005; Phillips et al., 2012; Welsh, 2012). Basically, singing makes you feel good and can show considerable effects on an individual's wellbeing (Tonneijck et al., 2008; Clift, S., et al., 2010; Clift, 2013). Individuals who sing frequently convey greater levels in well - being and emotional strength. Persons undergoing emotional stress, schizophrenia and chronic depression have observed these benefits (Talwar, et al. 2006). Bailey and Davidson performed a collection of studies examining group singing involving the homeless, ostracised and a group of middle class people. The results showed a varied number of benefits, these benefits were assorted into different type outcomes. The results are as shown: clinical benefits included energy, relaxation, singer's high. Group style process portrayed social support, friendship and feelings of normalcy. People with low self - esteem are more inclined to build friendships which can have positive affects for work and their social lives. The choir setting with a viewing audience showed confidence building, contribution, pleasure and pride. Lastly for the cognitive aspect participants conveyed concentration and an organised thought process (Bailey & Davidson, 2003, 2004, 2005). Previously mentioned, singing is extremely beneficial for well - being. It is known to build self - confidence and constructive awareness of ones self (Jacob et al., 2009; Pavlakou, 2009). In the lives of children music and singing are quite prominent

from an early age. Children enormously benefit from singing and these benefits are very similar to what was previously discussed. However, the benefits extend slightly further, and can include, enhanced communication, social inclusion and personal development (Moore & Carlyon, 2005; Phillips et al 2012; Welsh 2012).

The phenomenon of singing for health and well - being displays a vast range of benefits. Moreover, it seems it is no wonder to why individuals choose to sing and perform in a variety of contexts. Nanette Florian a pianist, bassist, and singer songwriter for the music group The New Christy Minstrels taught herself completely by ear. However due to a genetic mutation or hereditary hearing loss she began wearing hearing aids as her ability to hear faded, she ultimately underwent cochlear implant surgery. She expresses how the experience of music and singing made her feel "Singing songs felt like flying and gave me an emotional high. I'm grateful I had 40 years of hearing beautifully rendered aural music. Music was, who I was" (AAMHL, 2016, pg. 79 - 80). Another singer Janine Roebuck describes her encounter of a singing performance as a 13 year old. She says, "I remember the moment the curtains opened, and I was onstage ... singing the first notes and thinking this is where I want to be for the rest of my life" (Fulford et al. 2011, pg. 453).

Normal Hearing and Hearing Loss

What is the difference between a normal hearing auditory system and a hearing impaired auditory system?

Normal Hearing

Hearing is calculated in decibels (dB), a normal hearing ear can hear conversational speech usually around the level of 50-60 dB (Shearer et al., 2017). An individual with a normal amount of hearing can detect a sound and the level at which it befalls to extreme loudness is typically at the measured rate of 100dB (Moore, 2016). The structural anatomy of the ear and how it connects with sound waves is by transporting them to the sensory cells. Overall, this is a very complex system

(Hallowell et al., 1970; Alberti, P., 2001). An uncomplicated explanation of how the ear works in relation to the voice is auditory feedback is occurring whilst singing is air conduction and bone conduction which subsequently precedes to acoustic wave signals travelling to the cochlea and the brain (Erdemir & Rieser., 2006). Irrespective of the musical taste of the listener, melodies, comprising of sound waves are transferred from the external to the middle ear and into the cochlea. This is the area in which mechanical vibrations are changed into complex forms of neural action. Hereafter, neural actions within the cochlea begin with a sequence of auditory centres in the brain stem, midbrain, auditory cortex, accompanied by additional neural centres in the brain. This is where interpretation, understanding and emotional meaning of the sounds is gained (Salvi et al., in Marshal 2009, pg. 11).

Alberti (2001) explains how the normal hearing person is capable of actively tuning in and out of conversations within diverse settings and environments concerning a number of people. This concept is known as the 'the cocktail effect'. Related to this idea is the awareness and understanding of location and direction of sound source. This is known as Spatial Localisation. This is when a person can identify the location of sound to the source accurately. Thus, moving the body in direction to the sound source (Alberti, 2001; Cai et al., 2015). An understanding for both the design system and purpose of the ear is necessary in order to gain a clearer comprehension of the different levels of deafness and the ways in which they can be prevented (Hallowell et al., 1970).

Hearing Loss

The term hearing loss is used to include all levels of deafness. Levels of deafness are defined by the softest sound that an individual is able to hear and this is measured in decibels (dB). Someone who is unable to hear thresholds of 25 dB or better in both ears is classed as having a hearing impairment (Moore, 2016). There are four different levels of hearing loss ranging from the lowest loss of hearing to the highest (AOHL, 2015). These are mild, moderate, severe and profound (Appendix 1). The term deaf can also be used to indicate a partial or complete loss of hearing. Hearing loss can occur both before speech develops, this is known as pre - lingual

and after the development of speech, recognised as post - lingual (Hallowell et al., 1970). Hearing loss can affect one ear or two ears, this is characterised as unilateral or bilateral hearing loss, and it can create difficulty of hearing speech conversation and other noises (Alberti, 2001; WHO, 2020). Géléloc & Holt (2014) confirms that when the cells within the ear cannot generate, the hearing loss becomes a permanently absent.

Although hearing loss can be permanent, deaf individuals can still possess measurable natural hearing, known as residual hearing. Essentially this remaining hearing allows deaf individuals to hear certain sounds within their range of hearing loss. This indicates that deaf people rarely live in complete silence, this can even be valid for those that are profoundly deaf (Ramsdell, 1970; Holmes, 2017). Residual hearing can be precious for an individual's present situation and can play a significant role for progress of undertakings in the future. Additionally, this can be a guide for how accurately the hearing impaired individual can hear without the use of hearing aids or assistive technology (Ramsdell, 1970). Conclusively it can all be subject to a person's hearing thresholds which vary according to frequency. Specifically, some individuals may have greater sensitivity to sound at high frequencies while others at lower frequencies (Appendix 2). Einhorn (2012) states "Hearing losses are always complicated. Before I could work to improve my hearing, I first had to understand what I was hearing". It is essential for the hearing impaired individual to understand their own level of hearing loss and comprehend what they can and cannot hear.

Experiences from musicians and singers have been noted on this topic and could be beneficial for teaching hearing impaired singers. Evelyn Glennie (2019) is a profoundly deaf solo percussionist. She discloses that although she is profoundly deaf she is still able to understand sound through her residual hearing, vibrations, visual strategies such as lip - reading and gestures. Glennie continues with mentioning "to understand the nature of deafness, first one has to understand the nature of hearing. Deafness does not mean that you can't hear, only that there is something wrong with the ears. Even someone who is totally deaf can still hear/feel

sounds” (Glennie, 2019, pg. 4 - 5). Another account from a hearing impaired singer and pianist strengthens this notion. Angela Chen confirms that through year long regular practice with her chamber choir she was gradually able to distinguish melodies from particular vocal parts. Harmonies became easier to hear and were no longer a muddled mess of sounds (AAMHL, 2016 pg. 65 - 67).

Causes of hearing loss

The main causes of hearing loss can vary and range from genetics, natural causes, old age and noise - induced hearing loss. Hearing loss can scale through a range of ages. Within the UK there more than 45,000 deaf children (NDCS, 2015a; AOHL, 2015). As the UK’s population gets older and with the retirement age rising, the aging workforce will likely encounter an onset and increase of hearing loss in the workplace (AOHL, 2015). It is imperative that this elderly workforce obtains support and guidance for the management of their hearing impairment.

Noise-induced hearing loss transpires due to repeated exposure to possibly damaging, extreme levels of noise and music. This can involve workplace noise, venue noise at nightclubs, bars, live-music gigs, concerts and music through a personal player (Smith et al., 2000; WHO., 2020). Due to these extremely exceeded noise levels, over 1.1 billion young teenagers and young adults (12-35 years old) worldwide could be at risk of some form of hearing loss instigating a permanent hearing impairment (AOHL, WHO., 2020). Reflecting on these facts and statistics, assists me in understanding how hearing loss and deafness can transpire in certain ways and within different environments. Essentially this could perhaps assist with recommendations for prevention of hearing loss in the future.

Research shows that there are connections with the onset of Tinnitus due to hearing loss and noise exposure (Dobie, 2003). One in 10 adults in UK suffer from tinnitus (Davis, 1989, AOHL, 2015). Tinnitus can be described as a ringing or buzzing sound in the ear or head which cannot be credited to an outside sound source. Many cases of tinnitus are attributed to hearing loss, noise exposure and ageing. Studies propose

that tinnitus can be connected to depression and stress, which consequently can worsen the perception of the condition (Dobie, 2003).

Hearing loss challenges

There is a great deal of evidence within the literature that suggests the hearing impaired individual encounters a collection of negative challenges due to the hearing loss. This can include straining to hear and communicate within noisy environments, diminished spatial localization and increased negative psychological experiences (Ramsdell, 1970; Doggett et al., 1998; Southall et al., 2010; AOHL, 2020). Hearing loss largely increases obstacles for the hearing impaired within varied contexts and settings. Word and sound detection for speech for a one to one conversation within an overcrowded environment is very problematic.

Hearing Aids

Hearing aids are essentially assistive devices that allow the hearing impaired individual to increase sounds that they may not have been able to clearly hear without their use. Primarily hearing aids encourage the user to make better use of their residual hearing. Hearing aids are more effective when they are fitted at the early phases of a loss. Those who wait to be fitted will find it more difficult to adapt to the hearing aid technology (AOHL, 2020). Research studies have shown that when hearing aids are utilised daily positive benefits occur that show development for the hearing impaired individual (Mulrow et al., 1990; Perez & Edmonds, 2012). In contrast the user must realise that hearing aid technology despite its optimistic advertisement cannot compensate for a hearing loss. There are particular limitations to what the technology can achieve (Silver, & Davis, in Hallowell, 1970, pg. 320; Greasley et al., 2018). It must be mentioned that hearing aid technology has been chiefly created for speech. Thus, this can involve problems when listening to music and performing music (Chasin, & Russo, 2004; Chasin, 2006; Madsen, & Moore, 2014). There have been debateable papers relating to whether hearing aids should be worn whilst singers and musicians rehearse or perform or should they be taken out. (Chasin, 2012; Beck, 2016). It is appropriate to say that the hearing aid user

should demonstrate commitment, patience and willingness to learn to accept the hearing aid technology and in doing so re - educate one's self on the subject (Silver, & Davis, in Hallowell, 1970, pg. 320; Greasley et al., 2018). Two singers have detailed their experiences using hearing aids for music. These experiences have exposed both negative and positive considerations of the hearing aid technology.

“With my hearing aids, my hearing loss did not impact me negatively when playing the piano, because I could always rely on the music score and match the piano keys to notes in my brain. However, when listening to music without a score for reference, I could only perceive a rough melodic contour, and could not recognize or repeat the melody precisely. Different instruments in a symphony sounded like a mess to me, and I could barely recognize the harmonies. If I did not have access to the music score, many different music pieces would sound indistinguishable” - Shih-wen Angela Chen (AAMHL, 2016, pg. 65).

“Hearing aids that allow me to have Bluetooth control over everything I hear. The hearing aids are pre-set to correct my exact frequency losses and then on top of that they pair with the Apple iOS devices such as iPhone and are controlled with an app. The reason they help me so much as a singer is I have volume, bass and treble controls that I can change right on the app. These allow me to control the stage volume and bass/treble frequencies as needed to have a better understanding of pitch reference. I recently got an Apple Watch so now I wear that on stage, and I can control those settings right from my wrist. It has helped me to improve my pitch while giving me back my confidence and my enjoyment of singing”- Kathy Castellucci (AAMHL, 2016, pg.62 - 63).

Music making with a hearing loss

People's perceptions and views on hearing impaired individuals performing music is generally met with impossibility. Music making with a hearing loss is in fact very common (Hallam, 2009). Comparingly Alan Zimmerman a musician, producer and creator of Seeing Music confirms "I simply cannot recall a single day without making music, even with profound deafness" (AAMHL, 2016, pg. 133). Music pedagogy for the deaf has revealed that music can be rewarding for deaf individuals in numerous ways. A few of these can include sentimental benefits, fundamental enjoyment and social interaction (Williams, 1989). Engagement for deaf individuals in music activities (choirs, bands, orchestras, concerts, theatres, music groups) give them intention and enjoyment, they experience a better quality of life and in addition they are more involved society (HAFM, 2019). Music And The Deaf is an organisation that enriches lives through music. It is founded by deaf musician's and they lead music workshops and music classes for deaf persons. "We think everyone should have access to music, no matter what your level of hearing loss" (MATD, 2020).

When hearing loss in an individual with huge creative need in the auditory field such as a musician, the absence of the musical experience is acknowledged as an severe hardship. Unconsciously the individual construes the limitation as a lack of one's self (Ramsdell in Hallowell, 1970, pg. 441). Research confirms that hearing loss and deafness can double the risk of mental health issues such as depression and anxiety (Monzani, 2008; AOHL, 2020). Musicians that contributed to the research study 'Hearing Aids for Music' (2019) communicated the main physical issues that are frequently encountered with relation to hearing aids and music. The issues reported included tone quality and timbre, pitch variation, feedback, distortion, difficulties with hearing lyrics in songs, music sounding indistinguishable or 'tinny' and struggles within live music contexts. On the other hand, it was reported that performing without hearing aids caused the musician to miss cues (HAFM, 2019, pg.14). Wearing hearing aids whilst singing or playing can allow the user to hear their own voice abnormally. This is the occlusion effect; it can influence the singer largely. Research suggests that by using one hearing aid instead of two may reduce the effect of occlusion (Greasley et al., 2018). It is very important to reiterate that hearing aids

have essentially been created for speech and not music hence why it can be incredibly challenging for performing musicians.

Kinaesthetic awareness for the hearing impaired singer

Kinaesthetic awareness is when an individual has the ability to sense and understand what a body part is doing in relation to the surrounding in which it exists. The body's nervous system employs sensory feedback in line with our movements to assist with alignment (Gilman, 2014). Kinaesthesia is the mind and body connection. It permits the singer to experience particular physical reactions stimulated by awareness and mindful intentions. This can contribute to superior singing (Bauer, 2013). Research throughout the literature demonstrates the significance in which kinaesthetic awareness can have on both the singer and the hearing impaired. Helen Keller is celebrated for her personal achievements as she was both blind and deaf. Helen greatly relied upon kinaesthetic awareness, in order to experience life in its fullest. She had a great appreciation of music and would regularly listen to the radio with her hands and body. She was able to distinguish slow and fast tempo music and she could even recognise different styles and moods that were portrayed in the music. She utilised the vibratory sense to understand and appreciate music and the world around her (Tilney, 1929 Pg. 536). Likewise, Evelyn Glennie who is profoundly deaf has spoken of how she comprehends that her body is a huge ear which in effect allows her to identify and recognise different pitches in isolation. This is achieved by performing barefoot and in addition enables her to distinguish registers, textures, rhythms and dynamics. She feels and senses the vibrations in her body the way in which people feel heavy, strong bass drum beats in their chest or lower limbs. She describes how each individual person is quite different and therefore, they may hear these sounds through their bodies in varied ways. She expresses her idea of these music feelings in respect to receiving the sound from source to body "someone sitting in the front row would experience different physical sensations to someone sitting in the 3rd row or in the balcony" (Glennie, 2019). To the same extent Beethoven who was also profoundly deaf for the last 8 years of his life used his kinaesthetic awareness in order to perform and compose piano pieces (Barry, 2008).

“I found myself trying to remember the feeling of my whole body when I was told that I was singing in tune. That sometimes worked - I experimented again and again during each practice. I tried to develop an inner system that related my throat’s vibration and my body’s feeling to the pitch I sang” - Shih-wen Angela Chen
(AAMHL, 2016, pg. 67)

Research studies indicate when auditory feedback is masked, there’s less disruption which demonstrates less dependence on auditory feedback and therefore better use of kinaesthetic feedback. Furthermore, the results presented show that singers relied on auditory feedback less than instrumentalists and were able to use kinaesthetic feedback when auditory feedback is lost. These results indicate that singers are able to use kinaesthesia under these circumstances due to their singing practice and training (Erdemir, & Rieser, 2016). Through singing we obtain kinaesthetic feedback from a number of areas including mechanoreceptors located within the laryngeal joints and muscles, subglottic mucosa, and the muscles of the thoracic wall, abdominal wall, vocal tract, and face. This can allow us to monitor what is happening in relation to the voice.

Renee Blue O’Connell a singer, songwriter, guitarist and music practitioner is hearing impaired with cochlear implants. While developing her hearing with her new bionic ears she worked patiently through exercises devised, developed and researched by her singing teacher. These exercises would aim to retrain her ears and utilise her body in order to regain her musical perception. Tuning forks were firstly used to assist her with feeling the vibrations of the individual pitches. These were based on intervals where she was expected to guess each separate pitch. From here the teacher began playing two tuning forks expecting Renee to recognise the distance between both. Simple nursery rhyme songs were the steppingstones for retraining her how to listen and sing. Renee mentions how she mainly sang acapella as this allowed her to concentrate on her voice alone and not get distracted by additional instruments. Once she was able to achieve this her singing teacher

incorporated with a guitar or piano to accompany her. The exercises and lessons were challenging but fun. She confirms by undertaking these she was able to regain her musical perception (AAMHL, 2016, pg.103).

Additional tools and technology to assist the hearing impaired singer

Throughout this research study I have discovered a number of online tools and programmes as well as additional technology that can be used to assist the hearing impaired singer. These include Seeing Music (Appendix 4) which is a free online programme that allows people to visually see the sounds they are making or singing. There are a number of different functions that the singer can experiment with and these can possibly be utilised within a lesson, rehearsing space or additional at a performing venue. Likewise, Online Mic Test allows the singer to visually see what they are singing in relation to their pitching. This is an extremely helpful tool for pitch perception as it displays the notes in relation to treble and bass clef and also the frequencies that are occur whilst singing. I would suggest using this tool with Appendix 2. As mentioned previously in this review, technology is continuously advancing in hearing aids as well as assistive devices which can be incorporated into music performance. Some hearing aids now have a Bluetooth setting programmed into them and this enables the singer to play music directly to the hearing aid. It can also permit the singer to use the hearing aid as a personal monitor on stage or in the rehearsal space combined with Apple devices including phones, tablets and watches as controls for mixer settings.

Conclusion

In conclusion, by executing this research study I believe that I have built upon my previous knowledge on the subject matter and in addition I have gained a better understanding of how I can facilitate the management of a hearing impairment for the use of singing. I consider I have established a basic framework, that I can develop upon for future studies. Although this framework is fundamental I deem it is an essential starting point for the hearing impaired singer and the hearing impaired person that may wish to begin singing. I understand that it is not yet possible to present 'a one size fits all' design for the hearing impaired singer nonetheless I have devised a simple strategy (Appendix 5) that can be utilised by the singing teacher, singer and hearing impaired individual for the intention of progressing in singing. It is evident that there are many challenges associated with a hearing loss and even more challenges that are encountered for the hearing impaired individual whilst singing. However, once these challenges are managed or entirely overcome it can enable the hearing impaired singer to enjoy the health and well - being benefits linked to singing. From this research study I have realised that I would like to expand my teaching into new areas. Essentially I began this research in order to assist hearing impaired students within my teaching practice however I am now keen to support other teachers, choir masters, conductors and musicians that may need assistance on this topic.

References

Action on Hearing Loss, (2013). *Joining Up: Why people with hearing loss or deafness would benefit from an integrated response to long-term conditions*. London: Action on Hearing Loss. Available from: www.actiononhearingloss.org.uk/joiningup

[Accessed 28 December 2020].

Action on Hearing Loss, (2015).

Available at: <https://actiononhearingloss.org.uk/information-and-support/hearing-loss/types-of-hearing-loss-and-deafness/genetic-hearing-loss-and-deafness/>

[Accessed 8 December 2020].

Alberti, P., (2001) . *The anatomy and physiology of the ear and hearing In Occupational Exposure to Noise: Evaluation, Prevention and Control* B. Goelzer, Hansen, C., Sehrndt, G.. Ed. ed. Dortmund, Germany: World Health Organization..

American Journal of Speech – Language Pathology, 22 (2), 212 – 226.

Arrowsmith L, (2014) *Hidden Disadvantage: Why people with hearing loss are still losing out at work*. London: Action on Hearing Loss. Available from: www.actiononhearingloss.org.uk/hiddendisadvantage

[Accessed 27 December]

Association of Adult Musicians With Hearing Loss, (2016). *Making Music with a Hearing Loss: Strategies and Stories*. Second Edition, AAMHL Publications. Kindle Edition.

Aveyard, H. (2010) *Doing a Literature Review in Health and Social Care: A Practical Guide* (2nd edn). Maidenhead: Open University Press.

Auditory Verbal UK. (2019) Deaf Awareness Week 2019: AVUK patron Janine Roebuck's life as a deaf opera singer

Available:

<https://www.avuk.org/news/deaf-awareness-week-2019-avuk-patron-janine-roebucks-life-as-a-deaf-opera-singer>

[Accessed 11 December 2020]

Bailey, B. A., & Davidson, J. W. (2002). Adaptive characteristics of group singing: Perceptions from members of a choir for homeless men. *Musicae Scientiae*, 6, 221–256.

Bailey, B. A., & Davidson, J. W. (2003). Amateur group singing as a therapeutic instrument. *Nordic Journal of Music Therapy*, 12, 18–32.

Bailey, B. A. & Davidson, J. W. (2005). Effects of group singing and performance for marginalized and middle-class singers. *Psychology of Music*, 33, 269–303.

Baker M, (2006). *Opportunity Blocked*. London: RNID.

Barry, C., (2008). *Beethoven..* Oxford: Oxford University Press.

Beck, D. L., (2016). Music, Sound Quality, and Hearing Aids: An Interview with Brian Moore and Richard Einhorn. *Hearing Review*, 9 June, 23(7), p. 38.

Beck, R. J., Cesario, T. C., Yousefi, A., & Enamoto, H. (2000). Choral singing, performance perception, and immune system changes in salivary immunoglobulin A and cortisol. *Music Perception*, 18, 87–106.
Boardman,

Bell, J., Waters, S., (2005). *Doing Your Research Project: A Guide For First - time Researchers In Education, Health and Social Science..* 4th edn ed. Maidenhead: Open University Press.

Bell, J., (2014). *Doing Your Research Project: A Guide For First - time Researchers In Education, Health and Social Science..* 6th edn ed. Maidenhead: Open University Press.

Bisson , M., (2017). *Coach Yourself First: A coaches Guide to Self - Reflection*. Kibworth Beauchamp, Leicestershire: Matador Books.

Bogdan, R.C., & Biklin S.K. (1998). *Qualitative research for education: An introduction to theory and methods*. (3rd ed.) Boston: Allyn and Bacon. Burns,

Borton, T., 1970. *Reach Touch and Teach: Student Concerns and Process Education*. McGraw-Hill, New York.
Gibbs,

Burns, R.B. (1997). *Introduction to research methods*. (3rd ed.) Australia: Longman.

Centers for Disease Control and Prevention, (2020). [Online]
Available at: <https://www.cdc.gov/ncbddd/hearingloss/types.html>
[Accessed 8 December 2020]

Chapman, J. L., (2017). *Singing and Teaching Singing: A Holistic Approach to Classical Voice*. 3rd Edition ed. San Diego: Plural Publishing.

Chasin, M., (2009). *Hearing Loss on Musicians*. Oxfordshire: Plural Publishing.

Chasin, M., (2006 a.). Hearing aids for musicians. *The Hearing Review*, 13(3), p. 1–11.

Chasin, M., (2012). Okay, I'll say it: Maybe people should just remove their hearing aids when listening to music!. *Hearing Review*, 19((3)), p. 74.

Chisolm, T. H., Noe, C. M., McArdle, R. & Abrams, H., (2007). Evidence for the use of hearing assistive technology by adults: the role of the FM system.. *Trends in amplification*, 11(2), p. 73–89.

Ciorba A, Bianchini C, Pelucchi S and Pastore A, 2012. The impact of hearing loss on the quality of life of elderly adults. *Clinical Interventions in Aging*, 7, 159-63.

Clark, I., & Harding, K., 2012. Psychosocial outcomes of active singing interventions for therapeutic purposes: A systematic review of the literature. *Nordic Journal of Music Therapy* 21(1) pp.80 - 98

Clements-Cortes, A: Singing for life [published online 2013]. *Activities, Adaptation Aging*. 37(4): 273-290.

Clements-Cortes, A: Choral Singing Benefits for Older Adults. *Can J Music Ther.* 2014;20(1):85-109

Clements-Cortes, Amy. (2015). *Singing for Health, Connection and Care. Music and Medicine*. 7. 13-23.

Clift, S., et al., Choral singing and psychological wellbeing: Quantitative and qualitative findings from English choirs in a cross-national survey. *Journal of Applied Arts and Health*, 2010. 1(1): p. 19-34.

Clift S (2013) 'Singing, wellbeing and health'. In: *Music, health and wellbeing*. Oxford University Press, Oxford, UK

Cooper, H. M., 1998. Organising knowledge synthesis: A taxonomy of literature review.

Knowledge in Society, Volume 1, pp. 104 - 126.

Creswell, J. W., 1994. *Research design: Qualitive and Quantitive approaches*. Thosand Oaks, CA: Sage.

Creswell, J.W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches*. (2nd ed.) Thousand Oaks: Sage. Glesne,

Dalton, D. D. et al., 2003. The impact of hearing loss on quality of life in older adults. Helvik A.S., Jacobsen G.W. & Hallberg L.. *Gerontologist*, 43(), p. 661–668. .

Davis AC, 1995. *Hearing in adults*. London: Whurr.

Davis AC, Smith P, Ferguson M, Stephens D and Gianopoulos I, (2007). *Acceptability, benefit and costs of early screening for hearing disability: a study of potential screening tests and models*. *Health Technology Assessment*, 2 (42).

Dingle G et al. (2019) An agenda for best practice research on group singing, health, and well-being. Music Sci 2:1–15.

Dobie RA. Depression and tinnitus. *Otolaryngol Clin North Am*. 2003 Apr;36(2):383-8.

Einhorn, R., 2012a. Observations from a musician with hearing loss. *Trends in amplification*, 16(3), pg. 179–182.

Einhorn , R., 2012, b. *Hearing Loss Magazine, No compromise*. [Online] Available at: http://hearingloss-longisland.org/wp-content/uploads/2013/01/hlaa_hearing_loss_reprint_richard-einhorn.pdf [Accessed 19 December 2020].

Erdemir, A. & Rieser, J. J., 2016. Singing Without Hearing: The Use of auditory and motor Information when singers, Instrumentalists, and Nonmusicians sing a familiar tune. *Music Perception*, 33(5), p. PP. 546–560.

European Federation of Hard of Hearing People (2015). Hearing Loss: The Statistics. Available at: <https://efhoh.org/wp-content/uploads/2017/04/Hearing-Loss-Statistics-AGM-2015.pdf>

Evelyn Glennie, 2019. *Deaf, Sound and Music Questions*.

Available at: <https://www.evelyn.co.uk/wp-content/uploads/2019/06/Evelyn-Glennie-Deaf-and-Music-Questions.pdf>

[Accessed 10 January 2021]

Fulford, R., Ginsborg, J., Goldbart, J., (2011), Learning not to listen: The experiences of musicians with hearing impairments. *Music Education Research*. 13 (4), 447 - 464

Fulford, R. J., Greasley, A. E. & Crook, H. (2016) Music amplification using hearing aids. *Acoustic Bulletin*, 41(1), 49-51.

Fulford, Robert J., Ginsborg, Jane, Greasley, Alinka. (2015) *Hearing aids and music : the experiences of D / deaf musicians*

Available: https://www.academia.edu/15072626/Hearing_aids_and_music_the_experiences_of_D_deaf_musicians

[accessed 10 December 2020]

Gfeller, K., 2009. Music and cochlear implants: Not in perfect harmony. *ASHA Leader*, 1 June, 14(8), pp. 12-13.

Glennie, E., 2019. *Deaf, Sound And Music Questions*.

Available at: <https://www.evelyn.co.uk/wp-content/uploads/2019/06/Evelyn-Glennie-Deaf-and-Music-Questions.pdf>

[Accessed 4 January 2021]

Grape, C., Sandgren, M., Hansson, L. -O., Ericson, M., & Theorell, T. (2003). *Does singing promote well-being? An empirical study of professional and amateur singers during a singing lesson. Integrative Physiological and Behavioral Science*, 38, 65–74.

Graves, K. (2002). Developing a reflective practice through disciplined collaboration. *The Language Teacher*, 26(7), 19-21.

Hearing Aids for Musicians, 2019. *Hearing Aids for Music Findings and recommendations for hearing aid users, audiologists, manufacturers and researchers 2019*. [Online] Available at:

<https://musicandhearingaids.org/wp-content/uploads/sites/35/2019/04/Hearing-aids-for-music-findings-and-recommendations-25-April-2019.pdf>

[Accessed 3 December 2020].

Hearings Aids for Music, 2019. *Findings and recommendations for hearing aid users, audiologists, manufacturers and researchers*. [Online]

Available at: <https://musicandhearingaids.org/wp-content/uploads/sites/35/2019/04/Hearing-aids-for-music-findings-and-recommendations-25-April>

[Accessed 20 December 2020].

Halam, S., Cross, I. & Thaut, M., 2016. *The nature of music and its evolution. In The oxford handbook of music psychology*. 2 ed. ed. New York: Oxford University Press..

Hallowell, D. S. R., 1970. . *Hearing and Deafness*. rd Edition ed. s.l.: Holt, Rinehart and Winston, .

Hart, C. (2001) *Doing a Literature Search: A Comprehensive Guide for the Social Sciences*. London: Sage.

Hazard WR, Andrews R, Bierman EL, et al. (1990). *Principles of geriatric medicine and gerontology*, 2nd ed. New York: McGraw- Hill.

Hearing Link (2020). [Online]

Available at: <https://www.hearinglink.org/about-us/contact-us/>

[Accessed 10 December 2020].

Herbst KRG., (1983) Psychosocial consequences of disorders of hearing in the elderly. In: Hinchcliffe R, editor. *Hearing and balance in the elderly*. Edinburgh: Churchill Livingstone.

<https://musicandhearingaids.org/wp-content/uploads/sites/35/2019/04/Hearing-aids-for-music-findings-and-recommendations-25-April-2019.pdf>

Holmes, J., 2017. *Expert listening beyond the limits of hearing: Music and deafness*. Journal of the American Musicological Society., 70 (1). Pp. 171 - 220

Jacob, C., C. Guptill and T. Sumsion, Motivation for continuing involvement in a leisure-based choir: the lived experiences of university choir members. *Journal of Occupational Science*, 2009. 16(3): p. 187-93

Kreutz, G., Bongard, S., Rohrmann, S., Hodapp, V., & Grebe, D. (2004). Effects of choir singing or listening on secretory immunoglobulin A, cortisol, and emotional state. *Journal of Behavioral Medicine*, 27, 623–635.

Leborgne, W. & Rosenberg, M., 2014. *The Vocal Athlete*. 2nd ed. ed. San Diego: Plural Publishing .

LeCompte, M. D., Klinger, J. K., Campbell S. A., & Menke, D. W. (2003). Editor's introduction. *Review of Educational Research*, 73(2), 123-124.

Mackenzie, N. & Knipe, S. (2006). Research dilemmas: Paradigms, methods and methodology. *Issues In Educational Research*, 16(2), 193-205. <http://www.iier.org.au/iier16/mackenzie.html>
[Accessed 19 December 2020]

Mathers C and Loncar D, 2006. Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Medicine* 3

Matthews L, (2011) Unlimited potential: a research report into hearing loss in the workplace. London: Action on Hearing Loss. Available from: [http:// www.actiononhearingloss.org.uk/unlimitedpotential](http://www.actiononhearingloss.org.uk/unlimitedpotential) [Accessed 28 December 2020].

Mertens, D.M. (2005). Research methods in education and psychology: Integrating diversity with quantitative and qualitative approaches. (2nd ed.) Thousand Oaks: Sage.

Monzani, D., Galeazzi, G. M., Genovese, E., Marrara, A., Martini, A. (2008)., Psychological profile and social behaviour of working adults with mild or moderate hearing loss. *Acta Otorhinolaryngologica Italica*, 28:2, pp. 61-68

Moore, B. C. J. & Carlyon, R. P., (2005). *Perception of pitch by people with cochlear hearing loss and by cochlear implant users. In: In C.J. Plack, A.J. Oxenham, R.R. Fay, & A. N. Popper (Eds.), Pitch: Neural coding and perception . (pp.234 -277). New York, NY: Springer.*

Moore, B. . C. J., 2016 . Effects of Sound-Induced Hearing Loss and Hearing Aids on the Perception of Music Article. *Journal of the Audio Engineering Society*, 64(3), pp. 112 - 123.

Morrison, I. and S.M. Clift, 2013 Singing and People with COPD (Chronic Obstructive Pulmonary Disease). In: Singing Wellbeing and Health: context, evidence and practice. Sidney De Haan Research Centre for Arts and Health. Canterbury Christ Church University (<http://www.canterbury.ac.uk/Research/Centres/SDHR/ Documents/SingingandpeoplewithCOPD.pdf>) [Accessed 4 January 2021]

Mulrow , C. et al., 1990. Quality-of-life changes and hearing impairment: a randomized trial.

Music and the Deaf, 2020. Who we are. Available at: <https://www.matd.org.uk/who-we-are/> [Accessed 11 January 2021]

Myska, A. and P.G. Nord, (2008). 'The day the music died': a pilot study on music and depression in a nursing home. *Nordic Journal of Music Therapy*, 17(1): p. 30-40.

National Council on the Aging (US)., (1999) The consequences of un- treated hearing loss in older persons. Washington (DC). Available at: <https://d2mkcg26uvq1cz.cloudfront.net/wp-content/uploads/NCOA-Study-1999.pdf> [Accessed 15 December 2020].

National Deaf Children's Society (NDCS) Scotland, 2014. Close the Gap: Promoting positive post-school transitions for deaf young people in Scotland. Available from:

http://www.ndcs.org.uk/about_us/campaign_with_us/scotland/close_the_gap.html

[Accessed 2 December 2020]

National Deaf Children's Society (NDCS), 2015c. NDCS Factsheet: Special Educational Needs and Disability (SEND) in England. Available from: http://www.ndcs.org.uk/family_support/education_for_deaf_children/sen_reform_in_england/index.html

[Accessed 3 December 2020]

Noice, T., H. Noice and A.F. Kramer, Participatory Arts for Older Adults: A Review of Benefits and Challenges. *Gerontologist*, 2013.

Online Mic Test

<https://www.onlinemictest.com/>

[Accessed 10 December 2020]

.Pavlaou, M., (2009). Benefits of group singing for people with eating disorders: preliminary findings from a nonclinical study. *Approaches: music therapy and special music education*, 1(1): pg. 30-48.

Perez , E. & Edmonds , B., 2012. A Systematic Review of Studies Measuring and Reporting Hearing Aid Usage in Older Adults since 1999 A Descriptive Summary of Measurement Tools. *PLoS ONE*, 7 (3), pp. 318 -31.

Pink, Daniel H.(2009). *Drive: The surprising truth about what motivates us*. London, UK: Canongate.

Phillips KH, Williams J, Edwin R, 2012. The Young Singer. *The Oxford Handbook of Music Education*, Aug, Volume 1, pp. 1-12.

Prada, R., 2005. in *The Ear and the voice: A. A., Tomatis*. s.l.:The Scarecrow Press,Inc.

Sataloff, R. T., 1992. The human voice. *Scientific American*, 267(6), pp. 108 - 115.

Särkämö T, et al., Cognitive, Emotional, and Social Benefits of Regular Musical Activities in Early Dementia: Randomized Controlled Study. *Gerontologist*, 2013 Sep 5 Epub ahead of print.

Somekh, B., & Lewin, C. (2005). *Research methods in social sciences*. London: Sage.

Talwar, N., et al., Music therapy for in-patients with schizophrenia. *The British Journal of Psychiatry*, 2006. 189: p. 405-409.

Tambs , K., (2004). Moderate effects of hearing loss on mental health and subjective well- being: results from the Nord-Trøndelag Hearing loss study. *Psychosom Med* , Volume 66, pp. 776-82.

Tashakkori, A., & Teddlie, C. (2003). *Handbook of mixed methods in social and behavioural research*. London: Cassell

Tilney, T., 1929. A comparative sensory analysis of Helen Kell and Laura Bridgman. *The Laryngoscope*. 6 pg. 343 -378

Tonneijck, H.I.M., A. Kinebanian and S. Josephsson, An exploration of choir singing: achieving wholeness through challenge. *Journal of Occupational Science*, 2008. 15(3): p. 173-80.

Trehub, S., 2009. Academia, "Music in the Lives of Deaf Children with Cochlear Implants." *Annals of the New York*. [Online]

Available at:

[https://www.academia.edu/10751214/Music_in_the_lives_of_deaf_children_with_cochlear_i mplants](https://www.academia.edu/10751214/Music_in_the_lives_of_deaf_children_with_cochlear_implants) [Accessed 14 December 2020].

Racette, A., C. Bard and I. Peretz, (2006). Making non-fluent aphasics speak: sing along! *Brain*, 129(10): p. 2571-84.

Randolph, J. J., 2009. 'A Guide to Writing the Dissertation Literature Review'. A Practical Assessment. *Research and Evaluation*, 14(13), pp. 1 - 13.

Rolfe, G., Freshwater, D. & Jasper , M., Rolfe, G., Freshwater, D., (2001) . : .. *Critical reflection in nursing and the helping professions: a user's guide*. Basingstoke: Palgrave Macmillan.

Roy, N., Barkmeier – Kraemer, J., Eadie, T., Sivasankar, M. O., Mehta, D., Paul, D., & Hillman, R. (2013). Evidence – based clinical voice assessment: A systematic review.

<https://www.scribbr.com/>

Shearer AE, H. M. S. R., 2017. *Hereditary Hearing Loss and Deafness Overview.*, Seattle (WA): University of Washington, Seattle: GeneReviews®.

Skingley A, Bungay H (2010) The Silver Song Club Project: singing to promote the health of older people. *Br J Commun Nurs* 15(3):135–140.

Tomatis, A. A., 2004. *The Ear And The Voice*. s.l.:The Scarecrow Press, Inc.

UK Disability History Month (2018) Janine Roebuck Deaf Opera Singer

Available : <https://ukdhm.org/janine-roebuck-deaf-opera-singer-uk/>

[Accessed 12 December 2020]

Valentine, E. and C. Evans, The effects of solo singing, choral singing and swimming on mood and psychological indices. *British Journal of Medical Psychology*, 2001. 74: p. 115-120.

Vickhoff, B., et al., (2013). Music structure determines heart rate variability of singers, *Front Psychol.* 4: p. 334.

Welsh, G.F., 2012. The Benefits of Singing for Children. University College London Institute of Education.

Available :

https://www.researchgate.net/publication/273428150_The_Benefits_of_Singing_for_Children

[Accessed 17 December 2020]

Welsh, G.F., 2012. The Benefits of Singing for Adolescents. *Journal of Leading Education and Social Research*. 2(3), pp.1 - 4

Wiersma, W. (2000). *Research methods in education: An introduction*. (7th ed.) Boston: Allyn and Bacon

Williams E, Dingle GA, Clift S (2018) A systematic review of mental health and wellbeing outcomes of group singing for adults with a mental health condition. *Eur J Public Health* 28(6):1035–1042.

World Health Organization, 2021. *Coronavirus*

Available at:

https://www.who.int/health-topics/coronavirus#tab=tab_1

[Accessed 2 January 2021].

Appendix 1

Mild hearing loss

•

Quietest sound: 25-39dB • Can sometimes make following speech difficult, particularly in noisy situations or for long periods of time. People start avoiding social situations.

Moderate hearing loss

•

Quietest sound: 40-69dB

- Often have difficulty following speech without hearing aids. Likely to avoid most or all social situations.

Severe hearing loss

•

Quietest sound: 70-94dB • Usually need to lipread or use sign language, even with hearing aids. May be eligible for cochlear implants.

Profound deafness

•

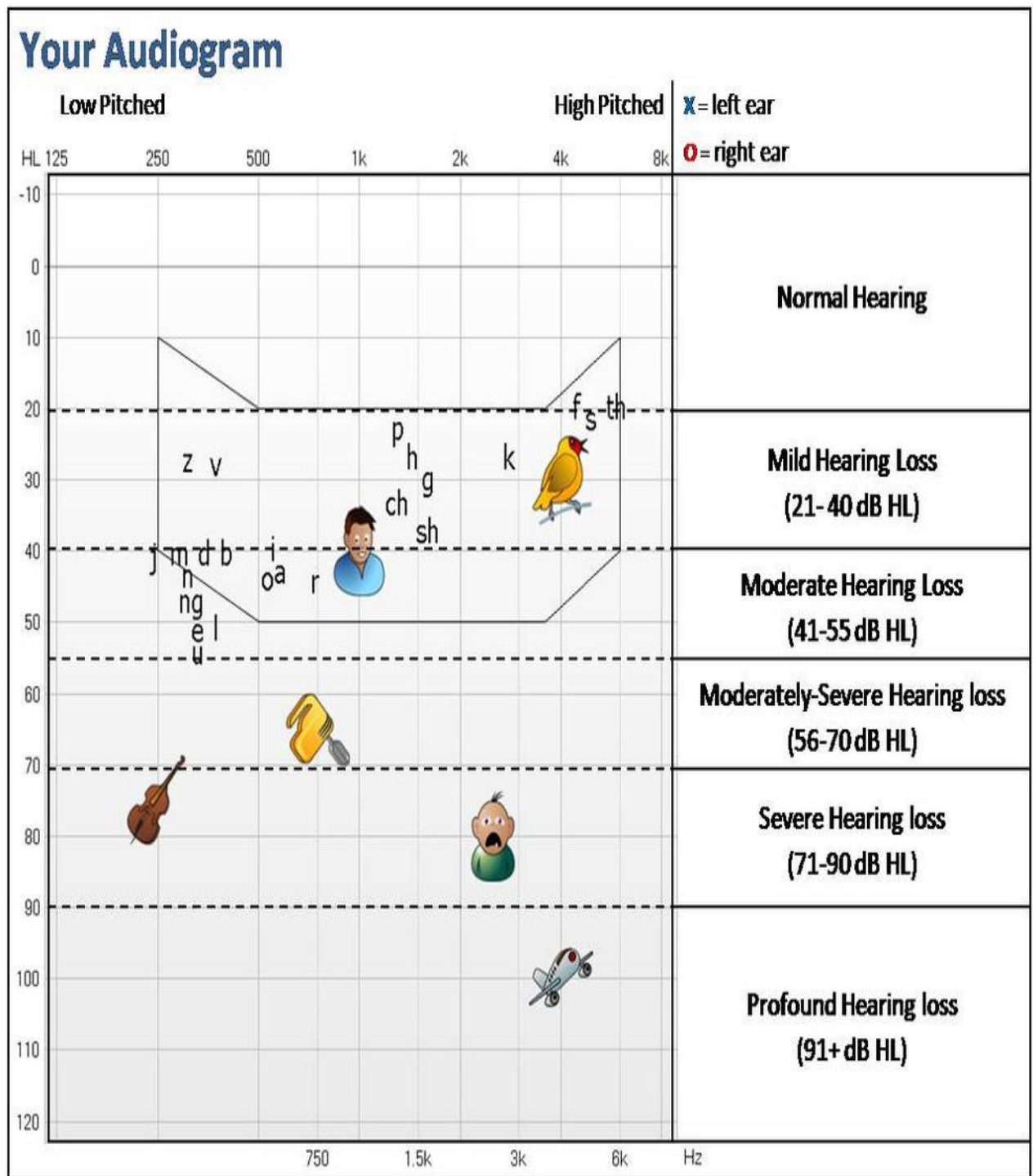
Quietest sound: 95dB • Usually need to lipread or use sign language.
Hearing aids often not helpful, may benefit from cochlear implants

actiononhearingloss.org.uk

Pg. 23

Action on hearing loss report 2015

Appendix 2



<http://www.physiciansaudiology.com/understanding-audiogram>

Appendix 3

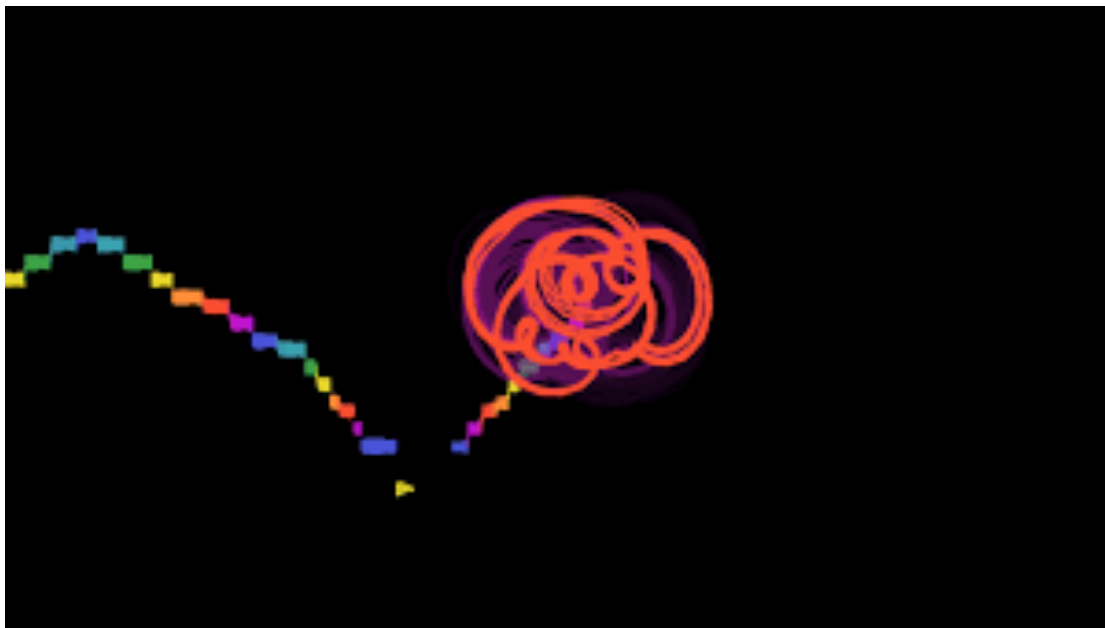
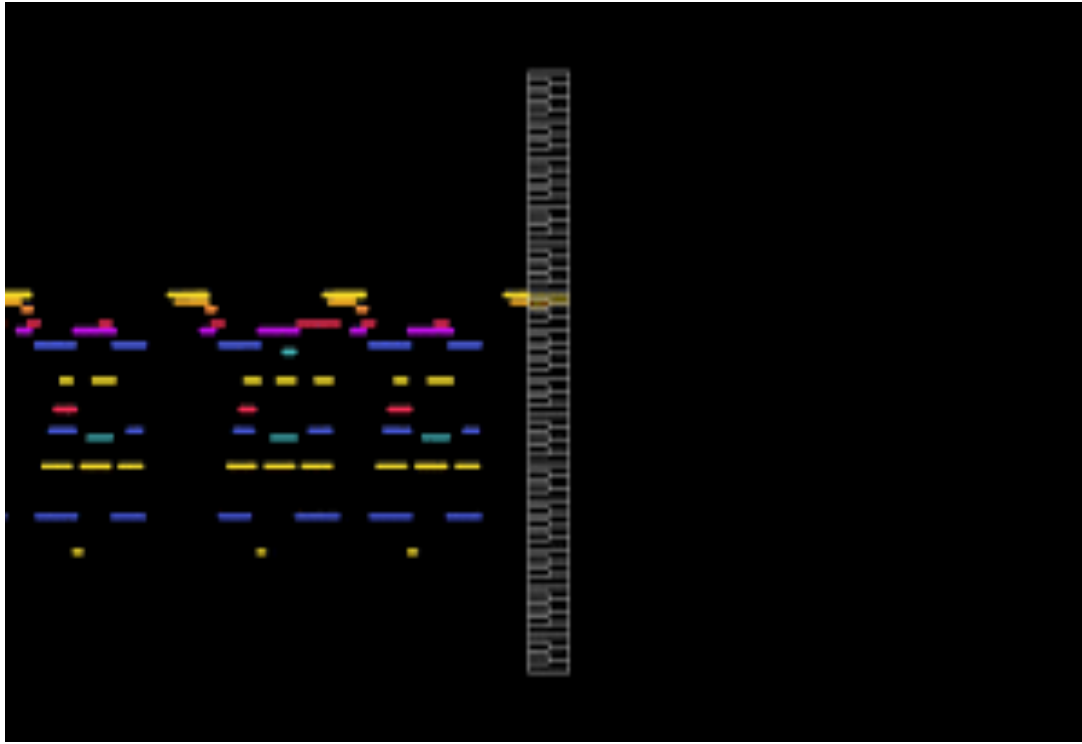
MIDI number		Note name	Keyboard	Frequency Hz		Period ms	
21	22	A0		27.500		36.36	
23		B0		30.868	29.135	32.40	34.32
24	25	C1		32.703		30.58	
26		D1		36.708	34.648	27.24	28.86
28	27	E1		41.203	38.891	24.27	25.71
29	30	F1		43.654		22.91	
31		G1		48.999	46.249	20.41	21.62
33	32	A1		55.000	51.913	18.18	19.26
35	34	B1		61.735	58.270	16.20	17.16
36	37	C2		65.406		15.29	
38		D2		73.416	69.296	13.62	14.29
40	39	E2		82.407	77.782	12.13	12.86
41		F2		87.307		11.45	
43	42	G2		97.999	92.499	10.20	10.81
45	44	A2		110.00	103.83	9.091	9.631
47	46	B2		123.47	116.54	8.099	8.581
48	49	C3		130.81		7.645	
50		D3		146.83	138.59	6.811	7.216
52	51	E3		164.81	155.56	6.068	6.428
53	54	F3		174.61		5.727	
55		G3		196.00	185.00	5.102	5.405
57	56	A3		220.00	207.65	4.545	4.816
59	58	B3		246.94	233.08	4.050	4.290
60	61	C4		261.63		3.822	
62		D4		293.67	277.18	3.405	3.608
64	63	E4		329.63	311.13	3.034	3.214
65	66	F4		349.23		2.863	
67		G4		392.00	369.99	2.551	2.703
69	68	A4		440.00	415.30	2.273	2.408
71	70	B4		493.88	466.16	2.025	2.145
72	73	C5		523.25		1.910	
74		D5		587.33	554.37	1.703	1.804
76	75	E5		659.26	622.25	1.517	1.607
77	78	F5		698.46		1.432	
79		G5		783.99	739.99	1.276	1.351
81	80	A5		880.00	830.61	1.136	1.204
83	82	B5		987.77	932.33	1.012	1.073
84	85	C6		1046.5		0.9556	
86		D6		1174.7	1108.7	0.8513	0.9020
88	87	E6		1318.5	1244.5	0.7584	0.8034
89	90	F6		1396.9		0.7159	
91		G6		1568.0	1480.0	0.6378	0.6757
93	92	A6		1760.0	1661.2	0.5682	0.6020
95	94	B6		1975.5	1864.7	0.5062	0.5363
96	97	C7		2093.0		0.4778	
98		D7		2349.3	2217.5	0.4257	0.4510
100	99	E7		2637.0	2489.0	0.3792	0.4018
101	102	F7		2793.0		0.3580	
103		G7		3136.0	2960.0	0.3189	0.3378
105	104	A7		3520.0	3322.4	0.2841	0.3010
107	106	B7		3951.1	3729.3	0.2531	0.2681
108		C8	J. Wolfe, UNSW	4186.0		0.2389	



Frequency to note converter

<https://experiments.withgoogle.com/seeing-music>

Appendix 4



Seeing Music: Zimmerman, A, (2018). <https://experiments.withgoogle.com/seeing-music>

Appendix 5

Strategies for singers with a hearing loss

These strategies can be used in preparation for singing, within the singing studio, rehearsal space and live performance environments.

- Try and understand the rate and level of the individual hearing loss and how this effects the frequencies that the ear hears. Experiment with different sounds frequencies, instruments and varied musical styles.
- Acknowledge the hearing loss and receive the most appropriate hearing aid technology for individual music needs.
- Request a separate music program from the audiologist and fix separate level gain controls.
- Ask the audiologist any additional questions that may assist with the hearing aids or be of concern.
- Practice singing within different environments and acoustic settings, both with the normal program and the music program. Additionally, changing the level of accompanying instrument or music backing track.
- Choose suitable noise cancelling headphones to assist with the listening and rehearsal of pieces.
- Obtain musical scores and/or lyrics that may be helpful as a visual aid for rehearsal and live performance.
- Learn and prepare new material in advance in order to eliminate unnecessary performance anxiety on the event date.
- Purchase a music tuner or download a suitable music tuning application to help with vocal pitching in challenging circumstances. Online Mic Test <https://www.onlinemictest.com/>
- Make it known to the necessary individuals within the specific music setting that you are a hearing aid user.
- Position oneself in a suitable area that supports self - monitoring of the voice and has the ability to hear a guiding melodic instrument. Make use of a personal stage monitor.
- Position oneself in clear visual view of the singing teacher and/or other musicians, ask for clear visual cues, clarifying the definition of each. Agree on certain gestures which Additionally, be aware of musician's body movements including foot tapping, and facial expressions.
- Experiment with shoes on and shoes off, recognising if this is a helpful sensory tool.
- Practise singing with and without no auditory feedback. Being aware of what the body doing and other sensory information that can help.
- Experiment with two hearing aids in and one hearing aid out. This may help within certain environments whilst singing and also with occlusion.
- Be well informed of ALD's and choose ones that may be suitable for the certain musical settings.
- Learn how to lip read to basic or intermediate level. This will be helpful within noisy performance settings.
- Be aware of music or harmful sound levels both recorded and live. Within extremely loud settings where communication is not needed wear suitable sound protection. In addition, use a decibel measurer to measure the loudness of an environment. Preserving the remaining hearing is extremely important.
- Use additional applications and programmes to guide your singing practice including Seeing Music <https://experiments.withgoogle.com/seeing-music>