The Relationship Between Hearing Status and Self-Efficacy in Adults

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Abstract

Hearing loss is a disability that impedes people's ability to access auditory information and communicate through listening and spoken language. Self-efficacy describes one's confidence in their actions and behaviors. The study examined the relationship between hearing status of adults with and without hearing loss and self-efficacy. The participants answered a series of assessment questions: A hearing demographic information questionnaire, a self-efficacy scale assessment, and a measure of subjective sound quality in various situations. Findings revealed that poorer performance in various hearing situations was correlated with lower score of self-efficacy. Alternatively, the better participants can function and effortlessly hear in various hearing settings, the higher their self-efficacy. Self-efficacy is neither correlated with severity of hearing nor age. The study also found that the later the participant's onset of hearing loss, the more likely they will have difficulty performing in hearing situations. Since the relationship between the degree of hearing loss and self-efficacy is insignificant, but the hearing performance is relevant to self-efficacy, better performance is reflected via appropriate hearing technology through rehabilitation. The study supports the notion that by undergoing hearing rehabilitation when necessary, regardless of the severity of the hearing loss, one will ideally be able to perform better in hearing situations, which will ultimately be a strong predictor of a higher sense of self-efficacy.

Introduction

Hearing loss is a type of disability that impedes people's ability to access auditory information and communicate through listening and spoken language. Recent technological advancements such as digital hearing aids and cochlear implants give people with hearing loss the access to sound in a near-typical range. They can hear at home at the dinner table, at the discussion table in the workplace, and even at noisy social gatherings. Despite the range of hearing technology available to people with all types of hearing loss and the gains in communication skill these devices provide, people with hearing loss may still struggle in social communication situations. Any degree of hearing loss can dramatically affect people's ability to feel comfortable in social settings, talk on the phone, speak up at business meetings, and navigate many other similar situations.

Self-efficacy describes one's confidence in their actions and behaviors (Bandura,1994). It is hypothesized that self-efficacy may be diminished for an individual with hearing loss due to difficulties in social communication. This study examined the relationship between hearing level and self-efficacy in adults with and without hearing loss.

Background

Hearing Loss

Hearing loss (HL) is a disability that affects over five percent of the world's population, across all ages (World Health Organization, 2021). Whether the HL is classified as mild or profound, it does not only impact the ability to hear. Any degree of hearing impairment affects multiple aspects of an individual's life. It impedes language development, speech perception, speech production, and communication (Blamey et al., 2001). Deaf children are more likely to express behavioral and socioemotional difficulties than typically-hearing children (Hall, Li, &

Dye, 2018). Hearing loss creates challenges in the classroom, workplace, and other social settings, and requires accommodations to improve communication (Shaw et al., 2013). Further research is required to explore the relationship between degree of hearing loss and self-efficacy.

Levels of hearing loss. There are two main categories assigned to distinguish the development of deafness: Pre-lingual HL and post-lingual HL. Pre-lingual HL is a type of HL that is diagnosed before a patient who has learned language, typically between birth to four years of age. Post-lingual HL is developed after an individual learns spoken language, generally at age five and older. Hearing loss can also be described as unilateral or bilateral, the former identifying only one affected ear, while bilateral refers to HL in both ears. The degree and type of HL play a decisive role as to the kind of technology a patient receives. The degree of hearing loss is determined by the patient's hearing thresholds across frequencies (pitches). A threshold is the quietest level at which an individual can demonstrate detection of a particular sound the majority of the time. Typical hearing is when a person's hearing threshold is about 20 dB or better. Mild HL is when the threshold falls somewhere between 20 dB and 40 dB. Although the term "mild" appears to mean "not so much," the term can be deceptive, and even a mild HL can easily impair day-to-day communication. Moderate HL is defined as a threshold between 40 dB and 70 dB, whereas severe hearing loss means thresholds fall between 70 dB and 90 dB. An individual with severe HL would not hear any speech sounds at a conversational volume and only some loud noises. A threshold higher than 90 dB is referred to as profound HL, sometimes identifying the individual as deaf (Centers for Disease Control and Prevention, 2020).

Types of hearing loss. Generally, there are four broad types of hearing loss. Conductive hearing loss is caused by an obstruction or fault in the outer or middle ear. For example, when an individual has microtia, the pinna is underdeveloped. Consequently, the abnormally shaped pinna

blocks the sound from entering the ear properly since the outer ear is unable to collect the external sound. Another common example of (temporary) conductive HL is otitis externa, more commonly known as "swimmer's ear." When water enters the ear and causes an infection, the symptoms of the infection, such as swelling, may lead to a temporary hearing loss. Sensorineural hearing loss occurs when there is an issue with the inner ear or damage to the vestibulocochlear nerve, a nerve that connects the inner ear to the brain. The third type, mixed hearing loss, is a combination of conductive and sensorineural HL. On rare occasions, people may be diagnosed with hearing loss due to auditory neuropathy spectrum disorder, which is when the sound is being collected and conducted normally, but there is damage to how the brain processes the sound (Centers for Disease Control and Prevention, 2020).

Causes of hearing loss. Hearing loss can be either congenital or acquired. Congenital causes are those directly causing impairment at birth; it is also possible for the cause of the HL to be prenatal, meaning an event or complication during pregnancy led to HL. These include but are not limited to: inappropriate use of drugs or alcohol during pregnancy, various infections during pregnancy, birth asphyxia (lack of oxygen during birth), and low birth weight. The second main cause of HL is referred to as acquired HL, which are events after birth that cause an individual to acquire HL that are not related to genetics or prenatal events. Acquired HL may be caused by: chronic ear infections, buildup of cerumen ("earwax") blocking the ear canal, otitis media (excess fluid in the middle ear), injuries sustained to the ear and/or the brain, use of certain medications such as those used to treat diseases (e.g. infection or cancer), excessive exposure to loud noise, or hearing loss associated with advancing age (World Health Organization, 2021).

Audiometric testing. Audiologists are healthcare professionals responsible for diagnosing and treating disorders of hearing and balance. In order to determine whether a patient

has HL, audiologists conduct a number of diagnostic tests. Pure-tone audiometric testing yields an audiogram, a visual representation that displays a patient's hearing sensitivity across a range of frequencies. Audiograms guide audiologists to determine the degree and type of HL. Other tests, such as otoscopy (viewing the eardrum directly) and tympanometry (examining movement of the eardrum) help audiologists check all parts of the outer, middle, and inner ear. The outer ear consists of the pinna, the external part of the ear visible to the naked eye, and the external auditory canal. The tympanic membrane (eardrum) acts as a divide between the outer and middle ear. Three tiny bones and the eustachian tubes compose the middle ear. The inner ear consists of the cochlear, vestibule, and semicircular canals. An individual with a hearing threshold of about 20 decibels (dB) or better in both ears across audible frequencies is said to have hearing within normal limits. If one or both ears reach a hearing threshold above 20 dB, the individual is identified with mild, moderate, severe, or profound HL, depending on the threshold. "Hard of hearing" generally refers to those with mild to severe HL. Those who are classified as "deaf" generally have profound HL (World Health Organization, 2021; Stanford Children's Health, n.d.).

Hearing technology. While there are numerous hearing technology options, finding the appropriate technology for each patient depends on their type and degree of HL. Assistive devices allow those with HL to hear and communicate more easily, essentially bringing the patient's thresholds as close to the normal hearing range as possible. The purpose of a hearing aid, one of the most commonly prescribed hearing devices, is to provide amplification and improve sound quality as it enters the ear. Hearing aids come in various models and sizes, and do not require any invasive procedures. People who are deaf and hard of hearing (DHH) and have mild-moderate sensorineural HL are classic candidates for hearing aids. Cochlear implants are

designed for individuals with severe-profound sensorineural HL. This implanted device electrically stimulates the auditory hair cells inside the cochlea, a snail-shaped organ inside the inner ear. It consists of an external processor with a magnet that connects to the internal component that receives sound and sends electrical signals to the inner ear. A third alternative hearing technology are bone-anchored hearing aids, which also have external and internal parts, similar to a cochlear implant. The purpose of bone-anchored hearing aids is to bypass the middle ear by converting sounds into vibrations (Center for Devices and Radiological Health, 2018).

Deaf vs. deaf. Capital-D Deaf and lowercase-d deaf each refer to different groups of people. Members of the Deaf community view their deafness as part of their identity, and not as a disability. DHH individuals diagnosed with HL later in life may also choose to identify as part of the Deaf community. People in the Deaf community prefer to communicate in American Sign Language, and often view hearing technology in a negative light. Lowercase-d deaf is the medical terminology for people diagnosed with any degree or type of HL. People who are deaf tend to prefer using hearing technology to functionally hear as well as oral communication to communicate. They generally do not identify themselves as part of the Deaf community, however there are situations where deaf people are mostly surrounded by typically hearing people and they may perceive themselves as lacking any Deaf identity. Minimal exposure to other DHH people may cause deaf individuals to be unaware of the existence of the Deaf community. Especially when deaf people are born into hearing families, they may try to blend into the typically hearing community rather than attending Deaf programs and promoting the Deaf culture (ConnectHear, 2020).

Self-Efficacy

Self-efficacy is defined as an “individual's belief in his or her capacity to execute

behaviors necessary to produce specific performance attainments" (Bandura, 1977, 1986, 1997). An individual's confidence levels in regard to motivation, behavior, and social interactions are reflected by self-efficacy. These internal cognitive self-evaluations influence daily decisions, personal goals, performance levels, and energy input to a goal (Carey & Forsyth, 2009). Bandura (1994) explains that a person with a strong sense of self-efficacy will perceive difficult tasks as ones they can tackle rather than a threat to shy away from. A high level of self-efficacy translates to one's ability to act and feel like they have control over a situation, rather than feeling vulnerable and avoiding the situation. Conversely, those with poor self-efficacy will avoid arduous situations, perceiving them as threatening, uncontrollable, and unattainable. Such individuals stress easily and have low self-esteem (Bandura, 1994).

Having a strong sense of self-efficacy is an important considerable factor toward one's ability to be successful. People with low self-efficacy and self-esteem fail to hold an advantageous skill that will equip them in numerous areas in life. The higher self-efficacy a person has, the better they will be able to perform in their career. This is especially true in modern times where technology is constantly advancing, and a greater need for strong self-efficacy is required to adapt to changes occurring in the workplace. The transition of young adults to parenthood and its associated responsibilities continue to expand. Marital relationships, raising children, being financially stable, medical complications, maintaining social life, staying healthy -- the list of responsibilities for adults are endless, and having a strong sense of self-efficacy is fundamental to balance these tasks appropriately (Bandura, 1994). Even for the so-called "average" adult, maintaining self-efficacy throughout various situations and tasks is difficult. Imagine someone diagnosed with HL. The additional burdens that DHH individuals face just make self-efficacy that much more crucial.

Literature Review

Self-Efficacy and Hearing Loss

Previous research has shown that people with HL are more prone to negative psychological impacts, including anxiety, anger, frustration, loneliness, and sadness (Kooser, 2013; Trychin, 1991). Ceuvas, Chen, Vang, and Saladin (2019) aimed to assess levels of self-efficacy in those with HL. Communication challenges faced by people who are DHH may pose challenges in the workplace or social situations.

Cevuas et al. collected data from 114 hard-of-hearing individuals, both men and women, adults aging from 19 to 86. The majority of the participants had acquired hearing loss, but some of the participants were born with congenital hearing loss. The participants completed five different assessments. The Generalized Self-Efficacy Scale (GSES; Schwarzer & Jerusalem, 1995) consists of ten questions about one's ability to perform a particular task or complete a specific goal. Each question is answered on a one to four scale, ranging from "not at all true" to "exactly true," respectively. Higher scores indicate higher self-efficacy. The second scale was the Multidimensional Scale of Perceived Social Support (Zimet, Dahlem, Zimet, & Farley, 1988), which measured a participant's perception of his/her social support. The Religious Commitment Inventory-10 (Worthington et al., 2003) assessed religious commitment and has a similar measuring scale to the GSES -- the higher the score, the greater the religious commitment. The fourth assessment used was the Levenson Multidimensional Locus of Control Scales (Levenson, 1973). This measured the internal locus of control for a participant. Locus of control is defined as a person's perspective and views of event outcomes in their lives, specifically as a result of their own personal actions. The researchers also collected demographic information about the participants' current disability-related lifestyles such as basic background

information like age, gender, education, presence of additional disabilities, along with hearing loss demographics such as age of onset and severity (Ceuvas et al., 2019).

The findings of the study indicated that self-efficacy and educational attainment had the strongest relationship among the participants (Cevuas et al., 2019). This conclusion is supported by previous studies: those with higher education were less intimidated and more independent than those with less education (Weisel & Kamara, 2005). This may be because those with further education have more developed skills and resources that promote and boost self-efficacy. Following educational attainment, internal locus of control was the next strongest predictor of self-efficacy. A strong internal locus of control promotes self-confidence to solve problems rather than relying on external factors or "fate." Employment levels were equally predictive of self-efficacy as internal locus of control. Participants who were employed and maintained productivity had higher self-efficacy levels. Individuals with disabilities, including HL, will face daily challenges, and the results of this study indicated that having social support present can boost self-efficacy. Encouragement and support provide comfort and affirmation, raising self-efficacy levels. Cevuas et al. (2019) concluded that higher education, strong internal locus of control, employment, and social support are all indicative factors for self-efficacy.

While the previous study (Cuevas et al., 2019) researched external factors in one's life that can strengthen self-efficacy levels, such as employment or religious participation, Dammeyer, Marschark, and Zettler (2018) studied personality traits found in deaf adults wearing cochlear implants. The purpose of this study was to investigate which characteristics are prominent in people with HL and their perception of self-efficacy using basic personality trait models. The participants of the study were 329 college students, a mix of DHH students and typical hearing students. Three surveys were administered to the participants. The first was a

personality trait survey, using the HEXACO-60 (Ashton & Lee, 2009), assessing six basic personality traits via sixty questions. The GSE scale (Schwarzer & Jerusalem, 1995) was the second survey instrument, which was answered with a one to four scale, ranging from not true at all to exactly true. Lastly, the communication questionnaire was answered by only the participants with HL, which the researchers compiled based on the Language and Communication Background Questionnaire (Li, Sepanski, & Zhao, 2006). These questions specifically targeted hearing-related questions, such as technology devices used, mode of communication, and if they had at least one deaf parent (Dammeyer et al., 2018).

Results for the study (Dammeyer et al., 2018) indicated that "conscientiousness," one of the six personality traits studied, was higher among hearing participants than in DHH cochlear implant users and DHH non-cochlear implant users. Those who are high in conscientiousness tend to be organized, disciplined, stubborn, and responsible, while those who have low conscientiousness are generally more laid-back, or in extreme cases more untidy and unreliable. One explanation as to why DHH individuals in this study reported lower conscientiousness may be attributable to educational experiences and parental styles. Another personality trait, "openness to experience," had higher scores among hearing participants than cochlear implant users, but not the non-cochlear implant users. A strong trait of openness to experience reflects creativity, and preference to new experiences, while low scores indicate a dogmatic trait. One explanation as to the cochlear implant users' low score in this particular trait may reflect not fitting in with the Deaf community or hearing community -- the concept of not belonging to either community may cause these participants to be less open to experiences. Self-efficacy was found to be higher among hearing participants than both DHH groups. The authors speculate that this may be attributed to the DHH individuals feeling discriminated against. Furthermore,

Dammeyer, Marschark, and Zettler (2018) found that self-efficacy scores were correlated with the traits of conscientiousness and openness to experiences.

While the study conducted by Ceuvas et al. (2019) identified external features in a person's life that can boost self-efficacy, and Dammeyer, Marschark, and Zettler (2018) discovered certain personality traits that correlate with self-efficacy and DHH CI users and DHH non-CI users, further research is needed to compare hearing status and self-efficacy in adults. In a study of parents of children with hearing loss, Joulaie, Abdollahi, Darouie, Ahmadi, and Desjardi (2019) found that "ANOVA analysis showed that there is no significant difference between hearing aid (HA) and cochlear implant (CI) groups in term of self-efficacy and parent-involvement…" However, the study measured the self-efficacy levels of the parents, not the DHH children themselves.

Purpose

The purpose of this study is to explore possible correlations between self-efficacy and subjective sound quality in adults with and without HL. Investigation will be conducted to determine whether there is a relationship between prelingual and post-lingual DHH individuals and their self-efficacy levels.

Research Questions

1. Will people diagnosed with HL have a lower sense of self-efficacy than people with typical hearing?

It is hypothesized that people with HL have a lower sense of self-efficacy than typically hearing individuals because previous research indicates that people with disabilities are more prone to negative psychological impacts (Kooser, 2013; Trychin, 1991). Since one of the four

influences of self-efficacy is psychological state of mind (Bandura, 1994), it is logical to presume that people diagnosed with HL are more likely to have a lower sense of self-efficacy.

2. Is self-efficacy affected by the age of HL onset? Will adults diagnosed with pre-lingual HL have a greater or lesser sense of self-efficacy than people with post-lingual HL?

It is hypothesized that adults diagnosed with pre-lingual HL will have a stronger sense of self-efficacy than people whose HL onset is later in life. According to Dammeyer, Marschark, and Zettler (2018), the second strongest indicator of self-efficacy was internal locus of control. Believing that one controls his actions and capable of accomplishing things with his own skill can predict self-efficacy. Adults with pre-lingual HL are more accustomed to attend hearing appointments and wear hearing technology than adults who acquire HL at an older age. By being accustomed to the lifestyle that comes with a HL diagnosis for a longer period of time, they may feel more confident in their hearing ability. Furthermore, older adults that are diagnosed with HL (post-lingual HL) are more likely to go untreated, attend rehabilitation, and are less educated about the benefits of hearing technology (Gopinath et al., 2011). Pre-lingual deaf people have dealt with HL most of their lives and have adjusted to the journey of being DHH.

Methods

Assessment Measures

Participants provided basic demographic information. Questions included gender, age category, race, age of developed HL, degree of HL on each ear, technology devices on each ear, communication preferences, and if any immediate family members have hearing loss. If a question was not applicable to a participant, there was an option to select N/A (not applicable).

Participants completed the *General Self-Efficacy Scale* (GSE; Schwarzer & Jerusalem, 1995), a ten question self-efficacy scale. Each question presented a situational statement in

which the participant had to select how much he/she agreed with the statement. Respondents selected answers on a four point scale, from one, or "not true at all" to four, or "exactly true." For example, one question asked: When I am confronted with a problem, I can usually find several solutions.

The final section of the questionnaire measured subjective sound quality in various situations; Hearing Implant Sound Quality Index (HISQUI19; MED-EL Medical Electronics, 2019) was developed by MED-EL, a hearing device manufacturer. Participants selected answer options on a scale from "Always" (99%) to "Never" (1%) about their hearing experiences in a variety of common scenarios. If a particular statement was not applicable, the option N/A could be selected by the participant. One example of a situation that was presented was the following: "You are seated in the backseat of a car and the driver in the front is talking to you. Can you effortlessly understand the driver?"

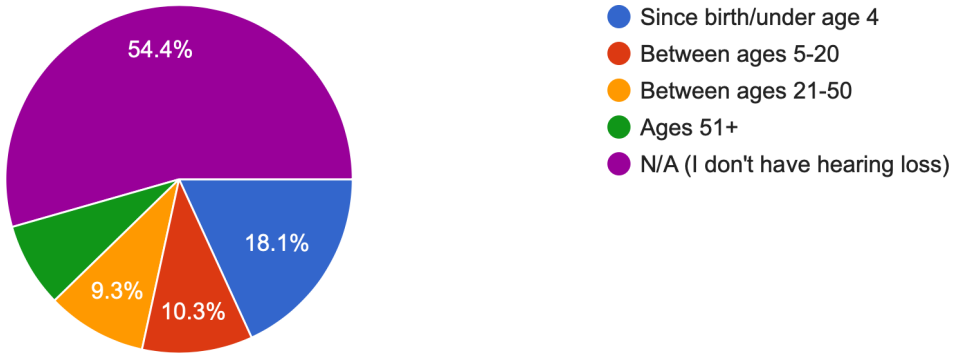
Participants

After obtaining approval from Western IRB, participants were recruited via direct messaging or advertisement via social media posts made by the research team. Participants ages 18 or older with or without hearing loss were eligible to participate in the study, and there were no cases in which participants were eliminated from the study. The 204 respondents were briefly informed as to the purpose of the study and informed that they would not receive any form of payment or benefit outside contributing to research. The only criteria to be included in the study was to affirm to be above the age of 18 and consent to be part of the study. About 164 (80.4%) of the participants who responded were female, while the remaining participants were male; one participant preferred not to answer the question. The age demographic distribution ranged from 18 years of age to 66+. However, participants each selected an age range category, such as 18-

25, 26-35, 36-45, etc. Ages 18-25 was the largest group of participants, presumably because of the correlation with the researcher's personal age. Majority of the participants identified themselves as white/Caucasian, yet there were a select number of participants who identified themselves as black/African American, Hispanic/Latino, Asian/Pacific Islander, Native American, multiracial, or preferred not to say. When the participants were asked when they developed HL, slightly more than half (54.4 %) responded "N/A'' implying no HL, while the remaining responses indicated they have been diagnosed with pre-lingual HL, post-lingual HL, or more specifically, presbycusis (Figure 1). The responses also show that more participants had some degree of HL on the right ear than the left -- only four (2.1%) -- yet this slight margin of difference implies that almost all of the participants had bilateral HL. Among the participants

Figure 1

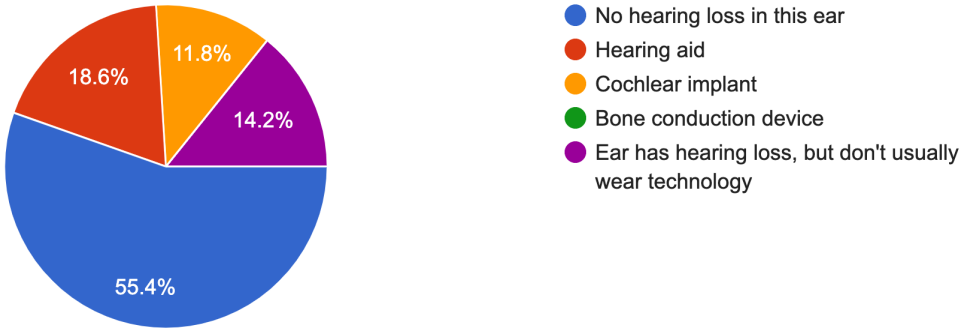
Age at Which Participants Developed Hearing Loss



who do have some degree of HL, the biggest category was profound HL for the right and left ear, 20.6% and 19.6%, respectively. In terms of hearing technology in each ear, hearing aid, cochlear implant, or has HL but wear no technology were all listed options (Figure 2). Per participants' responses, 96.1% of them communicate in English at home, and the percentage went up to 96.6% when asked about communicating outside of the home. Almost ¾ of the participants had an immediate family member who is deaf or hard-of-hearing.

Figure 2

Participants' Hearing Technology: Right Ear

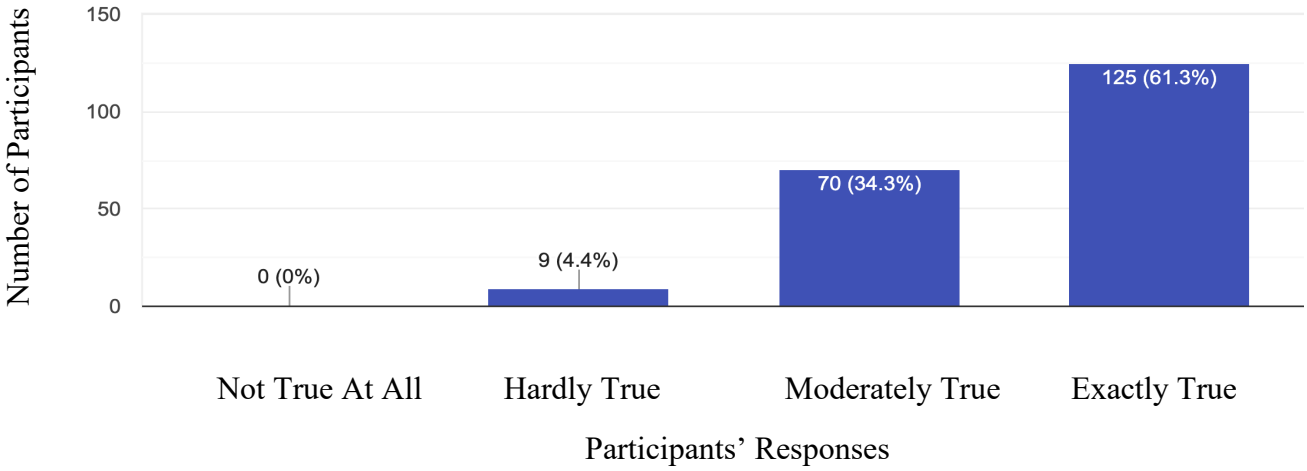


Results

Following the hearing demographics was the GSE questionnaire. For all ten questions, the majority of the participants chose either "3" or "4," which means "moderately true" or "exactly true," respectively. Such answers indicate that despite the fact that the participant had hearing impairment or normal hearing, most of the group indicated they are confident and likely have self-efficacy in various situations. Figure 3 displays one of the ten GSE questions; it

Figure 3

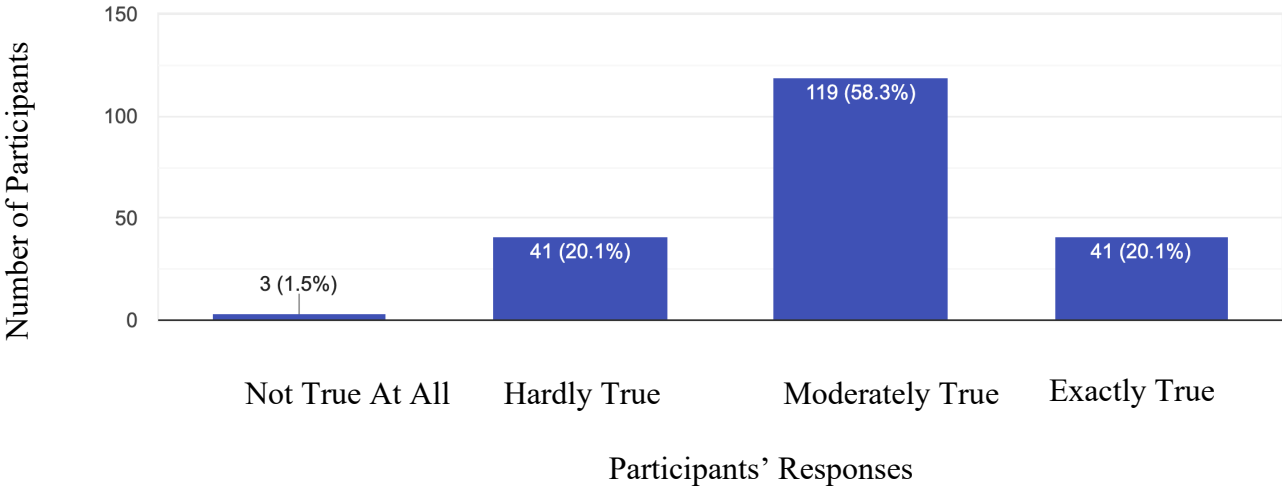
GSE Questionnaire Responses: "I Can Solve Most Problems If I Invest the Necessary Effort"



can be noted that roughly 195 (96%) of the participants believed the above statement was some range of true. Based on these responses, it is fair to state that the vast majority of the participants felt as though they can solve most problems when investing the necessary effort. Any degree of hearing loss did not seem to negatively skew the results. Another noteworthy GSE question asked: "If someone opposes me, I can find the means and way to get what I want." (Figure 4). This question received the fewest "exactly true" answers. Interestingly, this was the only question that included another person interfering with the proposed statement. This group of participants was more hesitant and less confident in achieving their goals when someone is opposing them. The remaining questions do not propose an outside person potentially preventing the person from doing what he desires.

Figure 4

GSE Questionnaire Responses: "If Someone Opposes Me, I Find the Means and Ways to Get What I Want"



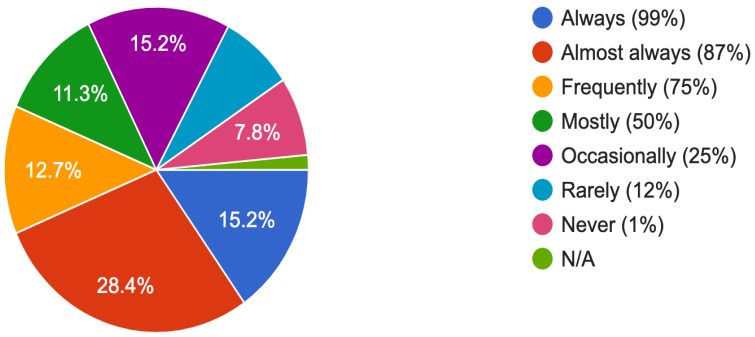
The results for the final questionnaire, HISQUI19, varied more than the GSE results. As seen for one of the questions, the participants' responses varied greatly (Figure 5). In terms of all the questions as a whole, "Always" and "Almost always" were generally the most commonly

selected answers. This suggests that more often than not, the participants, without considering their degree of HL, feel comfortable in various hearing situations.

There are several notable associations, as well as insignificant correlations that may merit further investigation. GSE scores were not correlated with age, meaning levels of self-efficacy were not dependent on how old the participants were $r_s = -.042$, $p > .05$. GSE scores were also

Figure 5

HISQUI19 Responses: "Can You Effortlessly Understand the Announcement in a Bus Terminal, a Train Station, or an Airport?"



not significantly correlated with the degree of HL, $r_s = .018$, $p > .05$. This shows that self-efficacy levels are affected by hearing loss. The participants with typical hearing, on the other hand, are not "missing" any hearing, so their self-efficacy was not affected by their hearing. In this study, their confidence is not correlated with their hearing.

A high HISQUI19 score is interpreted as a poorer hearing function. A participant who responded with mostly "always" and "almost always" answers, indicating high hearing ability in a variety of common situations would receive a very low HISQUI19 score, representing their better ability and hearing function in multiple hearing scenarios. Although HL score is not associated with GSE scores, HISQUI19 scores are correlated with GSE scores, $r_s = -.163$, $p <$

.05. The higher the HISQUI19 total -- poorer hearing function -- the lower self-efficacy scores. Meaning, worse performance in hearing situations was correlated with lower their self-efficacy. Alternatively, the better participants are able to function and effortlessly hear in various hearing settings, the higher their self-efficacy. Self-efficacy levels are not affected or changed depending on the participant's degree of HL, whether it may be moderate or severe, but rather depends on how well participants in the study can hear in daily noise settings does correlate with their self-efficacy levels.

Results indicate that higher HISQUI19 scores are associated with a higher HL score, meaning the total degree of HL combined for both ears, $r_s = .760$, $p < .01$. These correlations are sensible because the greater degree of HL the participants of the study have, the more likely they will have poorer hearing. Higher HISQUI19 scores are correlated with developing HL loss later in life, $r_s = .699$, $p < .01$. Participants who lost their hearing during the earlier years of their life may be more experienced and adjusted to functioning in hearing situations. Late-deafened people, participants who are likely diagnosed with presbycusis, reported more difficulty hearing. There was no correlation between age of onset of HL and self-efficacy scores nor was there correlation between hearing technology and HISQUI19. On a separate note, there was no significance in terms of the participant's spouse's hearing status, $p > .05$, which informs that people marry whomever they desire, and not solely based on their hearing levels.

When examining the respondents that are DHH and those with typical hearing, there are significant differences in the HISQUI19 total scores, $p < .01$. Such results are logical, as those with HL should have a higher score while those without HL should have a lower score. Therefore, there should be significant differences. Yet in regard to the GSE scores between the DHH respondents and normal hearing participants, it is indicated that there are no significant

differences between these groups, $p > .05$. This indicates that self-efficacy scores do not fluctuate significantly between the two groups and is not statistically reliant on the ability to hear or lack of.

Upon inspecting the type of hearing technology the participants wore and more specifically, correlations between the technology in each ear and HISQUI19 total, people who had a higher hearing technology score -- the participants who wear cochlear implants -- were significantly more likely to have a higher HISQUI19 score, $r_s = .644$, $p < .01$ (right ear) and $r_s = .638$, $p < .01$ (left ear). The slight difference of the correlations between the right and left ear is due to some participants reporting unilateral HL. The logical explanation for this correlation is that participants with a higher degree of hearing loss, hence more advanced hearing technology, will struggle more in listening environments.

Discussion

This study aimed to research the relationship between HL and self-efficacy, as well as the ability to perform in daily hearing situations. There are several notable findings from the study that merit further discussion. One of the first discoveries was that GSE scores were not correlated with the degree of HL. Establishing that the participant's self-efficacy scores are not influenced by their degree of HL means that the severity of one's HL does not significantly affect their ability to have confidence in their beliefs and actions. Severity of HL is not a predictor for self-efficacy. Continuing this notion of what does and does not affect self-efficacy, this study also found that self-efficacy is not correlated with age. The researcher had predicted that there would be a correlation -- participants with pre-lingual HL would have a higher sense of self-efficacy because they were able to adjust and accustomed to living with their HL. It was hypothesized that older adults diagnosed with presbycusis, age-related HL, would have poorer scores of self-

efficacy because their diminishing quality of listening and speaking causes them to know what is missing out in their life -- they may struggle communicating, a challenge they did not have to deal with earlier in their life. The fact that self-efficacy is neither correlated with degree of HL *nor* age implies that all patients diagnosed with any degree of HL at any age have the potential to maintain their sense of confidence in themselves.

Another significant finding of this study was that self-efficacy of those who are DHH was affected by their hearing performance, yet participants with typical hearing had no correlation with their sense of self-efficacy. Furthermore, the poorer participants performed in hearing situations, the lower levels of self-efficacy they reported, and participants who performed better in various hearing situations had higher self-efficacy levels. This study also found that the later the participants developed HL, the more likely they have difficulty performing in hearing situations. Participants diagnosed with HL earlier in life had an easier time listening. The final significant finding of this study was that participants with higher hearing technology scores are correlated with having a higher HISQUI19 scores.

In a study examining how self-efficacy and self-esteem are affected by age-related social concerns and health, Schieman and Campbell (2001) found that “physical impairment has a strong negative effect on health control and esteem and a weak negative effect on generalized self-efficacy” (p.22). Considering the findings of the present investigation in light of Schieman and Campbell’s (2001) findings, it is possible that in their study the physical disability was so severe that it deeply impacted the participant’s self-esteem and confidence in themselves. In this study, perhaps self-efficacy did not affect participants with any degree of HL because confidence is not necessarily based on actual impairment of hearing. Rather, self-efficacy depends on one’s ability to listen, hear, and perform in hearing situations (Schieman & Campbell, 2001).

Since self-efficacy is affected by technology, and not the participant's degree of HL, the results of the study indicate that what truly matters and affects self-efficacy is how well the participants feel they can perform in daily hearing situations. The degree of HL is irrelevant to hearing performance. Even those with profound HL can have high levels of self-efficacy as long as they feel their technology is working and allows them to feel confident in their hearing ability. The reflection of appropriate hearing technology is through rehabilitation. Rehabilitation is the process of adjusting to the hearing technology; it directly impacts performance, and hence will allow DHH individuals to feel confident in their hearing abilities. They will not necessarily feel confident merely because they wear a hearing aid or cochlear implant, rather once they undergo the process of rehabilitation with their hearing technology they will feel and perform more successfully. The study supports the notion that strong hearing intervention and rehabilitation, when necessary, can improve one's hearing performance, and ultimately, one's self-efficacy.

A common misconception is that people hear with their ears, but really the brain is the primary organ responsible for auditory input and hearing. The brain analyzes acoustic information and processes it into something meaningful. People with HL should wear technology to allow the brain to be exposed to language in order to try and recover the typical developmental process. Just like riding a bicycle or learning how to cook takes time, so too does the brain need time to learn, and in the case of those diagnosed with HL, specifically learn how to process auditory information. The brain needs practice to process auditory stimuli and convert it to meaningful speech. The best way for the brain to practice and develop its ability to receive auditory information is through rehabilitation. Hearing technology alone will not help the brain -- hearing devices are just a way into the ear. The brain does 90% of the work when it comes to developing language skills (Cole & Flexer, 2011).

There is an overwhelming amount of evidence that rehabilitation for DHH individuals is the key to success. Unfortunately, the researcher was unable to find a study comparing patients who received rehabilitation and those who did not. In a study conducted by Brodie et al. (2018) to find the impact of rehabilitation on quality of life for people with HL, the researchers concluded that hearing rehabilitation had a major positive effect on participants of all types of HL. Rehabilitation with hearing technology allows patients to be more content knowing how to use their devices, treating their HL, as well as beneficial strategies and techniques. The study supports the researcher's present study because it emphasizes the influential benefits of rehabilitation for HL. Rehabilitation is one of the key positive correlations to increase self-efficacy (Brodie et al., 2018). DHH individuals who fail to obtain any rehabilitative services will not be able to maximize their benefit of their hearing technology. It can be implied from this current study that one of the key factors for people with HL to maintain their sense of self-efficacy is obtaining rehabilitation. Proper intervention and rehabilitation for DHH individuals will improve their ability to listen and speak, and ultimately maintain or even boost their self-efficacy. By knowing that they see clinicians, work on their speech, language skills, participating in any form of rehabilitation necessary for that individual will help them feel confident in their ability to hear in daily situations. Such logical reasoning potentially explains as to why there is a correlation between self-efficacy and performance on the HISQUI19 scores.

The results of this study also indicate that developing HL later in life correlated with poorer performance in hearing situations. A theoretical explanation as to why later deafened participants struggle more than those who are diagnosed with pre-lingual HL is that DHH individuals are likely to be more committed to obtaining intervention and rehabilitation. Imagine a child diagnosed with sensorineural HL -- his parents will hopefully visit audiologists, speech-

language therapists to ensure language develops properly, and do everything possible to help their child work on his hearing and language skills. The child will likely grow up with fairly excellent hearing, comfortable in social settings because of the intervention he received. Now ponder about an elderly person diagnosed with age-related HL. How often do people mention their grandparents who dislike wearing their hearing aids? An older adult will have a harder time committing to obtaining hearing rehabilitation. There are other more prevalent doctor appointments and other priorities, hence an elderly person may not maximize his ability to hear. Furthermore, adults who lose their hearing can use their past experiences and knowledge to manage in situations where hearing and understanding spoken language is tricky. While children with HL may have a smaller lexicon and fewer experiences, adults who acquire HL at an older age are able to rely on context and familiar topics to be able to communicate. This supports the notion of this present study in which DHH participants who develop HL later in life are more likely to have a poorer performance than those born with HL. Additionally, some health professionals do not understand the benefit of wearing hearing aids, especially in noisy environments. If an older patient whose hearing is declining expresses those concerns to his doctor, the doctor may not fully support or understand the patient's needs -- perhaps the physician believes that all older adults naturally have poorer hearing, and this cannot be avoided and will be more hesitant to provide referrals. The lack of referrals for older patients is probably more common than in children since the demand for rehabilitation may seem more prevalent than it is for older adults (Davis et al., 2016). To further expand on the lack of emphasis on rehabilitation and intervention for older adults, Imagawa et al. (2020) found that there was a declining satisfaction for cochlear implant users as their age increased. These results indicated that there is a demand to improve elderly cochlear implant users guidance and practice on how to

use and manage their cochlear implants. This highlights the importance of improving intervention for older adults with post-lingual HL.

Participants who used hearing aids reported better functional hearing performance on the HISQUII9 than participants who used cochlear implants. Candidates for cochlear implants tend to have a more severe degree of hearing loss. The higher degree of HL one has, the more difficult it will be for them to hear. Therefore, participants who wear hearing aids will likely have an easier time in everyday listening situations than those who wear cochlear implants. Moberly (2020) states that although there has been tremendous improvement in speech recognition, there is room for progress and improvement. Cochlear implants are programmed to decrease unwanted background noises and increase particular speech levels. While all the advancement of technology for cochlear implants has improved over the years, Moberly's research indicates that cochlear implant users will naturally struggle in hearing settings, and presumably struggle more in noisy settings with background noise.

Interestingly, in a study comparing auditory perception in children with typical hearing, hearing aids, and cochlear implants, it was found that cochlear implant users had higher scores of auditory perception than hearing aid users. However, the speech intelligibility of both hearing aid and cochlear implant users were not significantly different from each other (Mohammad, 2020). Although the present research found that participants who wore cochlear implants rather than hearing aids have more trouble hearing, perhaps due to their more severe degree of HL, it is possible that the demographics characteristics of the participants in this study differed from those in the previous works cited. It is also possible that the participants who wear cochlear implants had low self-confidence and low self-efficacy, and underestimated their auditory performance abilities.

Limitations

There were several limitations for this study. The primary limitation is in regard to the demographics of the participants. The demographics did not represent a wide range of racial background or cultures and the sample only included participants who directly or indirectly knew the researcher. Most of the participants were contacted by the researcher or through social media advertising. The majority of the participants were female. Time constraints also prevented the researcher from sharing the questionnaires to more people; presumably, the more participants who participated in the study, the more comprehensive and accurate the study could have represented the sample. Furthermore, part of the data collected for the study was conducted using self-assessed questionnaires. Participants are potentially biased and either under-estimate or overestimate their hearing abilities. GSE questionnaire responses could also be somewhat inaccurate depending on how the participant interpreted the question, yet by definition, that is what self-efficacy entails.

Conclusion

The purpose of the present study was to research potential correlations between hearing status, functional listening performance, and self-efficacy. Two-hundred and four participants completed the study protocol. While there were many findings in this study, the significant results indicated that having any degree of hearing loss affected self-efficacy levels when compared to people with typical hearing. The specific degree of hearing loss was insignificant. Self-efficacy of those who are DHH was affected, yet participants with typical hearing had no correlation with their sense of self-efficacy. Participants who performed better in hearing situations had a higher score of self-efficacy, while those who scored lower in hearing situations had lower sense of self-efficacy. The later in life participants developed HL, the poorer they

performed in hearing situations. Lastly, self-efficacy is correlated with technology. The main practical applications of the findings of this study are regarding intervention and rehabilitation. Regardless of how mild or profound one's hearing loss may be, regardless of whether they have pre-lingual hearing loss or acquired hearing loss, the factor found in this study that affects self-efficacy is functional listening performance. As long as someone diagnosed with hearing loss is referred to a proper audiologist, obtains technology fitting for their type and degree of hearing loss, and receives appropriate intervention and rehabilitation to ensure auditory, language, and communication skills are not compromised, it is more likely that he will have the toolbox to ensure relationships and communication are not compromised -- as well as a sturdy sense of self-efficacy.

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