

With a Body to Hear

Composing for the Hard of Hearing and the Deaf

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Abstract

This project explores the different modalities of listening through the act of co-creation with Hard-of-Hearing individuals. Using a practice-based framework, I aim to compose music that can provide a musical experience for hard-of-hearing individuals. Creative sessions with three participants with cochlear implants between the ages of 11 and 13 are used to explore how music can be created for Hard-of-Hearing individuals. The initial active co-creation was changed to include more passive co-creation after the first session, when the participants showed a disconnect with the creation of music. The creative process then moved to creation by the researcher and feedback from the participants. The pieces of music I created were then played back for the participants. Changes that could be made to these pieces of music to make them easier to listen to were then made after each playback. Following these collaborative sessions with the participants, the process of reflection is used to explore the reasons for their responses to the different pieces of music and how more pieces can be created. It is found that there are aspects of instruments and their vibrational qualities that need to be taken into consideration when creating a piece of music for Hard-of-Hearing people, and that visual representations of music can be used as an additional means of creating a musical experience.

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Chapter 1: Introduction

Before embarking on the writing of this thesis, deafness was a terrifying idea. As a pianist, I could not imagine the loss of any of my senses, least of all my hearing. I had this notion that my craft would be negatively impacted by any form of hearing loss. I had been a classical musician for twenty years, and my training in music was entirely aural-based. While I had tried composing classical music for the entirety of my musical career, I was more drawn to the lyricism of the pieces found in musical theatre and film, and wanted to explore the kind of music that I viewed as a combination of contemporary pop music and classical music. Within this realm of composition, there seemed to be no room for anyone with a form of deafness, even though many musicians and people who work with music in its creation or performance end up with some degree of hearing loss. I had even been cautioned by all of my music teachers to ‘take care’ of my hearing because of how common hearing loss was. Thus, my fear sparked an interest in how Hard-of-Hearing people might experience music. My goal is to try to understand how I might partake in the music that I enjoyed, even if I could not hear it in the future. While it is common knowledge that sound carries vibration and thus Hard-of-Hearing people can still receive sonic information, the question arose of how that sonic information might be understood in the process of composition.

My research aimed to gain insight and understanding into modalities through which Hard-of-Hearing (HoH) people listen to music. I decided to use the compositional process to examine these modalities. However, I could not ignore the glaring fact that my reasoning for my research was rooted in ignorance and fear. I could also not ignore that I cannot fully comprehend or understand the full extent to which HoH people navigate the world with its hearing biases. I could only read about these issues and interact with these individuals as an outsider. Writing about HoH people as a group as a hearing person could cause misrepresentation and potential harm by my biases and assumptions, which I address at greater length in Chapter 2. I have tried to avoid language that can be considered harmful to this group within this

project. The project aims to explore how one can create music that is accessible to Hard-of-Hearing people.

D/deaf: Terminological and Cultural Considerations

In thinking and making music in the spaces of Deafness, I situated my research within Deaf Studies. Deaf studies emerged in the 1970s as a part of a movement that fought to recognise Sign Language, and specifically American Sign Language, as a valid language and that Deaf people have a culture of their own (Ladd 2003; Ladd and Lane 2013).

Deafness can be considered a state of being. The word 'deaf,' with the lower case 'd', is often used to describe an individual's state of hearing falling into a range of hearing that audiologists categorise as profoundly deaf, meaning the individual has little to no residual hearing (Penn 1993; Harmon 2010). Hard-of-hearing, which, for simplicity, will be referred to as HoH, encapsulates all individuals whose hearing is considered below the 'healthy' range of hearing, including those who are profoundly deaf. This group of people exist in a phonocentric society that historically has treated them as inferior and unable to function in the society in which they live (Senghas and Monaghan 2002; Bauman, Murray, and Skutnabb-Kangas 2014a).

The term Deaf, with a capital 'd,' describes forms of culture of which many Hard-of-Hearing people are a part. Deaf culture is constituted by language and cultural behaviours. However, not all HoH people conform to the Deaf culture, in a similar way that not all HoH people use Sign Language as their primary means of communication (Friedner and Helmreich 2012; Morgan and Kaneko 2020). Many of those within the Deaf community use Sign Language as their primary means of communication, even in communicating with hearing partners and children (Sutton-Spence 2010). Many HoH children are born into hearing families, which provides them with limited exposure to the Deaf Community and Sign Language, with

many individuals only connecting with Deaf communities later on in life.

Sign Language is important in the establishment of Deaf culture and is considered a visual language, which uses hand and body movements and gestures to portray a word or phrase (Stokoe 1980; Stokoe 2005).

Sign Language, like other languages, is unique to the country in which it is used, which influences the gestures and overall grammatical structure of the language. Prior to the formalisation of American Sign Language in the 1960s by linguist William Stokoe, it consisted of gestures and movements that were unique to smaller groups and places of origin (Stokoe 1980). Sign Language offers the biggest gateway into the Deaf community, with many HoH people learning the language as a second language rather than a first language, due to many HoH people having little to no connection to the Deaf community. In these situations, the shared discrimination that HoH people encounter in their day-to-day lives is a point of shared commonality through which HoH individuals connect and relate with each other, allowing them to find belonging in the Deaf community (Ladd 2003; Sutton-Spence 2010; Ladd and Lane 2013).

The navigation between the Deaf and hearing communities is an aspect of most HoH peoples' lives as they are surrounded by a hearing-centric world. The hearing world has been discriminatory towards HoH people throughout history. Narratives told in Sign Language have been seen to portray reflections of these discriminations and common struggles that many HoH people go through (Morgan and Kaneko 2020). The narratives that are told by Deaf people through various artistic mediums, such as poetry and storytelling, often showcase the struggles of navigating the hearing world and the deaf world (Morgan and Kaneko 2020). These narratives are especially prominent in allowing HoH people to discover and explore being HoH while being surrounded by hearing people who do not understand the struggles and nuances that come with being deaf (McIlroy 2008; Morgan and Kaneko 2020).

The identity of HoH people is not necessarily limited to either Deaf or hearing culture. Guy McIlroy (2008), for instance, argues that HoH individuals do not conform to only culture. If we examine disabled identity as a means of reflection of the political and discriminatory aspects that all disabled people are subjected

to, we can see the bi- or multicultural identity that many HoH individuals connect with, then we can examine HoH identity as a reflection and commentary of the discrimination faced due to both the Deaf and hearing communities (Leve 2011; Klandermans 2014; Siebers, Sturm, and Karāne 2017). While the hearing community has perpetuated a long history of oppression and discrimination towards HoH people, the Deaf community has also offered its own discrimination (Best 2015). An example would be how members of the Deaf community interact with HoH individuals who have cochlear implants or hearing aids, which I discuss later in this thesis (Retief and Letšosa 2018).

Music is deeply bound up with issues of culture and identity, which allows the creation of music to be a reflection of the identity of those who are creating it (Darrow 1985). Engaging with HoH people in creative spaces includes engaging with their identities, which is needed to explore how these individuals engage with music and how they listen to music.

The Ear and Hearing

Understanding how the human ear functions is an important step in understanding deafness. Hearing, in the conventional sense, begins at the ear. The human ear is an interesting and complex organ. It functions as one of the ways by which the person to whose body it is attached can convert a sound wave travelling through the air into bioelectrical signals that can be interpreted by the brain. There are three major areas of the ear, each with its own purpose to aid in the function of the organ: the outer, middle, and inner ear.

The outer ear is the part of the ear that one can generally see with the naked eye. It is defined by its cartilage structure that funnels down into a small hole on either side of the head, known as the ear canal. In addition to aiding in directing sound waves without loss of energy, the bone of the ear canal is covered in a thin skin that also allows for a small amount of conduction. The ear canal also produces a lubricating wax that keeps the cavity moist and protected from external pathogens or debris that can cause a loss of

hearing. The outer ear acts as a type of funnel that channels sound waves towards the tympanic membrane, or, as it's more commonly known, the eardrum, through the ear canal. Here, the outer ear meets the middle ear.

The middle ear is home to three of the smallest bones in the body: the malleus, incus, and stapes, which, in transferring the kinetic force of the sound wave, conduct and amplify these waves into the inner ear (Reichenbach and Hudspeth 2014). The malleus, the hammer-shaped bone that is connected to the tympanic membrane, vibrates as the membrane does, causing the other two bones to start vibrating in conjunction, which aids in amplifying the sound. Once the sound is amplified, it continues moving into the inner ear via the oval window, a connective membrane which connects the middle and inner ear, which causes the sound to create a pressure difference that allows the inner ear to conduct sound.

In the inner ear, the cochlea converts sound waves from a kinetic force to an electrical impulse that can be interpreted by the brain. The cochlea is a spiral-shaped cavity that is filled with endolymph. As the sound wave makes its way into the cochlea, it moves the fluid, which in turn moves the cochlear partition made up of the basilar membrane and the organ of Corti. As this partition moves, tiny hair cells are stimulated, with cells in different regions of the cochlea responding to different frequencies. These hair cells are responsible for the brain interpreting sound. As the hair cells are stimulated, they trigger a nervous impulse, which then travels through the auditory nerve to the brain, which interprets these impulses as sound (Alberti 2001; Reichenbach and Hudspeth 2014). Damage to any one of these three structures (outer, middle or inner ear) may result in hearing loss. Categorisation of a person's ability to hear is usually based on audiological measures, which specify a range of 'normal hearing,' wherein an individual's hearing is tested using both frequency and volume. Anything that falls below a certain range of frequency or volume is categorised as mild to severe hearing loss, where the near total lack of hearing is categorised as deaf (Penn 1993). There are a multitude of reasons for damage to the ear structures, with the most common of these being due to exposure to loud sounds (Wada et al. 2017). Exposure to loud sounds does not necessarily cause an instant loss of hearing. In most cases, the hearing loss is

gradual and mild, and affects an individual as they get older. The exposure to loud sounds causes damage to the tympanic membrane, which, due to continuous use, cannot heal properly, resulting in scar tissue forming on the membrane. This scar tissue affects its elasticity and, thus, its ability to conduct sound. Most people will experience this type of hearing loss during their lives. However, there are forms of hearing loss that do not occur due to physical trauma to the ear structures. Genetic conditions and certain diseases can affect the functioning of the ear structures as well as the centres in the brain which interpret electrical impulses from the cochlea (Shearer et al. 1999).

The sense of hearing is one of the five senses that humans possess. Through an automatic mechanism called auditory processing, human beings can grasp a range of information from an auditory stimulus (Kraus and Banai 2007). The nature of the source of the sound and the distance and direction of the source are aspects of the auditory stimulus that can be determined through auditory processing. Auditory processing is also needed for understanding most language, speech and vocal communication, and auditory interaction with music. With auditory processing, human beings can assign meanings to the things that they hear and begin to have emotional and physical responses based on the information that the sound conveys. Hearing people interact with each other through sound and, for many, the idea of living without sound is unfathomable. However, if hearing loss due to structural trauma is a common occurrence, why is there still so much value placed on the ability to hear sounds in this conventional way?

Disability

In considering this question, my study is informed by disability studies in which the social and cultural constructions of disability are explored. The construct of the disabled body has its origins in the power dynamic of societies around the world, creating instances wherein a group of people who do not fit into a societal norm that has been created by those in power face oppression and discrimination (Kudlick 2003).

The term and the consequential societal mindsets and behaviours that come with it have been used as a justification for the discrimination of marginalised groups within various societies (Goethals, De Schauwer, and Van Hove 2015; Reid and Knight 2024). In a Western context, a female body was once considered disabled in the male-dominated political climate, and, during colonisation and the slave trade, the black body was considered disabled (Lane 2002; Kudlick 2003; Straus 2011). Of course, being able-bodied was also a desired characteristic. The desired body was a white, heterosexual, able-bodied male, and those who did not fall into those categorisations were made to feel inferior (Hirsch 1995; Kudlick 2005; Reddy 2011; Straus 2011).

Disability studies have examined different societal models that have allowed those in positions of power to justify their discrimination. These include social and medical models as well as the religious influence on the lives of those with disabilities (Straus 2011; Retief and Letšosa 2018; Claassens, Shaikh, and Swartz 2019). Religious societies have often stated that disability (referred to by Straus as 'difference') is a sign of the individual being punished by their god or gods, or that they are a result of something evil or unholy. The individual in question bears a mark of divine disfavour through their difference, and, thus, bears ostracisation as a result (Eiesland 2005; Straus 2011; Retief and Letšosa 2018; Mugeere et al. 2020). A person who is 'cursed' with their difference may be subject to more than just verbal discrimination. Rituals wherein a spiritual leader uses their own faith and spiritual prowess to cleanse or save the individual were used to show the power of a deity, aiding in keeping people in submission to religious leaders (Claassens, Shaikh, and Swartz 2019). In sub-Saharan Africa, there are many cases of religious and spiritual violence against people of physical or mental difference (Mugeere et al. 2020). The counterpart for this is seeing the individual as a subject of divine favour. This stems from an individual seemingly 'overcoming' their difference and managing to ascend to a higher level than those in the norm, through their difference. The individual is no longer limited by their difference. Rather, they have reached a point of favour with their god or gods, and thus live on a higher level of being than those without their difference. For example, people of his time saw Beethoven as an individual who, despite his late-life

deafness, composed music that went beyond what any hearing composer could create, a narrative that is still present in how he is spoken of today (Straus 2011).

The most prevalent mode of thinking, which is still a major part of the current societal thinking around disabilities, comes from the rise of medical study in the nineteenth century, which has been named the 'medical model' (Reddy 2011; Retief and Letšosa 2018). With advancements in modern medicine, there came a desire for normalcy that resulted in society seeing disability as a disease or defect, and something to be cured (Bauman, Murray, and Skutnabb-Kangas 2014). This model is grounded in thinking of disability as a deviation from the norm, which needs to be remedied through medical intervention (Olkin 2001).

Medical aids such as prosthetic limbs, hearing aids or cochlear implants are a few examples of modes that are still used to attempt to remedy disability. The terminology that was used in this model, such as invalid and handicapped, created an extremely negative way of viewing disabilities, which translated into individuals with disabilities wanting to further integrate into the majority (Retief and Letšosa 2018).

The social model of disability moves away from the ableist narrative that has been present throughout history through medical and religious discourse. The social model looks towards the removal of the previous oppression that individuals with disabilities have faced. With the rise of the civil rights movement in the 1960s in the United States, people with disabilities advocated for their own rights to escape the oppression that they had faced. In the 1970s, the social model arose in response to the ongoing disability rights movement (Shakespeare and Watson 2001; Kudlick 2005). The social model states that disabled people are a minority group that has faced oppression, and it is not the individual's disability that disables them; rather, it is the discrimination and oppression from their society that is the disabling element (Shakespeare and Watson 2001; Kudlick 2005; Tina Goethals, Elisabeth De Schauwer, and Geert Van Hove 2015). This model seeks to enable disabled people to reclaim the language that was previously used to oppress them, thus giving words used in describing disability new meaning in modern contexts (Straus 2011).

While the social model is a seemingly ideal model to place disability studies in, it is not without its faults. The model and response to it, especially in the United States, is a rigid and unwavering response to the oppression and discrimination of disabled people, going as far as to avoid the use of terms like 'impairment' in the discussion of disability (Shakespeare and Watson 2001). A large factor in speaking about disability is knowing what a person's body is simply unable to do, thus the term 'impairment' that stems from the medical model. Shakespeare and Watson (2001) state that, just like sex and gender are two terms that cannot be separated, so disability and impairment are inseparable. Thus, we need to navigate and bring the medical model and social models to be in conversation with each other. Conditions of the human body are a reality, with some even leading to an impact on the quality of life that an individual wishes to have (Waldschmidt, Berressem, and Ingwersen 2024). Therefore, the interaction between the medical and social models is key in examining disability in a modern context and the creation of disabled identity. McIlroy and Storbeck refer to this as the 'dialogue model,' explaining how this model also examines the 'bicultural dialogue' that is present in the lives of minority groups (McIlroy and Storbeck 2011, 496). They posit that 'the essence of the dialogue model is reconciliation through critical self-reflective bicultural dialogue, which embraces postmodern tensions between contradictory identities' (McIlroy and Storbeck 2011). The key aspect here is navigation through different cultural dialogues that influence the identity of an individual, which are influenced by the different models of viewing disability, which will be explored more in Chapter 2 of this thesis when different racial and cultural dialogues become present in the conversation with the participants of the study.

Historically, South Africa followed the medical model of thinking around disability, which was discussed in earlier paragraphs. While this manner of thinking was seen globally, the unique socio-political environment of South Africa saw the interplay of tradition and colonial perspectives shape the experience of disabled individuals (Watermeyer et al. 2006). The many traditional cultures in South Africa often saw disability in a spiritual framework, linking it to ancestral anger or even curses or witchcraft, often leading to ostracisation and abuse by non-disabled people in families and the community (Wogqoyi 2012;

Mbazima 2016; Mugeere et al. 2020; Mkabile and Swartz, 2022). This often resulted in individuals with disabilities being hidden away, denied education, and excluded from social participation, perpetuating a cycle of marginalisation and poverty (Gathiram 2008). Combined with the medical model's influence and implementation during the 1900s, disabled people, specifically in Black communities, found themselves in particularly vulnerable circumstances. With the rise of racial segregation and the Apartheid Era, disabled people of colour had limited access to healthcare, education, and social services, further placing them on the fringes of society. While the racial segregation of this era in South Africa greatly affected the people of colour, discrimination against disability intersected with racial oppression, making disabled individuals unable to get education, work, and healthcare due to the adopted medical model that the government had adopted (Watermeyer et al. 2006). During the talks of democracy that began in the 1980s, the Disabled People of South Africa (DPSA) formed, headed by individuals with disabilities (Watermeyer et al. 2006). This organisation advocated for disabled people to have access to education and adequate health and welfare services. After South Africa became a democratic state, policies to aid in making the country follow the social model of disability were introduced to attempt to rectify the disadvantages that disabled people had previously faced. The disability grant and policies that were aimed at providing adequate healthcare to disabled individuals were implemented (Gathiram 2008). Despite these policies being advantageous in theory, there remains a large population of disabled individuals living in poverty and unable to access healthcare and social services. In addition to this lack of access, many individuals with disabilities, particularly in rural communities, continue to be ostracised by their communities and families, due to the continued prevalence of traditional beliefs (Wogqoyi 2012; Mkabile and Swartz 2022).

Ableism

We see, primarily in the religious and medical models of societal thinking, how disabled people were marginalised by the able-bodied majority through the creation of a narrative that they were either cursed,

existed on a different level of being, or were 'invalid' as human beings. This discrimination is known as ableism, which stems from intersectional feminist studies that sought to examine, critique and remove the discrimination of minority groups. As stated above, this discrimination comes from those in positions of power who use discrimination and oppression to keep power and influence in the hands of the oppressors (Waldschmidt, Berressem, and Ingwersen 2024). Over the course of the twentieth century, there have been movements to change the course of this power to bring forth an age of equality.

Modern ableist views hold that disabled people cannot do the same tasks as able-bodied people, thus they are unable to contribute to economic growth (Goodley 2018; Waldschmidt, Berressem, and Ingwersen 2024). This mentality stems from the growth of the medical model, which sees disabled people as invalid and inferior (Retief and Letšosa 2018). The medical model is still a very prevalent manner of thinking within modern, Western societies, which makes it difficult to advocate for rights and access for those who have disabilities, as these ideas are argued against by medical 'fact'. There is nothing wrong with medical knowledge and the medical field. However, the ideas surrounding what a 'normal' body is and does can be harmful to those with disabilities. This idea of normalcy that has been sponsored by Western medicine has influenced the societal response to disabilities and has created an environment wherein a disabled person still faces some form of discrimination because of their minority standing (Bauman, Murray, and Skutnabb-Kangas 2014).

Overt prejudice against disabled people is not the only form of discrimination that this group has to deal with. Unintentional, unconscious or implicit prejudice within able-bodied individuals also creates an issue, and can be more harmful for disabled people who experience it. As opposed to overt prejudice, which is a deliberate and obvious manner of discrimination that is identifiable by the aggressor and the victim in the situation, implicit bias is a subtle form of discrimination that the aggressor can oftentimes be unaware of (Moule 2009; Sue 2010; Marcelin et al. 2019; Tyner 2019). These forms of discrimination often stem from stereotypes surrounding certain groups, which have become ingrained within the various societal groups, making certain behaviours automatic, without the intent of being offensive.

When examining deafness and Deaf culture, the term 'audism' refers to the discrimination against individuals who are hard-of-hearing. The term was coined by Tom Humphries in the mid-1970s as a means of providing a more specific term to include in discussions surrounding disability rights, in an unpublished essay in which he suggested that audism was a form of discrimination akin to racism (Humphries 1975). Like racism privileges whiteness, audism places value on the ability to hear, which seeps into the Deaf community and places wherein hard-of-hearing people make up the majority in a space. Different degrees of hearing within the community can determine individual value, with individuals who can hear more having higher value placed on them (Bauman 2004). There remains an idea that being hard-of-hearing means that a part of oneself has been lost and that it is something to be mourned. This conception of HoH people as somehow not whole has further led to the idea that they cannot be afforded the same choices and opportunities as people who can hear (Lane 2002).

Despite the Sign Language being recognised as an official language in many countries, and being a significant cultural aspect of the Deaf community, hearing and spoken language remain abilities that determine value within society. My own understanding of ableism and audism, both within the world around me and my personal life, was only brought to light by the research surrounding deafness and the Deaf community. It was like I never knew that this type of discrimination existed prior. But once I knew about what ableism and audism were, I started seeing these forms of prejudice in simple interactions that I took for granted as an able-bodied, hearing person. Things such as wheelchair access and braille in places like the numbers in an elevator became more apparent to me, not because of their presence, but because of their absence in many places. I discovered that the world in which I lived so comfortably was not designed to accommodate those with disabilities. My research caused me to become aware of my own biases, which originated from a very limited exposure to disabled individuals or from the way that disabled people were spoken about by able-bodied people. Possibly, the lack of exposure and the ableist manner of speaking have fed into each other for so long that ableism has become ingrained in our societies. It is important to note that no person is without bias, but it is how the bias is acknowledged and

dealt with that is important moving forward, as I try to show in this project.

Music and Deafness

The differently abled body has been met with much ableist discrimination within musical spaces. Disabled musicians are usually seen to have succumbed to their disabilities, with their music not falling into the conventional norm that able-bodied musicians and audiences alike have deemed as acceptable (Straus 2006; 2011; Howe et al. 2016). With the cultural and social reflections with which music is associated, the societal modes of thinking come into play when speaking about disability in music. These assumptions and prejudices obviously do not exclude HoH people, with much value in music being able to hear and emotionally connect with a piece.

The theories and applications of using vibration to provide a musical experience for HoH people are not new. Especially during the nineteenth century, Western schools for 'deaf and dumb' children brought forth the idea of including music in the curriculum, and encouraging participation in musical events (Turner 1848, 1; Solomon 1980). Of course, the idea of including music in such curricula was met with much scepticism by the hearing public, as questions surrounding how these children can hear music began to arise. The initial thoughts around this were that HoH people could not interact with music and that hearing was required to have any interaction with music (Turner 1848; Darrow 1985). This sentiment reflected closely the oralist position of this time, which was sedimented at the Second International Congress for Education of the Deaf in 1880, known more commonly as the Milan Conference, which saw the favour of oral language in education for HoH children and the placing of a ban on the use of Sign Language (Elliot 1882).

Despite the ban on sign language, the introduction of music as a part of the curriculum occurred in the late 1880s when schools for HoH people began introducing physical education that included music during

classes (Solomon 1980). In these classes, it was observed that the HoH students engaged with the musical rhythm (Porter 1912). Further engagement with music was introduced in marching bands, where a similar engagement was observed (Porter 1912; Redfield 1927). Of course, these introductions to music followed the idea of aiding HoH children in functioning in a similar manner to hearing people, using music as a means of ‘training’ children’s ears to hear. Sound waves work by vibrating through a medium such as air or water. In these music classes, children experienced the music through the vibrations through mediums such as the band instruments that were played or the flooring of the area where they had their physical education classes (Linder 1992; Hash 2003).

More recent studies in this field have examined providing musical experiences through advanced haptic technologies. Haptic technology is the use of vibration to portray a moment or alert. This technology can also be used to convey sonic information through a single or series of vibrations. Sound waves are analysed through a computer to match different vibrations and vibration patterns with elements of the sound, such as pitch and duration. Lower pitches may trigger a slower, rumbling vibration, while higher pitches may trigger a faster, buzzing vibration. Sounds that only last for a short period of time may only trigger a short vibration. This technology is often used in electronic devices such as cell phones or game consoles. A cell phone may vibrate when a message or a phone call comes through, while gaming consoles may vibrate when a cue on-screen triggers, such as a character dropping an object (Sharma, Uppal, and Gupta 2011). This application of technology that is specifically used to convey musical information to HoH individuals has arisen in the form of haptic devices such as chairs and vests. These haptic devices are programmed to respond to certain aspects of a musical stimulus, which, in turn, deliver the audio information to the area of the body that the device is touching (Nanayakkara et al. 2009; Karam et al. 2010). These devices have been shown to provide musical experiences for HoH people, many of whom responded that their experience of music with the devices that they used was better than their musical experiences without (Nanayakkara et al. 2009; Karam et al. 2010; Fletcher 2021).

While there is evidence of HoH people having musical experiences through vibration, there remains the

impact of Deaf culture on how these individuals interact with music. As music is rooted in hearing cultures throughout the world, how does the recently recognised Deaf culture, composed mainly of individuals who have some or no hearing, place music in their culture? Within these communities, there seems to be a cultural divide between individuals who wish to interact with music and those who do not. Aside from the hearing partners and children who are a part of the Deaf community, and HoH people who have hearing loss, there are members of the community who engage with music actively, despite music being considered a byproduct of the hearing world that oppresses and excludes HoH people (Levinson 2014; Best 2015). Despite the differing views, the engagement with music by HoH people significantly increased between the 1970s and the 2000s. The participation in music by HoH people has not changed much of the preconceived ideas surrounding HoH people by hearing people. As music is still very much thought of in terms of hearing, by hearing people, there remains the idea that HoH people cannot engage with music, thus making it difficult for HoH musicians to be included in musical events (Best 2015). If music is something to be enjoyed by everyone regardless of their difference in the face of the mainstream, then its participation and interaction should not be limited to people who can hear. While I do not believe that the interaction with music should be compulsory, I do believe that all individuals should have the option to participate and interact with music.

Multimodal Listening

If sound comes from vibration, then there must be more to the perception of music than relying solely on the functionality of the ear. This 'something more', I want to argue, has to do with the difference between hearing and listening. In comparison to hearing, which I've described as the physiological action of the ear, listening can be defined as the broader perception of a sound and the assignation of meaning to what is being perceived (Purdy 1997). Meaning in sound often stems from the environmental aspects that can aid in the survival of an individual, with the listener's perception being used to determine location and

what the sound's source is and its intent (Yost 1991; 1992; Hagman 2010; Rice 2015). Listening is also a crucial part of the verbal communication process, influencing relationships between people who use these types of languages (Strother 1987; Kline 1996).

However, listening is not reliant on just the ear. The ear allows one to be able to receive sound that, in turn, can be listened to, but hearing a sound is not equivalent to listening to it. When we listen, we are paying attention to what the sound is. When listening to a sound, we are able to determine aspects of it that we are not able to know just by passively hearing it. Much of the way that listening is associated and taught is based on an aural-centric manner of thinking (Ceraso 2014). Because of the nature of sound, multimodal listening is a valid means of thinking about listening. Multimodal listening utilises the other four senses to discover aspects of sounds and assign meaning to them.

The idea of multimodal listening presents itself throughout history, with many HoH people using their other senses to perceive sound, with limited to no hearing. Other senses, predominantly touching certain materials such as wood, can be used to perceive vibrational information well (Kutela and Ahonen 2024). A famous example of multimodal listening, specifically including the sense of touch in listening, that, coincidentally, fits into the theme of HoH people and their relationship with music, is that of Beethoven, who bit down on one end of a wooden rod, with the other end touching his pianoforte as he composed. He was able to compose his later works by listening to the music through the vibrational information that was conveyed through the pianoforte, to the wooden rod, then through his teeth and mouth, which allowed him to perceive the sonic information (Straus 2011; Ceraso 2014). Yet this modality is not only restricted to HoH people. People more broadly listen through multiple senses in day-to-day living. In film and television, for example, the way the viewer perceives a scene is based on the sonic and visual information given. When playing a console game, there may be a tactile element to the perception of a scene due to the inclusion of haptic technology (Nanayakkara et al. 2009; Campoy-Cubillo and Querol-Julián 2015).

Within this idea of multimodal listening, we can apply Jean-Luc Nancy's ideas that the active engagement with sound is a part of the listening process (Nancy and Mandell 2007). Thus, one can listen to a sound by actively creating it. This is the premise underpinning the compositional aspect of my research project. By creating sound either through the body or through external means, an individual is able to perceive the meaning and sonic information about the sound that is being produced. Since the body is designed to be able to make sound, vocal or other, this also opens up a pathway to explore vocalisation and bodily resonance, explored by Nina Eidsheim (2015).

Eidsheim (2015) examines how vocalisation can be used as a means of listening, as the act of creating sound with the voice being a vibrational tool. As seen with the mechanism of the middle ear, a person can also receive sonic information through bone conduction. Bone conduction is the vibration of bone to transfer sonic information directly to the cochlea through the sound vibration, causing the fluid in the cochlea to move in accordance with the frequencies (Stenfelt 2011; Ellsperman, Nairn, and Stucken 2021). In the 1930s, bone conduction devices were introduced as another device that would allow HoH people to hear (French 1930).

Hearing people experience bone conduction in their normal hearing, but it is often overlooked until an individual blocks their ears. Now, surgically implanted and wearable bone conduction devices exist for the same purpose (Ellsperman, Nairn, and Stucken 2021). Even without a device, human beings have bones that can be close to a sound source that can aid in listening. Using these ideas to move away from traditional listening ideas that are based solely on hearing is the basis for the creation of music within this project. The creation of music aims to examine the different modalities of listening, focusing mainly on touch and sight, to gain insights into how HoH people perceive music.

Practice-Based Research

To explore modalities of listening while working with HoH people, I adopt a practice-based approach in this project. Practice-based research (PBR) is a research methodology that challenges the traditional notions around academic research through its reliance on the practical nature within a discipline. This mode of enquiry uses practice within the academic space as a valid and recognised means of finding new information surrounding a specific subject (Smith and Dean 2009; Crooke and Olswang 2015). PBR is a form of research that emerged in response to the 'traditional research pipeline,' which favours the reading of literature to explore unknown academic questions (Crooke and Olswang 2015, 1). While many practitioners include research as a part of their practice, practice-based research includes creating research questions and providing a methodology, the practice, that contributes to new knowledge by drawing on existing knowledge (Candy 2006). The practice influences the research and research question, which influences the practice. Within the practitioner's practice, there are questions that arise that can be addressed through both research and more practice (Candy 2006; Biggs and Büchler 2007).

This manner of research has taken many names, all with slightly different approaches, such as practice-as-research and practice-led-research, but all are rooted in the use of practice, the 'doing' within a certain discipline. Practice-as-research focuses more on certain aspects of practice that drive the creation of new knowledge, while practice-led research uses practice to drive the research process. While traditional research is rooted in the reading of academic works to build on and explore possibilities for new knowledge, PBR sees practice as a means of generating new knowledge and providing further understanding of phenomena in the world. While rooted in practice, PBR does not work in isolation. PBR is not the movement away from traditional research. Rather, it is the integration of traditional research with practice (Nelson 2013; Crooke and Olswang 2015).

This mode of enquiry aims to close the research/practice gap that has existed within the arts disciplines for many years (Kershaw et al. 2011). Art cannot exist without practice, yet there are few studies that are rooted in practice within the arts disciplines. While there is still the use of existing academic works that still form a foundation on which the practice is based, it is ultimately the creation of the art in question

that gives rise to the answers that one is looking for. The artworks generate new knowledge and insights that can be used within academic contexts (Smith and Dean 2009). It is often hard to provide empirically reproducible data due to art being an individual-driven endeavour. The creative process is the basis for all knowledge in the arts, and thus it should be the groundwork on which research within the arts (Sullivan 2006). PBR also provides an interesting stance for the researcher as it requires the researcher to engage with the practice and become a researcher-practitioner (Smith and Dean 2009; Nelson 2013). Researcher-practitioners move between the practice and research to drive forward their project and create knowledge based on the collaboration between the two.

New knowledge and insights gained through the practice and traditional research process are examined in a reflective process during the project (Keevers and Treleaven 2011). This reflective process involves looking back at what happened over the course of the practice and research, and using it to find new knowledge and insights. The reflective process does not necessarily provide black and white results; rather, it allows for safe assumptions following the enquiry that the practice seeks to explore to be made, which contributes to the knowledge gained (Nelson 2013).

Chapter outline

The following chapters of this project are the recounts and reflections of two sessions with three HoH individuals who volunteered to be a part of this project.

Chapter 2 discusses the design of the study, and the finding of willing participants to collaborate with. The ethical implications of working on a project that focuses on a minority group led to the discussion of including HoH individuals in the research process of the project. The decision to include these individuals created another aspect of the project design- finding volunteers for the project. The project is advertised to individuals in the Deaf community through the Kwa-Zulu Natal Blind and Deaf Society in hopes of

finding interested participants for the study. This proves to be an ineffective way of finding participants, and the potential reasons for this are considered. Following the actual manner in which the participants of the study were found, a discussion is had surrounding the major factors that would influence their reception of music, being their schooling and their cochlear implants.

Chapter 3 is a recount and discussion of the first session with the participants, divided into three major sections that deal with the major events that occurred during the session. The first section explores the participants' responses to questions around their personal feelings towards music and their answers to these questions. The line of questioning revolved around the kind of music they listened to and how often they would listen to music, if at all. The second section of the chapter recounts the part of the session that was supposed to include music creation. This part of the session shows the lack of engagement on the participants' side in the physical creation of music, and examines their potential reasons for not engaging in the activity. The third section then recounts the rest of the session and discussions around a more personal aspect of the participants' lives that is influenced by their cochlear implants.

Chapter 4 begins with a reflection of the initial session with the participants of the study, and how the next creative session with the participants will need to be changed to accommodate their initial responses. The chapter then discusses co-creation and the parameters that it sets in the project. The creation of three pieces of music without the physical input of the participants is then discussed, with each piece having different main elements that would need to be focused on. The next sections of the chapter are the participants' responses to the three pieces of music, and how we worked to change the pieces to make them easier to listen to.

Chapter 5 first provides a reflection of the previous session and the considerations to take going forward with creating a response piece without the participants. The chapter then goes on to explain what visual music is and how it will be used in the creation of the response piece. The final section of the chapter speaks to the response piece and the elements that make up the piece, with the reasons behind these

elements being used.

The final chapter summarises the conclusions that can be taken from the study, along with further research that can be done using this study as a guideline.

Chapter 2: Designing the Study

This chapter explores how the practical aspect of the study was conceptualised and designed in order to explore the modalities of listening. As the study would be rooted in the creation of musical pieces, the study is built around these sessions wherein I would be creating and exploring music and the ways through which one can listen to the sounds being made. To create music that would be designed for HoH people, there come into play ethical issues surrounding writing about a marginalised group. Beyond this, a pressing ethical issue arises when the participants are found, as they are all under 13. These ethical issues are divided into two sections: the first section explores the ethical considerations when working with HoH individuals as a group, and the second looks at the ethical considerations when working with minors. With these ethical issues in consideration, the design of the study had to change to include HoH people for deeper insights into the topic. These individuals would have aspects of their personal lives that influence how they think about music and how they interact with music, as well as how they interact with hearing people. These major aspects that the participants bring to the project that would influence how they would participate in the project is examined in the chapter.

Ethical Considerations

Working with disabled individuals means working with a broad group of people that has, as seen in Chapter 1, faced much discrimination and exclusion by those who are considered to be able-bodied. This historical context can categorise them as a marginalised and thus vulnerable group. It must be said that this categorisation is not a reflection of any disabled individual's position: individuals who are disabled are not immediately vulnerable. However, when considered as a sample population in research, care must be taken not to reproduce forms of discrimination that more generally surround disabled people. In this

sense, the consideration of disabled people as vulnerable individuals in the context of research is grounded in the historical awareness that they fall into a population sample who are at a greater risk for exploitation or discrimination (Pittaway, Bartolomei, and Hugman 2010; Gordon 2020). While there are legal elements put in place to protect these individuals, there are ethical practices that need to be followed in order to avoid the discrimination or exploitation of these individuals or groups. The understanding of what the project is about, the voluntary participation that can be withdrawn at any time, and the participants' autonomy are some of the major ethical considerations that need to be put in place before the data collection for the project starts.

Working with individuals who are categorised as disabled presents ethical issues that need to be addressed. Because these individuals belong to a group of people who are often victims of discrimination from other societal groups, structures have been put in place to protect them from such discrimination (Cornish et al; 2008). The key issues are the accommodation and enabling of these individuals. How can these individuals be brought into this study as equals (Lubet 2004)? Thus, the notion of co-composition, which I discuss later, emerged as an important factor in approaching HoH individuals for this project. This collaboration would allow the participants of the study to be co-owners and co-creators of the music created during the course of this study, rather than just being passive listeners to someone else's piece. The goal here was to enable these individuals who might have been excluded from music to be a part of the music-making process.

In preparing consent documents for this project, the nature of the project, what it entails and the desired input from the participants were all captured in an easy-to-read and easily understandable manner. I tried to avoid using academic language, attempting to use language that leaned towards more conversational language to explain the concepts of listening and how the project would be conducted. This was to allow people who were not familiar with academic language to be able to read the explanation of the project with ease of understanding. Voluntary participation was a large factor in working with HoH participants. As discussed in the literature review, the group opinions of music by members of the Deaf community

differ, with some individuals seeing music as a product of hearing, and others thinking of music as another means of expression of elements within their lives, such as discrimination or political climate. Thus, it goes to stand that there may be HoH individuals who would be uninterested in or even felt negatively toward the topic and participating in the project. Similarly, those who do wish to participate in this project also need to participate voluntarily. Their voluntary participation relates to their autonomy, their freedom in providing uncoerced information and opinions, which would be valued and encouraged in the workshops.

Recruitment of Participants

In the initial design of this study, participants were to be recruited through the KwaZulu-Natal Blind and Deaf Society. Participants who met the criteria needed for the project would be given more details about the project and asked if they would be interested in participating. Any individuals interested in participating would need to provide their email and/or cell phone number for direct contact with the researcher. I would then email and WhatsApp message the individuals interested in participating in the project and provide more details about the research and how it will be conducted. Participants who were still interested in participating in the research would then be given their consent forms. Further contact with the participants would then be over both email and WhatsApp messenger regarding days for performance and composition, and the interviews.

After pursuing this approach for a number of months, I was unable to recruit any participants for this study. The project reached a critical juncture, and it became clear that I needed to reflect on the reasons for the non-participation in this project by HoH people. In reflecting on this issue, I speculated that some of the reasons for the difficulty in recruiting HoH people for this study might be because Deaf culture and the HoH people who occupy this culture have historically been alienated from music and sound by a

hearing majority (Straus 2011). Because of this historical alienation, I was very conscious that HoH persons might feel like test subjects when being asked to participate in a project that deals with these subjects. I was conscious that, as a hearing researcher, my positionality could compound this issue, and as the sole researcher on this project, my presence could add to a feeling of alienation by making these individuals feel more like test subjects in an experiment, rather than individuals who add value to the project. Of course, it is not my intention to use these individuals in this way. Rather, they would provide insight and their own creative outlooks as partners in the project and the music being created.

Finding the Participants

While waiting for responses from the society, I also looked for participants through people whom I knew personally. If they had any family or friends who were HoH and might be interested in participating in the project. After the information was relayed to members within the Blind and Deaf society, I followed up with the organisation over a two-month period, while I was still looking for participants outside of that society. The search for participants in the society proved unfruitful. This could have been due to the nature of the project, or the long-standing disinterest on the part of HoH people to participate in dialogue with hearing people. Possible disinterest in participating could have stemmed from the long-standing exclusion and discrimination that hearing persons have imposed on HoH people as a group, and as individuals, which has been identified by McIlroy and Storbeck (2010) in other contexts.

While none of the more formal routes for recruiting participants worked, I eventually turned to a more community-oriented approach by reaching out to a family friend who was able to refer three people for the project. Upon their referral, I gave the participants the same explanation for the project I presented to the Deaf societal organisation before their participation was confirmed. I was informed that these participants, despite being younger than my targeted participants, found the concept of the project

interesting and wanted to participate. They were sisters in grades 6 and 7 in a mainstream private senior primary school in the Upper Highway Area in the outer suburbs of Durban.

Once they confirmed their participation, I set out to design the format of the workshops with them and their guardian. We decided that, to avoid encroaching on their school and extra-curricular activities, we would meet on a Saturday every few months to work on the musical aspect of the project. The biggest change that these individuals brought to the project was that, despite being entirely deaf, they wore cochlear implants and had done so since a very early age. While I had considered other technologies, such as hearing aids, in designing this study, I had initially not carefully considered what the impact of working with participants with cochlear implants would be on this project.

Further Ethical Considerations

After the participants had confirmed their participation, there came the ethical issue of working with minors that needed to be addressed. Like disabled individuals, children are considered a vulnerable group that is open to exploitation due to adults having more authority in society (Hayes 2001; Curtin and Murtagh 2007). This power imbalance can cause researchers to see children as unable to contribute meaningful knowledge to the research project. Children should rather be seen as individuals who can provide valuable information about their experiences. A method of mitigating this power dynamic is through informed assent. While children require the consent of their guardians to participate in research projects, they also need to provide their assent (their own consent outside of their guardian's) (Broome, 1992, Institute of Medicine, 2004). As Diekema (2003, 25) states, "assent reminds us that children should be treated with dignity and respect". As stated earlier, the initial description of the project was written without academic language, both the participants and their guardian found the nature of the project easy to understand. The project was further explained in person before written consent was given, detailing

what was required of the participants in conversational language. Further, it was explained that they were able to withdraw their consent at any moment during the project if they felt the need to. They were also told that if I said anything that they considered offensive, they were to alert and correct me.

Cochlear Implants

Cochlear implants were designed to allow individuals with severe hearing impairments to be able to hear again and enable their ability to communicate verbally with hearing persons around them (Tucker 1998; Friedner and Helmreich 2012). The design of the implant is divided into two major structures, each working in conjunction with the other to allow for the 'restoration' (a term I problematise below) of the user's hearing. The outer structure is seen on the head and ear of the user. When initially looking at it, it looks similar to a hearing aid, with the major difference being the circular connector on the user's head behind the ear. This structure houses a powerful magnet and a transmitter. The magnet is part of a pair that is used to keep the implant in place. The adjoining magnet is surgically placed under the skin covering the skull. This magnet is powerful enough to keep the implant in place over skin and hair, but it causes blistering and burning from the intense strength of the magnetic charge if the two are connected for more than about eight hours. This means that the user is only able to 'hear' for a fraction of their day. The outer magnet is joined to the microphone that picks up sounds from around the user, which sits in the outer part of the implant that is hung over the helix in a similar manner to the modern hearing aid. Speech, music, and environmental sounds are all collected by this small microphone. These analogue signals are converted into electrical signals that travel to the implant's speech processor. The speech processor is designed to pick out and separate frequency bandwidths (the different ranges of frequencies) that are filtered into a reduced electrical signal. The resulting signal is transmitted back to the magnet, where it is then transmitted to the internal receiver in the part of the implant where the magnets meet. The transmitter and receiver, being so close and held in place by the magnets, allow for as much audio

information to be transmitted to the inner mechanism. The inner mechanism of the implant is designed to bypass the inner ear itself, allowing for the auditory nerve to be stimulated directly (Zeng 2004; Friedner and Helmreich 2012). This process is done through a group of electrodes that are placed along a wire within the cochlea itself. The number of electrodes can range from twelve to twenty-four, depending on the implant's design. Each electrode is designed to be activated when a different frequency bandwidth is picked up by the microphone (Wagner et al. 2021). The implant is set to allocate different frequency bandwidths to an electrode, which are designed to mimic the hair cells on the basilar membrane within the cochlea.

The range of frequency bandwidths is directly correlated to the number of electrodes triggered by the speech processor. These bandwidths are set depending on the level of residual hearing that the user has (Petrov 2021). Fewer electrodes will result in a smaller number of frequency bandwidths that can be processed, while a larger number will result in the opposite. However, for the number of frequency bandwidths to match that of a healthy ear, there would need to be thousands of electrodes to mimic the thousands of hair cells in the cochlea. Another problem within the electrode array of the implant is that adjacent electrodes are sometimes stimulated despite their designated frequency bandwidth not being picked up by the microphone, resulting in a lack of differentiation between frequencies, which can result in sounds becoming incoherent (Wagner et al. 2021).

After the electrodes are stimulated, the resulting electrical signals are then sent to the auditory nerve, which is then processed and interpreted by the brain as sound. While for hearing people the implant is often seen as a means of restoring a HoH individual's hearing or allowing HoH individuals to enter the hearing community, the implants are not a miracle cure for deafness. What users of cochlear implants hear when using the implants is not the same as what a hearing person will hear. While a hearing person can hear anything within a frequency range of about 20 Hz to 20 kHz, a deaf cochlear implant user can only hear a frequency range of about 180 Hz to 8000 Hz (Wagner et al. 2021). Cochlear implants use frequency filtering to exclude certain frequencies from being processed in the implant. This filtering is

refined during the fitting process, where the electrodes in the implant are set to react to different frequency bandwidths. This filtering occurs to ensure that the frequencies that the electrodes used to stimulate the auditory nerve all fall within the range of human speech to allow for speech recognition and understanding. A person who makes the decision to use a cochlear implant needs to relearn how to hear and interpret sounds and has to relearn how to speak their oral language, which can provide its own array of personal issues for the individual in question (Chapman and Dammeyer 2017; Morgan and Kaneko 2020). Aside from having to learn spoken language, individuals who use cochlear implants do not find spoken communication easy. Speech discrimination in certain settings can be difficult, which can cause the user to face isolation and discrimination from those within the hearing community.

The idea of the 'restoration' of an individual's hearing is an audist view of deafness, with its roots firmly in the medical model of societal thinking on disabilities. As discussed, this medical model prioritises the remedy of any body that deviates from the societal norm of able bodies. Thus, the idea of the restoration of one's hearing, even if they have been HoH since birth or childhood, has not been received well within a community that has been oppressed by a hearing society for many years. While cochlear implants have been available to the public for fifty years, some in Deaf communities have found issues with the implants, especially around cochlear implants in children (Friedner and Helmreich 2012; Bauman, Murray, and Skutnabb-Kangas 2014b; Morgan and Kaneko 2020). As children who are born with hearing that does not align with the hearing norm of society they are seen to be born into the Deaf community and, without any hearing aids such as cochlear implants, would be linked to other deaf persons both within and not in the Deaf community. When given cochlear implants, some in the Deaf community argued that the procedure was a means of forcing the children into a community that was not their own, and taking away their choice of being a member of the Deaf community (Tucker 1998). Many HoH children are born to hearing parents, who possibly made the decision to allow their child or children to live within the hearing norm without any 'disability.' In these arguments, the implants are seen as ableist devices that are meant to further implement deafness as something that should not exist within the hearing society, still

pertaining to the outdated idea that deafness is a disease to be cured. In this sense, 'restoration' mentioned above is equated with the erasure of Deafness. When the implants reached a peak in popularity in the 1990s, the co-inventor of the device publicly stated that the implant would remove the need for the Deaf community, causing further anger in the Deaf community around its adoption (Bauman et al. 2014). However, despite that the implants may have originally been made for the erasure of Deaf culture, they do pose an interesting opportunity for communication between the two communities.

Both d/Deaf and Hearing

In spite of the imperfections of the implant, cochlear implant users have the unique capability to move between hearing and Deaf communities, making them both hearing and non-hearing people. These individuals have posed the question of whether the implants were truly tools of ableism or tools that were able to bridge the two opposing communities (Friedner and Helmreich 2012). Cochlear implant users can only 'hear' for a certain number of hours in a day, during which they can live and socialise within the hearing community, even though their 'hearing' is still not to the same degree as a hearing person's. Thus, throughout the day, as the users remove and put back on the outer part of the implant, they can move fairly freely between hearing and not hearing as they please, and as their needs differ throughout any given day. Through necessity, cochlear implant users have developed the skill of being able to move between the two communities. These two communities differ mainly in language and cultural values.

Their movement between communities that use two different languages allows the user to be able to communicate with members of both communities. Their ability to switch between oral and sign language gives them the ability to communicate with both groups of people, a skill that can allow for more communication between groups, using the cochlear implant users as a kind of messenger for those who cannot speak one or the other language. The adoption of the imposed language has also been linked to

the evolution of culture, which, when applying this to the adoption of oral language by HoH persons, the oral language no longer belongs to just hearing persons. Using oral language in addition to sign language indicates a shift in cultural boundaries, no longer limiting one language to only one or the other culture or community (Yazdiha 2010). Thus, despite their initial audist and ableist original function, cochlear implants can potentially be used as tools to create a deeper understanding and communication between these different cultural groups.

Mainstream Schooling and Deafness

While the use of cochlear implants presented a certain set of issues in the design of the study with regard to my engagement with the participants, the second major issue to negotiate was that these girls' experience of music was coded within a mainstream schooling environment. Going to a mainstream school offers an insight into the dynamics between younger HoH and hearing individuals, and their hearing teachers, who have to interact on a daily basis for about eight hours a day (which, coincidentally, is roughly the duration that a cochlear implant can be worn). Historically, the mainstream schooling treatment of HoH students has been akin to the treatment of indigenous peoples by their colonisers. This treatment stems, again, from the ablest actions and discourse that the hearing community has held for hundreds of years. The treatment of HoH students before the 1930s included proving their deficiency through standardised tests, the content of which was taught only orally (Vernon 2005). When the HoH students scored low on these tests, teachers would use it as a reiteration that these students were somehow of a lower intellect (Penn 1993). Much has certainly changed since these times, but there is little evidence to suggest that HoH are seamlessly incorporated into mainstream schooling.

There is a possibility and probable reality for HoH persons who use cochlear implants to face further discrimination when the expectations around the use of implants are not met. There is a limit to how

much a person can hear with the implants, but one may assume that the user in question can hear everything that a hearing person can. The users of the implants are still categorised as HoH by audiological measures, which can possibly lead to some confusion among hearing pupils about their HoH peers. Questions about why the user of the implant cannot hear the same as their hearing peers can possibly lead to the HoH pupil being isolated and bullied by their hearing peers.

The participants' mainstream schooling placed them in an environment where they interacted with and were asked to participate in music on a regular basis. Coincidentally, I went to the same school for both primary and high school. The school is an Anglican school, which has near-daily chapel services in the morning that include hymn singing as part of the half-hour to an hour service. There was also a weekly hymn practice. Besides these daily interactions, there are also compulsory subject music lessons that each student until grade 9 has to attend. These lessons would involve music creation, history, and theory.

Conclusions

This chapter provides the framework on which the project is built. The ethical considerations discussed allowed me to recognise the authority that I, as the researcher, held in the subsequent sessions with the research participants. This awareness was a guide to my future interactions with these young individuals so as to mitigate the inherent power imbalances between adult researchers and child participants.

This chapter also explores the background of mainstream schooling and how these schools do not commonly accommodate children who are hard of hearing. This discussion is paired with the exploration of cochlear implants to provide a general understanding of the challenges that these individuals may have with their experiences with music and their own Deafness. These elements create a theoretical and ethical foundation for the following sessions with the participants and lay the groundwork for understanding their reception of music in these sessions.

Chapter 3: The First Session

This first session was designed to find a general background around the participants' feelings towards music. These feelings and preferences would help find the starting point for what kind of music to be created in the session to follow. The session was divided into three sections that encapsulate the main interactions that the participants and I went through during the session. The first section describes the beginning of the session, which was defined by a lack of participation by the three girls. The responses to the initial questions around their musical interests are examined, and possible reasons behind these responses are explored. The second section recounts the creative part of the session, where I would try to create music with the participants. Their responses and reactions towards these attempts are similar to the first portion of the session, which leads to the third section. The third section is the direct response to the previous two sections. I directed the session to move away from music to try and create a relationship with the participants. In this third section, the commonalities between me and the participants are used to develop a relationship with these individuals.

The Silence

Thinking through the use of implants and their place in a mainstream school, I created a short list of questions to ask the participants to try and create a backdrop of their musical interests and backgrounds. These questions were also supposed to serve as a means of starting the conversation around music and, hopefully, make them more comfortable. The questions included what artists, genres, and individual songs the participants listened to, if any, and, if they did interact with music, in what contexts these interactions were in. I wanted the participants to feel comfortable and not as though they were being examined during our sessions. I thus tried to word the questions as though they were just going to be a

part of our conversations.

Once the participants arrived with their guardian, I went through the details of the project again, hoping to answer any questions that they may have and get a sense of their interest in the project. I explained the consent forms, which were the Rhodes University Children's consent forms that had been edited slightly to contain any information about myself and the project that was required, along with a guardian's consent form that permitted me to work with the young participants. I spoke about what the consent forms entailed and reiterated that this project was voluntary and that my biggest concern was making sure that they were comfortable and knew that they were not being forced to participate. During my explanations, I found that they were very quiet, wanting their guardian to answer questions that I had directly asked them, rather than answering them themselves. They only answered some questions briefly. I initially ascribed this to shyness, as this was the first time that we met in person. However, as my discussion of this session below shows, I realised that their responses suggested a more carefully attuned sense of silence in their lives.

My first written question asked if these three participants listened to music in their day-to-day lives. This question aimed to gauge what their relationship with music was and how, if at all, they consumed it. They answered that they would only listen to music in the car, on their way to school, and that the music that they listened to was on the radio, and not through Bluetooth or aux cable connections to the entertainment system of the car, which their family car was capable of doing. This suggested initially a passive consumption of music.

They did not listen to music actively and did not seek out listening experiences in their free time. They did not listen to music in the afternoons after school or when they were on their own. Their lack of engagement with music at these times could stem from the fact that they would have to take off the outer part of their implants when they arrived home from school, and physically could not use them to listen to music. They did not show much desire to listen to music during these times either. This lack of

engagement, however, possibly comes from the limited frequency bandwidths that their implants pick up. Their general lack of engagement was not unexpected based on how they were speaking about music during our discussions.

The next question asked what types of music they enjoyed listening to when they listened to music. Their guardian answered this question for them, stating that they enjoyed artists like Taylor Swift and One Direction, the latter of which was a bit surprising considering the group disbanded in 2016. Taylor Swift was a more generic answer, as the singer has been actively releasing music that appeals to girls and young women globally. These artists, however, are very mainstream popular artists that many people listen to. My initial thought was that their preference for these artists and this particular genre of music was influenced by their popularity. Opinions and preferences can develop out of the need to navigate an uncertain situation in an attempt to form a 'correct' opinion on something. In comparison, a majority influence can sway an individual to express an opinion that they do not necessarily agree with in order to gain approval in a certain social environment (Bauer and Ferwerda 2020). I lean towards the first way of forming an opinion. As music is not necessarily a well-navigated topic for them, they may have formed their opinions on these artists and their music based on the preferences of the hearing majority within their schooling environment, as that is where they spend the majority of their active days. As they did not give the names of other musical groups after their guardian answered my question, I assumed that music is likely a more unknown topic for them. Music preference is also a reflection of social identity and group identification, which links to the use of the social environment in which the participants find themselves to aid them in navigating the realm of music and establish their identities as HoH individuals who can engage with music (Gardikiotis and Baltzis 2012; Shepherd and Sigg 2024).

I then asked about their compulsory school music lessons and whether they enjoyed these lessons. These lessons take place up to three times during the school week, lasting for 45 minutes to an hour. They explained how these lessons were uninteresting to them, and that they worked a lot with GarageBand within these lessons. This DAW is very easy to use for beginners and non-musicians, from my personal

experience with the program. They used the limited digital sound library within the program to create music for various assignments, which indicates that the music lessons are not necessarily asking the students to be able to play an instrument to academically succeed in these lessons. However, their disinterest in these lessons led me to assume that these lessons were not something that these girls found easy to engage in. I asked if they used the program on a computer or a tablet, to further get context to the speakers that they were using to project the sounds from the program, and they said that they used tablets. This was probably the factor that affected their perception of the sounds from these devices. The small, built-in speakers that are present in phones and digital tablets are known to be of inferior quality to external speakers that can provide the full frequency range that is encapsulated in a piece of music (Wang et al. 2021). Without the full range of frequencies that a piece of music has, such as the bass frequencies, it can be more difficult to perceive audio information through feel, as these lower frequencies are more easily conducted through other mediums.

I finished my list of questions by asking whether any of the participants played any instruments, either at school as the school tries to encourage the learning of an instrument through compulsory lessons that occur in high school during school hours, where they were planning on attending. All three girls said that they wanted to learn marimba when they reached high school. They reasoned that the performances of the marimba group seemed very fun, which had garnered the attention of many of their peers, but the instrument was also something that they found easier to hear. I asked for clarification on whether they were referring to hearing the instrument or listening to it; whether they were perceiving or paying more attention to the sound, to which they said that they meant to hear.

The popularity of this instrument due to the performances that the group of musicians at the school did, however, seemed to be a big part of their decision to learn the instrument, which indicates a more socially based reasoning behind their choices, probably stemming from the navigation of an unknown area. One of the participants added that she might also wish to learn how to play the piano when she has to choose an instrument to learn if she were unable to join the class to learn how to play the marimba. Her sisters

did not agree with her choice, which indicated that this instrument was something that she had given more thought to. I asked if she had a reason, to which she said that it would be a nice instrument to be able to play. The piano is a very versatile instrument that still seems to be regarded as an instrument that is worthwhile to learn how to play in more traditional settings and mindsets. This was the first time during the session that one of the participants had expressed an interest in music beyond what their peers had shown interest in.

The Discourse

There was much hesitation in interacting with music and exploring other ways to listen when I introduced them through my DAW and the instruments that I had chosen to work with. I first showed them visual music making on the DAW. I asked them about their music classes in school and the types of projects that they were required to do. The two older girls explained the task that they were currently doing, where their teacher had asked them to create a piece of music that would go with inanimate objects, like a tree. I used that image to show them how they can create an image of a tree in a DAW, rather than creating music that goes with the image. In DAWs, there are pages that allow one to draw in notes, their duration, and their volume, without the input of a keyboard. I tried to explain that there were a lot of examples of composers who created visual sheet music that corresponded with an instrument.

I also showed them an example of a music visualizer. Music visualizers are digital programs that read the digital information from a piece of music, such as frequency and volume, and convert that information into a visual format using colours and shapes. A common visualisation of music is in rainbow-coloured bars that move in accordance with the frequency bandwidths within the piece. Other visualizers have abstract shapes that change colour with the frequency bandwidths randomly. The problem that I have found with visualizers is that there is no refinement of the shape or colour. While there is a certain

uniqueness through the bandwidths within the piece of music, there is no way to change the way the visualizer reacts to the piece or change how the visualizer looks. While these visualizers can be useful in providing a visual reference for the piece of music, there remains room for creating unique digital visualisations for any piece of music. The visualizer was not something that interested the participants, indicating a more traditional manner of thinking about music, which can possibly stem from the way that people around them have spoken about other modes of listening.

I then moved to the physical instruments to try and spark an interest in the vibrational listening that comes from being connected to an instrument. I started by trying to play and show them how to play an acoustic guitar, which, in my opinion, is an easier instrument to physically connect to than the piano. The guitar offers more of the body to touch the instrument, with the body of an acoustic guitar against the torso. The body of the guitar, like the human torso, is also the location of resonance for sound, which led me to assume that there would be more interest in this instrument by all three participants, rather than utilising the piano first, which only one participant was interested in. Playing instruments in any manner was something that seemed like it was a big task for the participants, which was my indication to try and establish a better connection with these three girls.

The Connection

What followed my failed attempts at creating music with these three participants was just an informal discussion. I tried to connect with them on a less forceful level, attempting to communicate with them as a friend, rather than a researcher. I asked them what they enjoyed doing, what hobbies they had, and more about their experiences at their school. One of the participants enjoyed dance, another way to interact with music that had not been mentioned previously. This interest made me think about rhythm in music, and how, when carried by instruments that utilised predominantly low frequencies, such as kick

drums or an electric bass guitar, to name a few, these frequencies were carried and felt more prominently when amplified. Movement, as examined by Nina Eidsheim (2015), is another means of listening and exploring the vibrational qualities of music.

I was once a student at their school, so we were able to talk about subjects and their wants and fears as they finished senior primary, and what they were excited or nervous about going forward in their academic careers, among other things, such as sports. The participants explained how they disliked swimming in their Physical Education classes and the compulsory swimming galas that occurred in the first term of school. Because the outer parts of their implants cannot be submerged, they have to be removed to swim, which inhibits their ability to hear instructions or start whistles or guns. Because of this, even though they wanted to participate, the lack of consideration for these three as HoH people has limited their experience with this particular aspect of their schooling.

As we spoke more and more about their experiences with their own deafness and their schooling prior, they began talking about how they often felt like they did not quite belong to either the Deaf community or the hearing community. They felt as though neither community accepted them, despite them having hearing and HoH friends. They felt as though there was no place for them. Their feelings of not having a space in a community where they belonged were similar to my own, being a mixed-race woman. The idea of not having a space in society where you do not belong has often caused me fear and a sense of isolation. There had been many instances where I could not relate to other People of Colour, or white people. Explaining these feelings to these girls seemed to create the connection I had been trying to develop throughout our time. These connections through our hybrid identities sparked an idea that individuals who exist in a liminal space can connect to each other through their experiences.

Conclusions

This first session brought forth the problem of engagement with HoH individuals as a hearing person.

While there was a strong effort on my side to get the participants to engage with me and music, specifically its creation, the participants showed an unwillingness to engage with these topics and activities. The initial questions surrounding their music preferences and the frequency of their engagement with music were either left to their guardian to answer or were answered with very short statements. During the next step of the session, where I asked them to explore different ways of listening to music, primarily vibration, they showed reluctance to participate in the creative process. This lack of engagement led to the session moving away from music and towards an understanding between me and the participants. This understanding was brought forth by dialogue. This dialogue focused on the similarities between me and the participants: the feeling of existing in a liminal space. As cochlear implant users, the participants battled to find a place within the Deaf community and the hearing community. Despite going to a hearing school and having friends within the space, they expressed the difficulties that they faced being in a hearing school. This discussion allowed me to find common ground with these participants through the challenges of not feeling as though I belong within racial spaces.

Chapter Four: The Second Session

Reflection of the Previous Session

Due to the practice-based nature of this project, the act of reflection is necessary in the discovery and exploration of knowledge in the field (Smith and Dean 2009; Buchanan 2013). Reflective practice is looking back at an experience and using that experience to develop new theories or actions to take in the next experience (Jasper 2003; Amulya 2004). There is also a part of the process that allows the practitioner to develop in their craft using reflection to improve on future practice (Fook 2015). In this project, the reflection involves looking over the sessions and creating theories and reasons for the participants' behaviours, and possible ways to improve the sessions and creation.

My major takeaway from the first session was how the participants were reluctant to engage. Their initial responses to my questions about music were short and left to their guardian. These responses should have immediately indicated to me that they were not completely comfortable in the situation that they were in. My initial actions should have been to try and find ways of making them comfortable, which would have involved moving the initial part of the session away from music. This would have developed a relationship with the participants earlier, which might have caused them to be more willing to be part of the creative practice if I had moved it to the later part of the session.

The silence in their responses also created the impression that the participants did not have much of an opinion on music in mainstream media. They did not actively try and listen to music in their day-to-day activities. They would listen to music in the car when the radio was on, or at school, where it was compulsory, which made me come to the conclusion that they were passive listeners. This lack of active engagement could stem from a desire to fit in with their hearing peers at school, a place where they said later in the session that they do not feel as though they completely belong. As they already felt separate

from their peers because of the way that they heard, they possibly gravitated towards the musical preferences of their peers to create some commonality. Another reason behind this preference could be the unfamiliarity with music. The unfamiliar subject could have led to the participants using their peers' musical preferences as their own, as their hearing peers were familiar and comfortable with music and had created preferences from years of experience.

I also created the idea that the participants could not experience music through means like their cell phones or tablets, due to the inability to use over-ear headphones, or in-ear earphones, because of their cochlear implants. While most, if not all, of their hearing peers would be able to experience music with these tools, the participants would not. The sounds transmitted by in-ear earphones would not have been picked up by the receiver of the implant, due to it being located on the outside of the ear. While over-ear headphones would have possibly allowed the participants to listen to the music on their phones or tablets, the size of the over-ear cushions could press on the receiver, which would cause the experience to be uncomfortable. This idea presents another layer to how they cannot experience music in the same manner as their hearing peers.

This relates to the second part of the session and how the participants did not engage with attempts to create music collaboratively. As stated, their lack of familiarity with me could have been a factor in this part of the session. Their lack of familiarity with music as a subject that they can participate in could also be a contributing factor. They had stated that certain instruments were easier to hear than others, which is something that I could have asked them to elaborate more on during the session. The reasoning behind their finding that different instruments are easier to hear is possibly similar to how different instruments sound different to hearing people, which they might experience through vibration. Asking them to elaborate more on these instruments would have provided me with more guidance on the instruments that we would be able to use to create the pieces.

I assume that there was also the fear of creating something that I did not deem to be acceptable during

this time. In a similar fashion to how one feels when presenting their work to a teacher, there was probably a fear of being embarrassed if I did not like what they came up with. This is based on their age and their unfamiliarity with both me and music. Their unfamiliarity with music and possible fears and apprehensions that they had displayed during the session had led me to seek to change the way in which I would go about the physical creation of the pieces to be more passive on their part.

Our discussion at the end of the session allowed me to form a relationship that I think should have been established much sooner. I, as a researcher, should have realised that no collaboration can happen if there is no prior relationship between composers. Nevertheless, this conversation aided in creating the connection that would be used in the previous session. Our first place of connection would be about the school. I was able to draw on my past experiences with the school and the music lessons, which had changed slightly since I was their age. The problem with the school itself seemed to be due to the lack of accommodation that the participants had. I had explained to them that music is more than just how it sounds and suggested that they can use visual and vibrational elements to participate in their music classes. I probably could have shared examples of experimental music that tested the boundaries of conventional thinking around music to use as examples for them to allow them to have a better understanding.

When they spoke about their schooling, they spoke about how they felt as though they did not truly belong in their hearing school, but also did not truly belong in a school for Deaf children. I had experienced this idea of not belonging in different racial spaces, which had made me able to connect to their feelings. While feeling as though you are existing in a liminal space is difficult to navigate, I feel as though it can open up channels for discussion between hearing and HoH people. Individuals with cochlear implants are in a unique position to move between the hearing and HoH groups. This could possibly allow a connection between these two groups, which could lead to a bigger effort being made to create accessible spaces for HoH people and possibly disabled people in general. This idea is something that I wish I could have expanded more on with the participants, but their age would have made it difficult.

Co-Creation

Howard Becker (1982) proposed that the creation of art is a collaborative endeavour. He wrote in his novel *Art Worlds* that the creation and performance of art are reliant on all the roles that go into the work, even the roles that are not considered creative or artistic. I would like to focus here on the collaboration with the audience for whom the creative work is made. While the audience is not physically present for the creation of the work, the artist still has their conceptualised feedback and performance participation to guide them in their creative process (Becker 1982; Litt 2012; Ennis 2022). After the creation comes the reveal of the artwork, where the artist now interacts with the physical audience. The audience may show physical responses to the work, such as clapping or cheering, which then influences further development of the artwork or future artworks going forward. This type of co-creation is the main form which is used in this project, due to there being a disconnect between the participants and music, which made them reluctant to engage in an active role in the composition process.

Within collaboration in art, there is also a navigation of the cultural influences that influence the final piece (Clayton, Herbert, and Middleton 2003; Morrison and Demorest 2009). Art is rooted in culture, meaning that artists are influenced by the culture in which they create their art. Different cultures place different values on certain elements of art, which influences the final work (Garfias 2004). In music, one culture may value the use of a diatonic scale, as opposed to another culture valuing a pentatonic scale. While there are traditional cultural values, cultures also adapt and influence each other, as shown in the similarities in different cultural artworks. Within this project, the cultural values placed on music are rather broad, with the hearing culture placing a lot of value on music, and Deaf culture giving it very little value. However, this cultural communication through this act of co-creation can allow different ideas surrounding music and sound in general to be explored.

Creation of the First Piece

The conceptualisation of the first piece of music was aimed at being similar to that of the genre of music that the participants were most familiar with and engaged with the most. This genre was pop music, and I thus aimed to draw inspiration from the artists that they had said they were most familiar with during our first workshop. Pop music as a genre can be seen to have its own rhythmic and melodic tendencies, which work for the purpose of the piece of music being easily remembered and recognisable to a listener. This particular genre is created using both digitally created and recorded sounds that are manipulated and layered to create a piece of music (O'Grady 2017). I made the first piece of music entirely on a DAW (a Digital Audio Workstation), using a MIDI (Musical Instrument Digital Interface) keyboard, which allowed me to connect my electric piano to the DAW, and prerecorded sounds. Working with a DAW allows for the greater manipulation of sounds, even allowing for the manipulation of the sound wave itself, while using MIDI allowed me to be able to play any instrument in the DAW's sound library through a piano keyboard, which allowed for greater freedom in what instruments I would be able to use.

I opted to create a piece that followed the structure of the genre of music that the participants enjoyed listening to, that being pop music. This particular genre of music is known for its repetitive beats and melodies, with the aim of being easily recognisable and memorable. The genre utilises simple chord progressions using a minimum of three chords with a maximum of five in very rare cases, to create a structure for each part of the song. As pop music is usually a vocal/instrumental duo, the music is often just an accompaniment for the vocals, with the vocal melody line also being memorable and recognisable. The music is usually made up of two verses, with a chorus after each one. Some songs have a pre-chorus or bridge section, which adds memorability to the chorus section. In some cases, the bridge comes before the final chorus, indicating that the song is reaching its peak moment in terms of vocal melody and musical accompaniment. Other songs use the simple verse-chorus format (Johnson 2007). This makes for a rather musically uninteresting piece of music, but if accompanied by a vocal melody, it becomes much

more interesting with the added layer. As I am not a singer, I stuck to creating an instrumental chorus that introduces each instrument individually.

I divided the piece into three layers: the drums, the bass, and the melody. While many pop pieces include a vocal line and vocal harmonies, I wanted to keep the piece focused on the instrumental aspects of the song so as not to take away from examining the participants' engagement and listening to music rather than words. To begin, I started with the drum section to create a foundation to build the rest of the piece on. A drum section carries the rhythm of a pop music piece. This was the aspect of the piece that would correlate to the rhythmic listening that HoH people have been found to follow (Florian et al. 2017). The time signature of the song would be 4/4, four crotchet beats in one bar, following the usual time signature of the genre. The beat consisted of a kick drum, a snare drum, and a hi-hat cymbal, all of which were created using the sounds available on the DAW that were being used. The sound of the drum was chosen to have a fast attack to attempt to be distinctive among the other instrumentation through its vibrational aspects, as this was the instrument that I assumed would be easier to listen to through vibration. No effects were added to the sound, as this was assumed to impact how this particular instrument would be interpreted through vibration. The snare drum sound was chosen with the same mindset as the kick drum. As snare drums are tuned higher than the other drums in an acoustic set, the choice of sound for this instrument was not chosen based on how well it could travel through other media. Rather, it was chosen based on how it would be heard with a cochlear implant, as there are still frequency discernment limitations that the implants face, which are factors in how instruments are heard. The last sound that made up the drum section was the hi-hat, which would create rhythmic subdivisions within the beat, as opposed to the kick and snare drum sounds, which were aimed at carrying the pulse and overall beat of the piece. In acoustic settings, the hi-hat produces higher frequencies, which limit how well the sonic vibrations travel through other media. It would thus perform a similar function to the snare drum to provide aural information to the cochlear implants.

The bass line consisted of the root notes of the chords used, with the sequence changing slightly in the B

major chord of the second bar, where the bass note changed to the third of the chord. This was to create a slight variation of the bass line to allow the participants to have a slight deviation from the rhythmic pattern. The next aspect of the piece was creating the chord progression that worked with the bass line, which would be made up of instruments that would be played on a lower frequency spectrum. This part of the piece would work with the kick drum sound to carry lower sonic information through other vibrational mediums, as well as add to the rhythm of the piece. The key of the piece was E major, with the chord progression following chords I (E major), II (F# major), and chord iii (g# minor) in a two-bar sequence, with chord V (B major) replacing chord II in the second bar. Chords I and II in the first bar are played in the first inversion, to create a rising effect of the chords, which accompany the rising bass line. The chords were played on beats 1, 2 and 3, with the chord played on beat 3 being sustained over two beats, which aimed at allowing the participants to be able to listen to both sustained and non-sustained notes to allow them to consider if a sustained note is easier or more difficult to listen to than a non-sustained note.

Creation of the Second Piece

The second piece that I created was based on the same structural principle as the first piece, following the verse-chorus format. The piece also acted as a possible backdrop for the inclusion of lyrics, for which I wrote a vocal melody line, but omitted it from the final piece due to a portion of the piece having a counter melody that was played with the vocal melody. The difference between this piece and the first one was that the composition was only on an acoustic piano. I believe that other instruments can be added to the piece, but I had aimed to play the piece live to add a point of comparison of live music versus recorded music. Live music provides more interaction with the instrument as it is making the sound, allowing an opportunity for the passive listeners to move closer or further away from the instrument, or even touch the instrument, which can allow listeners to be in more direct contact with the sound as it is

being produced.

The piece consisted of a melody that sequences over a verse/chorus structure, aligning with the typical structure of popular music, but it was inspired more by musical theatre pieces. The melody was the first part of the piece that was created, using alternating second and third intervals in the B major scale, which sequenced with a fourth in the third beat of the bar. This melody made up part of the verse section of the piece, with a different melody in the chorus section. The chorus melody was a three-note line that repeated for three bars, with the sequence reversing from the third quaver in the fourth bar. The intention behind the piece was to have a contrasting vocal melody line that mimicked the verse melody but was sung over the chorus melody. During my research, the idea of vocal music came up as a means of exploring listening (Nancy and Mandell 2007; Eidsheim 2015). This vocal melody did not come to fruition due to the fact that I am not a singer, nor was I confident in my ability to play one melody line while singing another.

Creation of the Third Piece

The third piece I composed followed a more contemporary structure. With classical music as my background, I am all too familiar with the notions that late nineteenth- and early twentieth-century composers proposed about music and what music should be, deconstructing the traditional narrative of what music is. I attempted to try and create a piece of music that was not bound by the traditional constructs of music. I don't think I succeeded in that regard. Instead, I created a more classical-inspired contemporary piece, with the primary reasoning behind the piece being experimental, to provide another option for the participants to listen to. This piece was also composed solely on the piano.

The range of the piece was completely in the lower register of the piano to experiment with the reception of a piano piece that does not use any notes above C4. There was no other real structure to the piece

besides a basic melody line that fell between C3 and C4. The left hand played a continuous sequence of rising fifths of a C minor scale. I attempted to keep the piece simple, as the frequency range of the piece was very small. In my thinking, the smaller frequency range would mean that it might be more difficult to discern between aural pitches. However, due to the lower frequencies being easier to feel, the different wavelengths might be easier to feel. Thus, the left-hand section provided a greater range within the lower frequencies, while the right-hand played the basic melody line that consisted of a smaller frequency range within the higher portion of the frequency range. To my hearing ears, it was rather difficult to discern between notes in these lower registers, but, while playing, I felt a slight sense of corporeal comfort, which was my indication that I, as a musician, was becoming more aware of the vibrational aspects of the music as I was playing it.

Reception of the First Piece

When playing the first piece, I was opposite the participants, which allowed me to observe their body language as the song was playing. During my reflection on this, I found that being able to see how one's body reacts to a piece of music can give their overall impression of the music, and, in this case, told me if they were able to follow along to the beat. The first few bars with only the chords and bass line playing were listened to with great concentration. Judging by the looks on their faces, however, when the drum line started, there was a point of relaxation where their facial expressions changed. Two of them were nodding their heads along to the music, while the other was moving her foot in time to the rhythm of the kick drum. I took this as a positive reception of the rhythmic elements of the piece.

After the piece was finished playing, I asked the participants their opinions on the piece. All three said that they enjoyed it, with one saying that it was 'cool.' I asked them if there was anything that they would change about the piece, reiterating to them that the music was about their preferences, and not my own.

When we were speaking about the things that they would change, they started speaking more about the physical sound wave and how it felt, rather than how it was heard. One of the participants spoke about how she would like the kick drum, the lowest-pitched drum in a drum kit, to have a similar impact as how a ping-pong ball would bounce on a speaker as the speaker played a drum line, which indicates a strong vibrational force behind the sound. Another said that it would be nice to have a stronger kick drum to reiterate the rhythm within the drum line, but including piano adds a balance to the music as the feeling of the piano's sound waves was 'fuzzy' and 'ringing.' I went to the sound library on my DAW and found other kick drum sounds and started playing each sample to them. We spent time experimenting with the different sounds both in isolation and with the rest of the piece. We ended up choosing a lower-pitched kick drum that had a higher rate of impact than the previous sound. Once we had chosen this sound and edited the drum line, we re-listened to the section of the piece that included the drum line to see if they were completely sure with their decision.

When they said that they were satisfied with the drum line, I asked if they wanted to change or add anything else to the piece, and introduced them to the other instrumentation options that I had included for the chordal aspect of the piece. Two of the participants preferred the one alternate instrumentation, with the third preferring another. I think that this difference was just a preference, but there could be a preference in the type of wave being played and its vibrational properties. Examining the individual sound waves in each sample, I gathered that the amplitude of the initial sound's waveform differed very slightly from the second, but the second sound's waveform decayed more slowly than the first. The second sound's waveform also showed that the frequency of the second kick drum sound was slightly lower.

I played the original kick drum by itself in the piece, then played each alternate instrument within the piece to allow them to listen to the different instrumentations within the context of the piece, and not just on their own. I then played both alternate instrumentations together with the rest of the piece, which is what they decided was the best option for the piece.

This response to this piece provided an indication of how different instrumentation can cause different vibrotactile information to be present within the medium that the sound is travelling through (Russo et al. 2012). I believe that providing a large range of frequencies allowed the participants to also hear the music while wearing their cochlear implants. While I am unsure of their implant's level of frequency discrimination, I can safely assume that they were able to discern between the mid and high frequencies and that they were more aware of the vibrotactile elements that were portrayed through the drum lines, specifically the kick drum.

Reception of the Second Piece

The second piece was played on the acoustic, upright piano in the room where the participants and I worked on our music. I could only gauge their reactions from the video recording of our session, which showed how two of the participants were concentrating rather intently while I was playing.

They stated that this piece was easier to hear. When I asked for clarification on whether they meant 'hear' or 'listen,' the term 'hear' was used again. This probably comes from the frequency ranges used, as the melody line stayed within a mid to upper-mid range of frequencies, which are the easiest frequencies for cochlear implant users to discern (Wagner et al. 2019). One of the participants had previously stated that the piano had a 'fuzzy, ringing' type of vibration, to which another responded that you could not really feel the piano vibrations. This made me suspect that this piece was received mainly aurally by the participants, due to the nature of the vibrotactile element of the sound waves that a piano produces by itself, which made it difficult for them to receive it tactilely.

Surprisingly, this was also the piece that was preferred by the participants, out of the two that had been played. I have concluded that this was due to the structure and various elements of the piece that were appealing to the ear, rather than the body. An alternative to piano as the instrument of choice would have

possibly changed the reception or included other instruments to carry the melody line. The intended vocal melody of the piece could have provided another element of vibration for the participants to explore, which could have enhanced their experience of the piece.

Reception of the Third Piece

From an aural perspective, the third piece was not as appealing as the first two pieces, at least in my opinion as the composer. However, I was not thinking of the aural appeal when I was composing the piece. After what the participants had said about not really being able to feel the vibrations of the sound waves that the piano produces, I realised that, despite my effort to create a piece that is vibrationally appealing, this piece would not be received well. This thought was confirmed by the participants' reactions to the piece, with their facial reactions showing confusion. Playing this type of piece on a different instrument could have possibly made the piece more vibrationally and even aurally appealing. With different instrumentation, the vibrational aspect of the piece could have also been felt more easily, as the participants had previously stated that the piano was harder to listen to due to how the vibrations themselves felt.

Conclusions from the Second Session

I found that the language that the participants used in the second session differed greatly from the first workshop. During the first workshop, I felt as though they were exploring music in similar manners to how I would expect hearing persons to, with much less focus on the other aspects of sound. However, in this workshop, I found that their way of speaking about music and overall engagement had changed.

There was far more willingness to interact with the music and voice their thoughts and opinions on how

sound waves feel to them. Going forward, consideration of what instruments are used would need to be a more important step in the composition process. An important step in further compositions would be to select instruments based on how they feel. Further showing the hybridity of those who use cochlear implants is the way the participants use both their ability to hear and their ability to feel. I believe that the use of the ear in conjunction with the body to listen to music is a possible way forward for hearing people to further engage with music, which would aid in garnering more understanding between HoH and hearing individuals.

Chapter Five: The Response

Reflection of the Previous Session

Allowing the participants to be more passive collaborators proved to be a better way of including them in the creative process. Their apprehension about being involved in the creation of music due to their lack of familiarity with it, as shown in the first session, had shifted in the second session. They had become far more open about the creative process and being involved in it. I would like to think that building a relationship with them at the end of the first session had also aided in causing them to be more receptive to the creative process and actually want to involve themselves in it. They showed an interest in the vibrational aspect of the pieces, which allowed me to continue using vibration within the next piece.

Following the previous session, I felt that I needed to employ a more contemporary means of thinking about music going forward. I felt like my thinking was limited to just vibration, and I had not thought about other ways that I could explore other ways to create a musical experience for HoH people. Thinking about only vibration as an alternative means of experiencing music felt like a very closed-minded and hearing-centric way of exploring what I intended to explore, which led me to try to think of other senses to compose the final piece for this project. I still wanted my music to be accessible and to theoretically be listened to in a casual setting. This led me to want to try and explore music in a visual way; to expand on the different senses that can be used to interpret sound waves. The inclusion of the visual stimulus with flashing LED lights has also been seen to enhance the musical experience of HoH people using a haptic chair (Florian et al. 2017). If the vibrational stimulus is not directly touching the listener, a more detailed visual stimulus may still allow the listener to experience the music, in addition to the vibration.

Visual Music

Visual representation of music is a concept that has been explored well before digital technology was used to create digital visual representations of sounds that are known today. A common visualisation of music is musical notation, which has been used historically in cultures that engage with music (Strayer 2013). Music notation depicts sounds either graphically or phonetically, and has been used to allow other artists to recreate a piece of music (Strayer 2013). As Western experimental composers started to push the boundaries of what music is, new ideas surrounding musical notation began to arise. Non-traditional means of notating music, such as graphic notation, began to be explored. These diagrams that made up the score were interpreted by the performer (Литвинова 2019). Shapes, colours, letters, and pictorial representations were all used to convey a musical idea that would be interpreted differently by different performers (Smith and Smith 1981).

Musical ideas and representations have also been represented visually using drawings and paintings. In fine art, artists used music to influence their use of elements such as colour, the use of space, and line thickness, to name a few (Uszler 1995; McDonnell 2007). An example of the use of music to influence art is the painter Roy de Maistre. Maistre was a musician who turned to painting to express various musical ideas (McDonnell 2007). He used a colour code to depict different pitch values derived from the white notes on a piano. His later works shifted from using single notes to a chord-based colour code (McDonnell 2007).

Digital media are also used to create visualisations of music. DAWs can show a visual representation of a sound or a group of sounds in a variety of different ways. One way is a spectrogram, which shows how the frequency and amplitude of a sound change over time. Amplitude or loudness is shown through colour gradation. The frequencies shown also include the various overtones within a sound (Yu 1967; Dennis, Tran, and Li 2010). Waveforms are another way that the DAW shows the information, with the amplitude of the sound being shown over time. These are only two examples of how music is visualised in DAWs, but

there are other ways of visualisation. Other examples of visualisations in a digital medium are sonic visualisers used in various desktop media players. When playing a song, the media player would show moving shapes and patterns that would change colour as the song progressed.

Creating the Final Piece

Looking back on the previous sessions with the participants, I became more aware of how different instruments felt on a vibrotactile level. From our last session, this difference can be felt when a recorded instrument is played, and when the instrument is played live. Different instruments have different timbres, so it stands to reason that different instruments would produce sound waves that feel different. Frequency (pitch) and loudness of the sound influence whether the sound is felt through vibration, while, I believe, the sound envelope and the material that the sound wave is resonating through determine how the sound wave feels. Timbre possibly plays a large role in determining the feeling of a sound wave.

I wanted the piece to be divided by a general frequency range, with the low-end frequencies being played and visualised differently from the mid and high frequencies. The aim was to use the lower frequencies as a touch-based element of the piece, while the higher frequencies would be visualised. The medium through which the piece would potentially be played, however, was an obstacle. A common medium for music to be played on is a portable speaker, or earphones, which prioritise mid and high frequencies and, thus, do not cause tactile vibration with the music. To counter this, I thought of ways of visualising both the low and high-end frequencies in a way that still made them distinctive. The instrumentation of the piece was inspired by overtone and throat singing, and lower string instruments. I selected a group of instruments that I would sample, with the group being refined based on each instrument they felt, keeping in mind what the participants had said during our previous session. I created the piece using MIDI presets as I had access to a large variety of different instrument sounds that would allow me to explore a

greater variety of instruments.

The lower frequency group consisted of the cello, the double bass, and a male choir humming. The cello and the double bass were very similar in how they felt, so I decided to only work with the double bass and the choir. In terms of feeling, the double bass had a slight rasp to it, a similar feeling to running your hand on wood that has just been cut with a table saw. The male choir felt smoother, but still had a light, raspy feel.

I looked at the lowest note that a standard double bass could play, E1, and used that as the starting point for the piece. This starting point determined that the piece would be in E major. There was no other reason behind this key choice. The double bass played a continuous E1 note, creating a drone effect, which would provide a foundation for the rest of the piece, as this would provide a point of comparison for the other lower frequencies. The male choir was played an octave higher in the male vocal bass range, but was played in a basic rhythmic manner. This rhythm was to provide a slight movement to the piece.

The higher melody of the piece was initially created using a tenor saxophone to include an instrument that includes breathiness, which was initially a means of including a more human-like aspect to the piece. The breathiness of the saxophone sound that I chose to use did not translate well into a basic visualiser, so I decided to replace it. As I reflected on the previous sessions with the three participants, I remembered how they had said that they found marimbas easy to listen to. I examined the sound envelope of the marimba on my DAW, which showed how the marimba has a short sustain and release time, like other percussion instruments. This could be a part of the reason why this instrument was easier for the participants to listen to. I used the marimba sound in place of the saxophone.

The visual elements of the piece were created using a combination of online and offline methods. As the piece was assumed to be played on a digital medium such as a phone or a tablet, I wanted to make the visual representations of the piece a video. The piece was exported on two separate tracks, with the lower frequencies being on one, and the higher frequencies on the other. The lower track was imported

into an online visualiser that allowed me to create a video visualisation using presets on the website. I chose a preset that displayed the frequencies using a circular visualiser that followed the volume of the different elements of the track, rather than representing the different frequencies. This visualiser worked for the droning effect made by the double bass, as the choir was slightly louder than the double bass. This lower section was placed on the left-hand side of the video to represent that these were the lower frequencies, as keyboard instruments represent them.

The higher frequencies were visualised using coloured balls that rose and fell with the frequencies. This visualiser was also created using an online visualiser; however, it was created on a different website from the other visualiser. I moved the visualisation to the right-hand side of the video to indicate that these frequencies are the higher ones. After creating the higher visualiser, I put the two videos together in a video editor on my computer with their audio overlapping. There was no additional audio editing of the piece.

One of the problems that I have run into with the visualisers is that they are not specific to a single pitch. The visualisers that I have seen and worked with only use frequency ranges, making it difficult to differentiate between notes in the melody, as it had a smaller frequency range. It would be interesting to be able to create or use a digital visualiser that can read the individual notes that are played. For example, the visualiser could read the piano melodies and represent them through a range of red coloured balls that rise and fall as a note is played, with the saturation of the colour representing pitch. A visualiser like that could possibly allow HoH people to experience music on a digital platform that doesn't support haptics.

I would have liked to have another session with the participants, but their schedules did not allow us to meet again. Thus, this final piece was created with them solely as the imaginary audience. This piece is different from the ones that I had played during our second session, which has led me to believe that they might have found it interesting, as they would have explored more of a different way for them to listen to

music that they had not previously experienced before our session.

Chapter Six: Conclusions

The historical background of discrimination against HoH individuals can be seen to have created a general apprehension towards music due to how the hearing community created it to be a completely aural experience (Holmes 2017). This is seen in both the lack of response to the project in its initial recruitment of participants for this project and how the three participants exhibited signs of isolation from music during the first session. Even though these participants used cochlear implants to hear for a part of the day, they still showed signs of a lack of connection to music and its creation. We can see from the transition from the first to the second session that discussion around creating music that is accessible contributes to bringing HoH individuals into a musical space, even if they have felt it has been inaccessible to them.

While we understand that hearing aids and cochlear implants can be used for HoH individuals to hear, this hearing is only for a limited range of frequencies, being the frequencies that speech falls into. This means that there are frequencies in music that are not discerned by these devices (Holmes 2017). The frequencies falling out of this range will need to be shown through other means, such as through touch and visualisations, to name two. These modalities of listening are a means of creating accessible music that is accessible for individuals who are HoH. Key considerations when creating this kind of music are looking at using elements of rhythm and timbre. How the vibrations of an instrument feel to a HoH individual can determine how easy the sound is to listen to (perceived).

While this project was aimed at creating music for HoH individuals, the exploration of music as a multimodal experience can benefit hearing musicians. The consideration of vibration and the visualisation of music can aid in how one both creates and plays music. By collaborating with HoH individuals to create accessible music, we can also garner conversation between these two groups to potentially create more understanding of Deafness and being HoH.

Limitations of the Study

Working with a small group of HoH people provided a more personal space for interaction between both the participants with each other and the researcher, which I found was a more ideal setting when working with younger individuals. A smaller group of participants allowed for more personal questions surrounding their own experiences with their Deafness. These questions allowed for a unique insight into how HoH people who use cochlear implants exist in both the Deaf space and the hearing space, inviting new considerations for hearing people who want to interact with those in the Deaf community. While working with this smaller group was beneficial in seeing those with cochlear implants as people who could invite conversation between the two groups, it limited the general knowledge that can be gathered.

Working with larger groups allows for more statistically general conclusions to be drawn and allows us to see trends among a larger population.

Another limitation encountered in this project was working with a young demographic. The nature of this project was more suited for older individuals, as they would have had more experience in music and the relationship that HoH people have with music. This life experience could have provided different views on music, leading to different ways of composing pieces to be tailored to them and their preferences.

Working with a younger demographic who used cochlear implants had allowed me to create music with individuals who were in a unique place within the Deaf community, which added another element for exploration within the project.

Further Research

Further research on exploring the modalities of listening can be conducted through more collaboration

between hearing and HoH individuals. This would aid in starting more conversations between the two groups, and would allow hearing people, specifically hearing musicians, to learn from HoH people. Learning from this group would allow further exploration of the nuances of creating accessible music. This could include further exploring the timbre of instruments and how the vibrations of various instruments feel, rather than hear.

Possible further research could also dive deeper into the creation of more sophisticated visualisers. While visualisers can change with different frequency bandwidths, they are not very nuanced. Creating a visualiser that changes with the specific elements of a piece of music would be a further way of creating accessible music (Choi et al. 2024).

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