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# Accommodations and Resources for Audiologists with Hearing Loss

Joseph Thomas Kraus
*University of Northern Colorado*

UNIVERSITY OF NORTHERN COLORADO

Greeley, Colorado

The Graduate School

# ACCOMMODATIONS AND RESOURCES FOR AUDIOLOGISTS WITH HEARING LOSS

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Joseph Thomas Kraus

College of Natural and Health Sciences
Department of Communication Sciences and Disorders
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Accepted by the Doctoral Scholarly Project Research Committee

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Deanna K. Meinke, Ph.D., Research Advisor

_____

Diane Erdbruegger, Au.D, Committee Member

_____

Erinn Jimmerson, Au.D Committee Member

## ABSTRACT

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Hearing loss affects millions of people worldwide. The audiology profession strives to help all individuals achieve their communicative goals and needs, providing support and expertise to a deserving population. Audiologists themselves are not immune to the challenges of hearing differences themselves. This project has two main objectives to identify and discuss needs and challenges faced by audiologists, both within their professional field, as well as their educational upbringing, and to highlight specific accommodations that can enhance their professional success. The research phase of this project aims to develop a resource guide tailored to the needs of audiologists with hearing loss by highlighting current literature, discussing accommodations that are already in use, as well as future directions for this population. This project seeks to contribute to the success of all audiologists, by fostering awareness, advancing the field's commitment to inclusion and diversity, and empowering professionals to continue to deliver high-quality hearing healthcare while breaking down barriers to their professional advancement.

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| | |
|---|---|
| ADA | Americans with Disabilities Act |
| ADAAA | Americans with Disabilities Act Amendment Act |
| CI | Cochlear Implant |
| dB | Decibel |
| D/deaf | Term encompassing both Deaf community and condition of hearing loss |
| DHH | D/deaf or hard of hearing |
| FAPE | Free and Public Education |
| FM | Frequency Modulation |
| HA | Hearing Aid |
| HAT | Hearing Assistive Technology |
| HL | Hearing Level |
| HFHL | High-Frequency Hearing Loss |
| kHz | Kilohertz |
| IDEA | Individuals with Disabilities Education Act |
| NHANES | National Health and Nutrition Examination Survey |
| PTA | Pure-Tone Average |
| PSDs | Physical and Sensory Disabilities |
| SdDHH | Students Who Are d/Deaf or Hard of Hearing |
| SIFTER | Screening Instrument for Targeting Educational Risks |

| | |
|---|---|
| SFHL | Speech Frequency Hearing Loss |
| SNHL | Sensorineural Hearing Loss |
| SNR | Signal-to-Noise Ratio |
| SPL | Sound Pressure Level |
| WHO | World Health Organization |

# CHAPTER I

# LITERATURE REVIEW

Hearing loss is the inability of the auditory system to properly relay audible stimuli to the brain. According to the World Health Organization (WHO), hearing loss affects billions of people worldwide (WHO, n.d.). For those with hearing loss, there are negative impacts related to social isolation (Shukla et al., 2020), education (Most, 2004), and quality of life (Punch et al., 2019). Yet many individuals with hearing loss overcome these challenges and elect to pursue professional careers in medical settings. This literature review will cover defining hearing loss, the prevalence of hearing loss, the impacts of hearing loss, current legislation applicable to students and employees who have hearing loss, as well as beginning to discuss accommodations for all workers with hearing loss.

## Hearing Loss

Hearing loss is considered to be present once hearing thresholds, the lowest intensity sounds a person can detect, are worse than a specified benchmark at any test frequency (typically .25-8 kHz). This benchmark is most commonly determined to be a 20 decibel (dB) hearing level (HL) (Khairi Md Daud et al., 2010), however, a 25 dB HL cutoff is sometimes used (Zahnert, 2011), or a >15 dB HL (Le Prell et al., 2011) for younger populations. The severity of a person's hearing loss is also based on categorizing hearing thresholds into 5 categories: mild, moderate, moderately severe, severe, and profound hearing loss (Kim et al., 2016). These benchmarks can be slightly different among researchers. Kim et al., (2016) categorizes the hearing threshold

ranges as: mild loss has thresholds between 26 – 40 dB HL, moderate loss between 41 – 55 dB HL, moderately severe loss between 56 - 70 dB HL, severe between 71 – 90 dB HL, and profound for hearing thresholds above 90 dB HL. Hearing loss can be both congenital and acquired, both will be described below in further detail. The usage of a capital D in Deaf stands for the Deaf culture and community (Smolen & Paul, 2023). Individuals who identify with the Deaf culture typically exclusively utilize sign language to communicate and are more involved within the community (Smolen & Paul, 2023). The lowercase d in deaf is used to simply represent the physical condition of having a hearing loss (Smolen & Paul, 2023). The term D/deaf will be utilized to represent all individuals who identify with either category.

**Congenital Hearing Loss**

Congenital hearing loss is a hearing loss present at the time of birth. While it is more common for older adults to have hearing loss, individuals of all ages are subject to it. Two to three out of every 1000 children are born with a detectable hearing loss in at least one ear (Vohr, 2003), therefore congenital hearing loss is not a common etiology. Congenital hearing loss can occur in response to environmental and prenatal factors, such as high levels of bilirubin at birth (Olds & Oghalai, 2015), premature birth (Bielecki et al., 2011), or toxic exposures to the child while in utero (Bielecki et al., 2011). Certain congenital infections also can be the cause of congenital hearing loss, including cytomegalovirus and rubella (Korver et al., 2017). Infectious diseases account for approximately 35.8% of neonates who fail their neonatal hearing screening (Lammens et al., 2013). Additionally, genetic mutations are the reason behind congenital hearing loss (Shearer et al., 1993). These genetic implications can be with or without additional factors, meaning the auditory pathway can be the only anatomic structure(s) affected by the genetic variable, or there can be more than one physical impact from the genetic mutation. Genetic

abnormalities account for approximately 19.8% of neonates who refer on newborn screenings (Lammens et al., 2013). Common anatomic components that are affected by genetic mutations include inner ear homeostasis and mechano-electrical transduction. Congenital malformation accounts for approximately 6.1% of neonates who fail their neonatal screening from 1997 to 2011 (Lammens et al., 2013). In developed countries, early detection and intervention are used to limit the effects that congenital hearing loss may have on a person's speech, language, and other life skills (Korver et al., 2017). Early intervention and habilitation minimize the negative effects of hearing loss over a lifetime (Ching, 2015).

## Acquired Hearing Loss

Hearing loss that develops after birth during childhood or adulthood can be caused by multiple etiologies: presbycusis (Wang & Puel, 2020), age-related hearing loss, environmental situations including medications (J. Guo & Chai et al., 2019) or some illnesses (Havia et al., 2002; Stam et al., 2014), or exposure to high levels of noise (Hong et al., 2013).

### *Acquired Hearing Loss in Children*

Hearing loss can be acquired in utero but also shortly after birth if complications arise (Kenna, 2015). Infectious causes such as rubella, herpesvirus, and syphilis can all be contracted before and after birth and can lead to hearing loss as the child develops (Kenna, 2015). Other infectious causes that can be contracted later in life that can cause hearing loss include measles, Lyme disease, mumps, and bacterial meningitis (Kenna, 2015). Other environmental factors can contribute to hearing loss such as noise-induced hearing loss, and ototoxic medications (Kenna, 2015), which will be discussed further in the adult section.

### *Acquired Hearing Loss in Adults*

Presbycusis is age-related hearing loss. The most common sensory impairment seen in the elderly, presbycusis is the declination of the cochlea, the hearing organ, and results in impaired hearing and deterioration of speech comprehension. Presbycusis is permanent, progressive, and affects both ears equally (Wang & Puel, 2020). According to the World Health Organization (WHO) (2018), approximately one-third of individuals over the age of 65 years old are impacted by disabling hearing loss, making presbycusis the most common sensory disability seen in the older population. Of adults aged 60 or older, approximately 70% had a hearing loss that was disabling, as defined as thresholds greater than 40 dB HL in the better ear (Vasconcelos et al., 2019). Adults can be employed and acquire hearing loss during their working careers.

Illnesses or other medical conditions that can cause hearing loss include, or at least have co-morbidity with hearing loss, but are not limited to diabetes and arthritis (Stam et al., 2014), Meniere's disease (Havia et al., 2002), high blood pressure (de Moraes Marchiori et al., 2006) and meningitis (Richardson et al., 1997).

Medications that may damage the ability to hear, called ototoxic drugs, also can be the cause of acquired hearing loss (J. Guo & Chai et al., 2019). These drugs can include but are not limited to aminoglycoside antibiotics (Schacht et al., 2012), platinum-based anticancer agents (Schacht et al., 2012), and loop diuretics (Ding et al., 2016). These drugs damage the auditory structures such as the spiral ganglion cells (L. Guo & Cao et al., 2021), the auditory nerve (Kiang et al., 1976), or the stria vascularis (Ding et al., 2016). Most commonly, however, the ototoxic drugs target the hair cells within the cochlea (Schacht et al., 2012). At the onset of ototoxic damage, frequencies greater than 8 kHz are affected, but the lower frequencies will be affected if proper intervention is not pursued (J. Guo & Chai et al., 2019).

As you can read, there are a multitude of etiologies that contribute to hearing loss, and these can contribute to the onset of hearing loss at any time from prenatal to late adulthood. Therefore, the prevalence of hearing loss will vary depending on the age of the population and the definition of hearing loss.

## Prevalence of Hearing Loss

### Total Population

Hearing loss is the fourth most common global disability. The World Health Organization (WHO) reports that over 1.5 billion people (roughly 20% of the global population) live with hearing loss, as defined by measured hearing thresholds higher than 20 dB HL. The global population is growing, as the projected prevalence is estimated to be over 2.5 billion by the year 2030. (World Health Organization, 2018).

Data from the National Health and Nutrition Examination Survey (NHANES), where part of the procedure is to perform hearing tests at specified frequencies (.5, 1, 2, 3, 4, 6, and 8 kHz) from the years 1999 – present, can be used to estimate the prevalence of hearing loss in the U.S. population (Hoffman et al., 2017). Hoffman et al. (2017), examined the prevalence of hearing loss in terms of age groups and determined if there was a decline in the loss for the 20 – 69-year age group differentiated by decade of life by comparing audiometric data from the NHANES 1999-2004 cycle to data from the 2010-2011 cycle. These authors defined hearing loss into two different categories: speech-frequency hearing loss (SFHL), as defined as the pure-tone average (PTA) greater than 25 dB HL of .5, 1, 2, and 4 kHz, and high-frequency hearing loss (HFHL), as defined as PTA greater than 25 dB HL of 3, 4, and 6 kHz. From their 3831-person sample size, the following age breakdowns were obtained: For the age group of 20 – 29 years (n = 840), 2.2% had speech-frequency hearing loss (SFHL), and 7.1% had a high-frequency loss.

For the 30-39 (n = 758) age group, the percentages were 3.3% and 10.8% for SFHL and HFHL respectively. The 40 – 49 (n = 739) age group demonstrated 7.8% with speech SFHL and 26.0% with HFHL. The 50 – 59 (n = 772) age group had 23.1% with SFHL and 50.2% with HFHL. Finally, the 60 – 69 (n = 722) age group had the largest percentages, with 39.3% exhibiting a speech frequency loss and 68.0% exhibiting an HFHL. From these analyses, the authors determined that while the overall speech-frequency hearing loss for the 20 – 69 age group has decreased in the 2011 – 2012 NHANES cycles when compared to the 1999-2004 cycle, age was still an appropriate determination of the likelihood of hearing loss (Hoffman et al., 2017). Both the 1999 – 2004 cycle and 2010-2011 cycle overall results are shown in Table 1.1 (Agrawal et al., 2008). The change in prevalence of total speech frequency HL and total high-frequency HL were shown to be statistically significantly different (Hoffman et al., 2017).

**Table 1.1**

*Comparison of the overall prevalence of hearing loss for ages 20-69 years*

| NHANES Cycle Period | Total Speech Freq. Hearing Loss | Total High Freq. HL |
|---|---|---|
| 1994 – 2004 | 15.9 % | 31.9 % |
| 2011 - 2012 | 14.1% | 31.1% |

*Note.* The percentages show combined prevalence for both unilateral and bilateral hearing loss, for ages 20 – 69.

**Undergraduate Population with Hearing Loss**

Research is limited in the number of Students who are deaf or Hard of Hearing (SdDHH) that pursue college degrees. This lack of information can be caused by multiple things, one of which being SdDHH students not reporting themselves to the disability center to be accounted

for in demographic and/or research. It has been established that SdDHH students often do not use the available resources that would positively impact their education (Hyde et al., 2009).

Additionally, some students who would qualify as having a hearing loss may not be aware that they do have a hearing loss. Le Prell et al. (2011) reported pure-tone threshold findings in 56 active college students, all of whom said they had normal hearing. The pure-tone examinations revealed low-frequency PTA (using the frequency range of .5, 1, and 2kHz) hearing loss in 2.7% of the tested ears, and high-frequency PTA (using the frequency range of 3, 4, and 6kHz) hearing loss in 7.1% of the tested ears, as defined by a PTA as an average in either of the frequency ranges that was greater than 20 dB HL.

While tracking down the exact number of undergrad students who have hearing loss is difficult, some assumptions can be made about the matriculation of high school students who have hearing loss as they attend post-secondary institutions. Using a retrospective analysis of a sample of US households from the 1997 – 2005 National Health Interview (n = 95132), Boulet et al. (2009) determined that 5 per 1,000 children aged 3 to 17 have a hearing loss. More recently, The American Community Survey by the US Census Bureau estimates that there are 308,648 deaf or hard-of-hearing children between the ages of 5 and 17 years (US Census Bureau, 2018). This census estimate is determined via a questionnaire used to determine the prevalence of a variety of impairments, including hearing loss. Sixty-six percent of all high school students go on to enroll in college immediately after high school (U.S. Department of Education, National Center for Education Statistics, 2021), if the percentage is the same for the SdDHH population, then 203,707 (66% of 308,648) of the d/Deaf or hard of hearing students reported by the US Census Bureau in 2018 went on to college immediately after high school.

### Graduate School Population

While the exact population of SdDHH students is hard to calculate, inferences about the percentages of SdDHH who move onto graduate-level classes can also be made. In a 2014 study, Powell et al. surveyed sixty-four deaf or hard of hearing (DHH) students from thirteen post-secondary institutions in New Zealand, as well as an additional 8 who were interviewed for further information. Out of the total population of SdDHH who took the survey, 5 (8%) were undertaking master's level classes and 3 (5%) were taking Ph.D. level classes for a total of 8 (12.5%) of SdDHH in graduate-level classes. Three out of the 8 interviewed students were taking graduate-level classes; however, the post-secondary classification was not given for those students. There does not appear to be data for U.S. students.

### Graduate Students in Communication Sciences and Disorders with Hearing Loss

Communication Sciences and Disorders include both Audiology graduate programs and Speech-Language pathology graduate programs. Students who have a hearing loss may find themselves naturally drawn to these sorts of education pathways and eventual careers since they will be working with a population that they, themselves might identify with. When surveyed, 77% of audiology graduate students with hearing loss reported their interest in the field was related to their own experiences with hearing loss (Bethel & Mormer, 2020).

## Academic Impacts of Hearing Loss

### Primary School

The impact of hearing loss on students in K-12 schools has been well documented, where poor academic performance can be significantly associated with even mild hearing loss (Khairi Md Daud et al., 2010). Khairi Md Daud et al., (2010) wanted to determine not only the

prevalence of mild hearing loss in primary school children but also the association between mild hearing loss and academic performance in that same population. Five schools in Malaysia were selected randomly, and the students from those five schools were then placed into three different groups, dependent on their current academic standing. Group A was comprised of the best academic performers, while Group C was comprised of the students who performed the poorest. Audiometric testing was subsequently performed on all three groups. The authors defined mild hearing loss as thresholds between 20 – 39 dB HL at .5, 1, 2, and 4 kHz. Two-hundred thirty-four students completed audiometric examinations, and hearing loss was identified in 15% of the students, with the highest prevalence corresponding to the group of students with the lowest academic performance (Khairi Md Daud et al., 2010).

In a 2020 study, the academic outcomes of aided children with ranging hearing losses were investigated (Tomblin et al., 2020). Spoken language, reading, writing, and mathematic skills were measured in second and fourth grade students, 183 students with hearing loss, and 91 students with normal hearing. For the children with mild and moderate hearing loss, scores across all categories were statistically similar in both grades. However more moderately-severe hearing loss, as defined as a loss between 60 – 75 dB HL in the better ear, resulted in significantly poorer oral language and reading skills (Tomblin et al., 2020).

### *Degree of Hearing Loss*

In a 2004 study, the impact of the degree and type of hearing loss on academic achievement was investigated by Tova Most. Forty-seven Israeli second-grade children with various types and degrees of hearing loss participated. The Screening Instrument for Targeting Educational Risks (SIFTER), Hebrew version, was completed by the student's teachers. All but four of the students had hearing loss that did not exceed 75 dB HL. The relationship between

hearing loss and academic performance was linear up to 75 dB HL, the higher the hearing loss, the improved performance within the communication domain of the SIFTER. In the hearing losses higher than 75 dB HL, however, performance in that domain decreased. To summarize, children with more minimal hearing loss performed worse on the SIFTER than those with more severe hearing loss, up to 75 dB HL. Additionally, the impacts of hearing aids were considered. Some students did not wear hearing aids, and some teachers did not know their students had hearing loss. Student t-tests were run to compare the hearing aid and non-hearing aid groups. The hearing aid group performed significantly better on all domains of the SIFTER except attention than the non-hearing aid group (Most, 2004).

Not only is education impacted, but psychosocial traits, economic independence, and quality of life can also be impacted by the presence of hearing loss in students (Davis & Hoffman, 2019). It can be concluded that SdDHH in post-secondary settings would also see similar trends, in both education and other areas.

### *Age of Intervention*

With updates to newborn hearing screening protocols and the implementation of early intervention measures, it is expected that linguistic delays connected to childhood hearing loss will be minimized in the future (Moeller & Tomblin, 2015). However, it is important to catch hearing loss and implement intervention strategies as soon as possible, to have the best language outcomes (Ching et al., 2017). In a prospective study of 350 children, the period between birth and receiving amplification is vital for language outcomes. Children who started amplification at the age of 24 months had poorer language skills than those who started at 3 months, particularly those who had more significant hearing loss (Ching et al., 2017).

## Impact of Hearing Loss on Post-Secondary Programs

The progression from high school to post-secondary institutions requires all students to undertake more responsibility and self-advocation to be successful in higher education. While schools are legally required to offer support to SdDHH, (Bowman, 2011; deBettencourt, 2002; Lipkin et al., 2015), the students themselves often-times underutilize those available resources or do not use them at all (Cawthon et al., 2015; Hyde et al., 2009).

In a longitudinal study where authors used data from the second National Longitudinal Transition Study (Wagner et al., 2007), Cawthon et al. (2015) determined that decreased amounts of accommodations were used by SdDHH in post-secondary settings compared to that of students still in high school settings. The accommodation type, however, whether that be language and communication accommodations for standardized testing, non-language and communication accommodations for standardized testing, language and communication accommodations for instruction, non-language and communication accommodations for instruction, or mental health accommodations, remained the same for post-secondary students. The drop in postsecondary accommodation usage was sharp, the usage of accommodations for standardized tests had the greatest drop. Accommodations went from 70% in secondary settings to 10% in post-secondary environments. The IDEA (2004) requirements play a bigger part in offering access to accommodations during assessments, even if it is just for instructions about the test. Using accommodations during instruction saw an increase of 10%, meaning that students were more likely to use the accommodations offered to them when their instructors were presenting information, whether that be course material or test instructions. The authors concluded that making decisions and advocating for themselves may be hard for SdDHH during

this transitional period (Cawthon et al., 2015). However, usage of accommodations did not have a significant impact on degree completion rates (Cawthon et al., 2015).

Seventy-two former and current university students who had a hearing loss at the time of attending Queensland University (Griffith University) from 1985 – 2005, were polled using both a forced choice (demographic information) and an open-ended response set of questions to determine what their experiences were while attending the University (Hyde et al., 2009). Open-ended questions were designed to ask questions about what their personal experiences were, what tools they used to help benefit them in their education, what their challenges were, and what recommendations they might have for future SdDHH. More than half of the students polled did not use the available services that they were qualified for. Thirty-five percent used technological aids like Frequency Modulation Devices (FMs), 36% used interpreters, and 65% reported taking their own notes as opposed to using the service of someone taking notes for them. SdDHH respondents perceived greater difficulty than their peers in several different environments. These difficulties included self-reported struggles of hearing instructors in certain environments, such as computer classes or larger, amphitheater-style classrooms. Difficulty hearing in group work and projects was also reported to lead to feelings of isolation of SdDHH. No correlation between using available accommodations and degree completion was determined, as 67% percent of the polled students had finished their intended degrees (42%) or were currently working towards their degrees (25%). Only 2% of the students withdrew for academic reasons, and 16% for personal reasons. These completion rates are comparable to the completion rates of college students in general. (Hyde et al., 2009).

## Impact of Hearing Loss on Graduate Audiology Students

In Audiology graduate programs, degree completion is dependent on student-measured success in different environments. Students must show proficiency in coursework, research projects, clinic work, and internship/externship placements where they deliver clinical services to patients with hearing loss.

Bethel and Mormer (2020) set out to determine the impact that hearing loss might have on audiology graduate students, as well as some of the strategies used to overcome those difficulties. To do this, they sent two online surveys to both audiologists with normal hearing and graduate audiology students with hearing loss. Surveys were shared on social media platforms that are specific to audiology students and audiology professionals. Subjects were recruited via social media targeting all audiologists, or audiology graduate students, who have hearing loss. Responses were received from forty-four audiologists and 37 graduate students responded to the surveys. Items that were identified in these surveys included: potential solutions to communication issues that arise due to hearing loss, motivation, self-efficacy, disclosure, and hearing loss terminology preferences.

The accommodations or potential solutions to challenges faced will be discussed later in this chapter. However, the impact of hearing loss was felt by graduate audiology students in several ways. Overall, the communication challenges can be broken down into four situations: scoring speech tests, listening checks, patient communication, and clinical instructor communication. Clinical instructor communication included any instance of educational instruction between the student-clinician and supervisor regarding clinical procedures, case discussion, or advice to the student-clinician. Self-efficacy and critical thinking of solutions are important for student success in audiology graduate school. In terms of psychological impact,

50% of polled students responded “yes” to the question “Did your hearing loss ever make you doubt your abilities as a clinician.” Additionally, 31% reported outside skepticism regarding their pursuit of audiology due to their hearing loss. Positively, almost all of the students polled said their hearing loss had a positive impact on their counseling skills (Bethel & Mormer, 2020).

## Legislation

In primary and secondary education settings, two of the main legal documents supporting students with qualified disabilities are the Individuals with Disabilities Education Act (IDEA, 1997) and Section 504 of the Rehabilitation Act of 1973. In Post-Secondary Education and beyond, the Americans with Disabilities Act (1990) and its amendment the Americans with Disabilities Act Amendments Act of 2008 (ADAAA) are in place, in addition to Section 504 of the Rehabilitation Act (1973).

### Individuals with Disabilities Education Act (2004)

The IDEA (2004) is a federal law that provides free and appropriate public education (FAPE) for students with disabilities from ages 3 to 21 years (Lipkin et al., 2015). Since IDEA is a federal law, some funding for this population of students is given to both state and local education organizations to ensure the special education and related service needs of individuals who meet the IDEA criteria are met (deBettencourt, 2002). Post-secondary institutions, however, are not subject to the mandates of IDEA (Madaus & Shaw, 2006).

The IDEA has two iterations, the first passed in 1997 to provide FAPE for all children with disabilities and was based on improving the “Education for All Handicapped Children Act of 1975” which was impeded by poor expectations, funding, and research (Poppen & Alverson, 2018). The IDEA Improvement Act of 2004 amended the 1997 legislation and focused more on

addressing the needs of the children in achieving their post-secondary goals, including further education, employment, and independent living (Poppen & Alverson, 2018).

There are four parts to IDEA, Part A: General Provisions, outlines IDEA's overall purpose, which is to ensure that all children with disabilities have access to FAPE and have appropriate evaluations to determine the child's eligibility for special education services (US Department of Education, n.d.). Part B: Assistance for all children with disabilities includes rules regarding funding for states that provide FAPE for children with disabilities from ages 3 to 21 years (US Department of Education, 2021). Part C: Infants and Toddlers with Disabilities, includes rules concerning funding for states providing early intervention strategies for children from birth to age 2 years old (US Department of Education, 2021.). Finally, Part D: National Activities to Improve Education of Children with Disabilities, includes rules related to funding for support personnel, assistive technology, parent training, and resource centers (US Department of Education, 2021.).

**Section 504 Rehabilitation Act of 1973**

Section 504 Rehabilitation Act of 1973 was instituted to expressly forbid discrimination based on disability in any program or activity that receives federal funding (Poppen & Alverson, 2018). Section 504, instead of being a federal law, is a civil rights statute, meaning that additional funding is not given for students, but requires that if an institution or school, regardless of whether that school is private or public, receives federal funding then that institution or school cannot discriminate students (deBettencourt, 2002). One of the key points of the Rehabilitation Act was to promote and expand employment opportunities for individuals with disabilities (Poppen & Alverson, 2018). Due to this, and the inclusion of explicitly named "adult education programs" in Subpart D, post-secondary institutions that receive federal funding for

students with disabilities, such as hearing loss, are required to prohibit discrimination against students with disabilities (Madaus & Shaw, 2004). The law defines individuals with disabilities as persons with a physical or mental impairment that limits one or more major life activity, such as caring for oneself, walking, seeing, hearing, and more (US Department of Health and Human Services, n.d.). An employer or organization is prohibited from excluding an individual who fits under that definition an equal opportunity in any setting. (US Department of Health and Human Services, n.d). Additionally, the law defines the right that any individual under the above definition to participate, have access to, or enroll in program benefits or services (US Department of Health and Human Services, n.d).

### *Differences Between Post-Secondary and Secondary Legislation*

Since IDEA does not subjugate post-secondary institutions to the same regulations, the ground rules for how post-secondary institutions operate under Section 504 are slightly different. Since higher education institutions likely take funding from the federal government, Section 504 would still apply to them, meaning that they cannot discriminate against persons with disabilities of any kind, either amongst employees or students (who are sometimes both an employee and a student). The same is true for private institutions that either directly or indirectly accept federal funding. If any federal funding is accepted by an institution in any capacity, then it is subject to the following guidelines under Section 504.

However, there is another legislation that does apply to post-secondary (higher education) institutions. The Americans with Disabilities Act (ADA, 1990) and the following amendments in the Americans with Disabilities Act Amendments Act (ADA-AA, 2008) directly apply to post-secondary institutions. The acts are federal law, similar to IDEA, and require post-secondary

institutions to provide reasonable accommodations to “otherwise qualified” students who experience disabilities (Summers et al., 2014). Through this, we see post-secondary institutions implementing Disability Support Services offices to provide accommodations to qualified students (Adams & Proctor, 2010).

While FAPE is required in primary and secondary education, post-secondary institutions are allowed to charge for tuition, housing, and other fees. Additionally, post-secondary intuitions are not required to seek out students with disabilities in the same respect as secondary and earlier intuitions. Students in post-secondary environments are required to be more assertive and advocate for their needs, including informing the Disability Support Service offices that they may be eligible for support services which generally results in smaller amounts of students using the accommodations that are available to them from their institutions (Cawthon et al., 2015).

**Americans with Disabilities Act and Americans with Disabilities Amendment Act (2008)**

The original Americans with Disabilities Act was passed in 1990, with one of its goals to improve the labor conditions and statistics for disabled individuals. Disabled, working age (21-58) individuals before 1990 were employed at least 46 percentage points lower than non-disabled people. The ADA (1990) required employers to make what were deemed “reasonable accommodations” for individuals with disabilities to be able to perform their tasks the same way their non-disabled peers do. The idea behind the original ADA was to make employing disabled individuals, and their subsequent required accommodations less costly to the employer, thus increasing the employment of persons with disabilities labor statistics. This cost savings was to happen, in theory, by increasing workplace productivity, even with the extra expense of accommodation. However, an examination of labor statistics, found that the unconditional employment probability between disabled and non-disabled workers did not change following

the enactment of ADA (1990) (Hotchkiss, 2004). This statistic however is susceptible to the natural changes in the economy, including recessions like the one experienced in 1990-91 (Hotchkiss, 2004). ADA (1990) still used the definition of disability as The Rehabilitation Act, that an individual needed to have: an impairment that substantially limits one or more major life activities or a record of impairment (such as a medical history of blindness) (Law, 1991). Problems arose with the language surrounding what substantially limits one or more major life activity. Arguments would be made that some disabilities were not severe enough to "substantially" limit an activity (Rodriguez, 2020). The narrow definition of disabilities often made it hard for individuals who do have a hearing loss, albeit not d/Deafness to argue for the accommodations they deem necessary in their work environments (Rodriguez, 2020).

Mitigating measures, that is, the usage of corrective treatment or a measure to mitigate a disability, such as low-vision devices (excluding glasses and contacts), amplification devices, and medications. Under ADA (1990), the argument could be made that mitigating measures could be implemented by the individual with the impairment and that the individual would no longer be "substantially" inhibited to perform major life activities (Ostolaza & Wennihan, 1999). This argument was an extremely hot topic and ultimately contributed to the need for revision of the Americans with Disabilities Act (Ostolaza & Wennihan, 1999).

The next installment of ADA, the Americans with Disabilities Act Amendment Act (2008) was aimed to widen the definition of what a "disability" is. Additionally, the positive or negative effects of "mitigating measures," are to be ignored. Previously, under ADA, several cases were taken to the Supreme Court where mitigating measures were used in arguments to determine disability. These two steps, and the expansion of what a "major life activity" is, broadened the number of people that would be included in the legislation (Bowman, 2011).

These reasonable accommodations are the duty of the employer to fund, as long as the accommodations do not have an unreasonable financial burden (US Equal Employment Opportunity Commission, n.d). The new definition of disability applied to all 5 titles of the act. Title I deals with employment, and states that employers must provide reasonable accommodations to employees that qualify under the broadened definition (ADA National Network, 2004). Title II prohibits discrimination, including exclusion, of qualified individuals from all public domains including programs, activities, and services, including public transportation (ADA National Network, 2004). Title III subsequently deals with discrimination in private places of public accommodation, such as restaurants, doctors' offices, hotels, etc. (ADA National Network, 2004). Title IV requires telephone and internet companies to provide necessary accommodations for effective communication, such as closed captioning (ADA National Network, 2004). Finally, Title V incorporates further miscellaneous provisions, such as ADAAA's relationship to other laws, the act's impact on insurance providers, and a list of other certain conditions that are not to be considered as disabilities (ADA National Network, 2004)

The importance of ADA (2008) to individuals with hearing loss may be evident, but several important components need to be understood. Primarily, the definition of hearing loss needs to be clear. ADAAA makes it much easier to define d/Deafness as a disability under the guidelines, since being d/Deaf substantially limits in the major life activity of hearing. Individuals with hearing impairment other than d/Deafness need to show that they are "substantially limited in hearing or another major life activity" to be technically qualified under ADA. Mitigating measures, such as hearing aids or cochlear implants, and the positive effects they bring are excluded from consideration when substantiating a limitation due to hearing loss. A history of impairment is also covered, so long as a record of an impairment that substantially

limited the individual in question in the past is produced (US Equal Employment Opportunity Commission, n.d.).

Secondarily, once a hearing loss is properly substantiated under the ADA's definition, it is important to understand what accommodations are available. Geyer and Schroedel (1999) examined the usage of accommodations via a survey of 232 employees and 51 who are d/Deaf or hard of hearing. They examined various specific types of workplace accommodations in the survey: TTY (Teletype) or TDD (Telecommunications Device for the Deaf), Phone amplifier, Flashing lights for fire alarms, Computer e-mail, sign classes for co-workers, co-workers taking notes during meetings, summaries of meeting notes, availability of interpreters, improved lighting in work areas, moving things for better lines of sight, changing job duties, changing job training, and giving information about hearing loss to co-workers (Geyer & Schroedel, 1999).

More recently, Haynes and Linden (2012) investigated what workplace accommodations are used by individuals with hearing loss, as well as the perceived efficacy of the accommodations that are used. Seventy-one individuals who reported a "functional limitation" to hearing responded to an online survey. The specific accommodations utilized by the participants were placed into four bins: Universal Features (UF), such as adjustable workspaces and built-in features (such as FM systems), Adaptations, such as adjusted work schedules, moving or adapting common tools, or modified job tasks, help or assistance which includes modified training or supervision or sign language interpreters, and Assistive Technologies (AT), such as telephone aids, vibrating pagers, sound transmission systems, and more. The most common accommodations were telephone aids (55%), co-worker help (34%), and electronic communication (31%). In general, participants responded positively to the importance of their

accommodations and the frequency of use. Participants were less positive with the satisfaction of their accommodations, however.

There are still some stigmas surrounding hearing loss and the workplace (Southall et al., 2011). A 2011 study by Southall et al., investigated the factors that contributed to the disclosure or non-disclosure of hearing loss by adult workers who had adult-onset hearing loss. After filling out questionnaires, 12 adults with varying degrees of hearing loss participated in interviews about their professional experiences with their hearing loss. Five main themes emerged from the conversations. Theme one was related to the perceived importance of the situation. Respondents reported that in some instances they felt it was more important to disclose the hearing loss, and other situations did not require disclosure. Theme two incorporated how in control the respondent felt in specific circumstances. If the respondent felt in control of the situation, they were less likely to feel the need to disclose the hearing loss. Theme three described community affiliation. Respondents stated that describing their hearing loss, particularly partial hearing loss, was difficult to describe and some community members did not understand it. A respondent even reported that they felt treated differently, due to perceived cognitive impairment from their peers. Theme four was related to the burden of communication. Respondents discussed that some of their peers had a more positive response to communication challenges, while others were more negative. Finally, theme 5 incorporated other factors that are specific to each individual's unique situation, such as fluctuating levels of hearing ability and adaptive technologies. Simple things such as the visibility of hearing aids were described, with some respondents not wanting peers to know they have a hearing loss, and others were more willing to have adaptive technology be visible. All the above factors and themes contributed to an individual's personal decision to disclose a hearing loss or not, but the stigma around having a hearing loss (Southall et al., 2011).

## Summary

The presence of hearing loss impacts an individual's ability to perform a bevy of everyday tasks, during their time spent in educational settings and professional situations. Hearing loss is present when a person's hearing thresholds are higher than 20 dB HL (Khairi Md Daud et al., 2010). Hearing loss can be attributed to many different factors (Kenna, 2015), and can be both congenital (Lammens et al., 2013) and acquired (Kenna, 2015). The population of individuals who experience hearing loss is growing, and will likely continue to grow, as it is estimated that 2.5 billion individuals will have a hearing loss by the year 2030 (World Health Organization, 2022). Students who have hearing loss are susceptible to specific challenges, both in graduate-level settings (Bethel & Mormer, 2020) and earlier settings (Tomblin et al., 2020), however early intervention is key for positive language outcomes (Ching et al., 2017). Differences in legislation for secondary and post-secondary settings sometimes reduce the number of students in higher education who pursue accommodations they would be qualified for (Cawthon et al., 2015), however, accommodations that are utilized professionally are self-reported as very important (Haynes & Linden, 2012).

The presence of hearing loss in a clinician, however, could be beneficial in many ways. Patient representation is valuable, and the usage of personal experience can be beneficial for audiology clinicians during counseling periods with patients (Bethel & Mormer, 2020). Understanding the specific challenges, one might face, as well as the potential accommodations that may be available can be useful to the professionals and students in these populations.

# CHAPTER II

## ACCOMMODATIONS AND RESOURCES

In the field of audiology, the ability to perceive and interpret sound is paramount, as audiologists are dedicated to diagnosing and treating hearing impairments in others. However, audiologists themselves are not immune to the challenges posed by hearing loss. In this section, we delve into the vital discussion of accommodations needed for audiologists with hearing loss, across multiple tasks that are fundamental for an effective audiologist. As these professionals navigate the intricacies of their hearing challenges while providing essential care to patients, it becomes imperative to explore the accommodations, technologies, and supportive environments that can enable them to excel in their roles, ensuring both their well-being and the effectiveness of their patient care. According to a survey by Bethel & Mormer, seventy-seven percent of audiology graduate students or active audiologists with hearing loss report that their own hearing difference is what got them into the field. However, fifty percent reported yes to the question "Does your hearing loss make you doubt your abilities as a clinician?" (Bethel & Mormer, 2020). Due to this self-doubt, appropriate accommodations are needed to be made, to ensure the best patient care possible.

# Communication Demands and Functional Hearing Needs

## Classroom and Laboratories

As outlined in the previous chapter, students with hearing differences often have a more difficult time in the classroom and laboratory settings (Tomblin et al., 2020). Part of this difficulty can be related to the acoustical parameters of the room itself, which can create more difficulty for students with a hearing difference (Kennedy et al., 2006). These struggles create the need for accommodations to be made to create the best possible communication environment.

## Educational Accommodations for Audiology Graduate Students

Educational accommodations are legally required interventions that allow certain student population groups access to the same education as other students who do not need accommodations (Bolt & Thurlow, 2004). Depending on whether the educational setting is a post-secondary institution or a secondary or earlier primary school, the legislation regarding the inclusion of these accommodations is different (Madaus & Shaw, 2006). Accommodations for individuals with hearing loss in educational environments are fairly standard across institutions, however, regardless of whether they are enrolled in a post-secondary environment or not. The most common accommodations for students who have hearing loss include Hearing Assistive Technology (HAT), speech-to-text systems, sign language interpreters, note-takers, and preferential seating.

## Frequency Modulation (FM) Systems

Around the turn of the century, Soundfield FM systems were made to be portable (Crandell et al., 2001), giving the speaker the ability to move around while still presenting a listener with more speech and sound information than would be possible without the system. FM

systems have been proven to improve the listener's speech understanding of noise for both hearing aid users (Hawkins, 2004) and cochlear implant users (Schafer & Thibodeau, 2003).

Frequency Modulation systems improve speech understanding by decreasing the signal-to-noise ratio (SNR) for the listener. This is accomplished by sending a speech signal from a microphone that the speaker wears to a receiver that the listener wears. Since the microphone is seated at or near the speaker's mouth, and then presented to the listener at the ear canal, residual room noises are mitigated (Lewis et al., 2004). Frequency-modulated systems have proven to be the most successful in improving speech understanding in noise when assessed using the Hearing-In-Noise Test (HINT) when compared to other assistive listening technologies (Lewis et al., 2004).

Frequency Modulation systems have been shown to improve speech understanding for multiple types of hearing loss and amplification devices, including but not limited to minimal to mild hearing loss (Tharpe et al., 2003), unilateral hearing loss (Appachi et al., 2017), hearing aid users (Hawkins, 2004), and cochlear implant users (Schafer & Thibodeau, 2003).

There are some drawbacks to FM usage, however. In students that will travel from classroom to classroom, which is typically the case in secondary and higher education settings, the FM system has to be brought to each classroom and given to each teacher before instruction starts. Additionally, in group conversations, the FM microphone needs to be either placed in the middle of the conversation, which limits the efficacy of the FM system or passed from speaker to speaker, which can impact the logistics of a group conversation. When responding to a questionnaire, teachers reported the main limitation in their use of FM was the teacher's lack of knowledge about the device (Miranda & Brazorotto, 2018).

### Speech-to-Text

Speech-to-text devices are a growing way to assist students in taking notes. Compared to interpreters, high school students with hearing loss were able to retain more information using speech-to-text devices (Stinson et al., 2009). Speech-to-text devices were originally controlled by an operator that is inside the classroom, who types out the teacher's speech verbatim, and then the developed script would be presented to the student (Stinson et al., 2009). Over time, automatic speech-to-text devices have begun to become more prominent. Early automatic devices were less accurate than their person-operated counterparts, and while overall accuracy is not perfect in the new devices, great strides in accuracy have been made. Modern devices are easier to operate, are faster, and have been proven to be effective over distance (Chern et al., 2017).

### Interpreters, Note Takers, and Preferential Seating

While speech-to-text may be an appropriate accommodation for students to get the notes they need, as well as present the listener with another modality to receive the educational material, traditional note-takers and interpreters are still an option. Sign language interpreters have been a mainstay in mainstream educational settings for over a century. For students who need this type of accommodation, there is evidence that interpretation is still effective for student understanding (Marschark et al., 2006).

Note-takers are another accommodation option for students who have hearing loss. Using another person's notes would allow the students to focus on the instructor to improve their understanding. Issues arise with this strategy as students tend to not like using other individual's notes to study (Hyde et al., 2009). Further complications arise, as some students are not willing

to share their notes with others. Recruiting note-takers can be complicated, and some universities and other institutions offer incentives for students willing to share their notes, such as bookstore gift cards or other small rewards.

Preferential seating has been an accommodation strategy for a long time and still should be strongly considered for students who have hearing loss. Physically being closer will drastically improve student understanding in some settings. Preferential seating is not always about seating the student in the front row of a classroom, closest to the speaker, but rather finding the optimal position for the student to sit that will facilitate seeing and hearing both teachers and classmates. The preferential location may also vary depending on the type of learning activity (i.e., lecture, lab, discussion).

## Clinical Setting

The clinical setting presents another level of factors that need to be taken into consideration when making appropriate accommodations. Fortunately, during some clinical procedures, visual means provide more clarity for clinicians with hearing differences. Visual means can include the usage of light when the response button is pressed during audiometric testing. However, even during tests that have visual components, auditory input is still needed for patient communication and directions. This section will outline the different strategies that can be utilized during different clinical procedures. Bethel and Mormer in 2020 performed a study in which they sent online surveys to 44 audiologists with normal hearing, and 37 audiology graduate students with hearing loss to determine challenges faced by student clinicians with hearing loss. The survey had questions related to motivation, self-efficacy, terminology preferences, and potential solutions to these challenges. Each of the challenges and solutions will be discussed in further detail in this section. The most commonly reported difficulties include

patient communication during speech testing and performing listening checks on patient amplification (Bethel & Mormer, 2020).

**Counseling and Case History**

Frequency-modulation systems have been already discussed in educational accommodations; however, they can also be used in a clinical setting. Clinicians will come in contact with a variety of patients who have a variety of different backgrounds and attributes during a typical clinical day. Clinicians with hearing loss have an increased difficulty understanding patients, their families, and/or their caregivers, and these difficulties are increased when communicating with patients who might have accents, speech disorders, or are predisposed to be fast or quiet talkers. Both counseling and interviewing a patient to obtain a comprehensive case history is a vital part of the clinical workday. Communication challenges can impede the clinician's ability to effectively do both tasks and compromise the efficiency of the interactions. Further development of effective accommodation strategies is needed to overcome all communicative breakdowns between the clinician and patient, and the utilization of an FM system in this instance could help restore some understanding. Other accommodations include adjusting seat positions and lighting to allow for optimal acoustics and visualization of patients/family/caregivers, and usage of other effective communication strategies (Bethel & Mormer, 2020).

***Pure-tone Audiometry***

As stated above, audiometers can provide visual feedback to the audiologist whenever the response button is pressed. Visual reinforcement is vital for clinicians who have a hearing difference, as second-guessing patient responses is common (Bethel & Mormer, 2020). There will still be instances where verbal communication with the patient will still be required,

however, the utilization of assistive devices such as FMs and appropriate communication strategies, such as improved lighting, can help improve clinician understanding during those times.

### *Speech Testing*

During audiometric speech testing, clinicians with hearing loss are likely to experience some difficulty in understanding the test words when repeated to them. This struggle can be attributed in part to dim lighting in audiometric test booths and monitoring headphones that do not accommodate hearing aids or cochlear implants effectively (Bethel & Mormer, 2020). An FM system, where the microphone is attached to the patient being tested, and the receiver connected to the clinician's amplification device will help improve speech understanding in this testing situation. Other solutions to problems that arise during speech testing include having the patient write down their responses, pausing Speech-in-Noise tests to hear the patient, and having a second scorer when necessary (Bethel & Mormer, 2020).

### *Objective Testing*

Generally, tympanometry, wideband reflectance, acoustic reflex testing, otoacoustic emissions, and auditory evoked potential testing are measured objectively, not requiring patient responses that need to be communicated verbally to the clinician. This limits the potential for communicative breakdowns between the patient and clinician. However, similarly to audiometric testing, instructions still need to be given, and communication still needs to be maintained between the patient and clinician. Utilizing an HAT and proper communication strategies can improve communication, should any breakdowns occur (Bethel & Mormer, 2020).

### *Amplification Management*

Amplification management refers to counseling on hearing aid and/or cochlear implant usage, care, and maintenance. When asked, clinicians responded positively to the idea that wearing amplification personally was a helpful tool when counseling patients (Bethel & Mormer, 2020). The most commonly reported benefit was being able to relate to patient struggles, which fostered trust between the patient and clinician.

There are still some struggles during counseling, however. Communication breakdowns can be present during a conversation, utilizing HAT and appropriate communication strategies, such as ample lighting and clear sightlines between communication partners can inhibit those breakdowns as much as possible (Bethel & Mormer, 2020).

### *Adjusted Listening Tubes*

Listening tubes are a vital resource for audiologists when assessing the functionality of hearing aids. The listening tubes allow for the audiologist to assess hearing aid function by placing a sound bore over the receiver of the device and inserting another sound bore, usually connected to an earmold. For clinicians who wear amplification devices, the traditional listening tubes create a dilemma: the listening tube earmold will not work with the clinicians' devices. Laura Schauer is an audiologist with cochlear implants, and she worked with Pacific Coast Laboratories to develop a method to overcome this challenge. Using a non-functioning replica of the clinician's amplification device, the earmold impression material is poured onto the microphones and microphone cover creating the impression needed to create a custom cover. This shell is then sent to a manufacturer who creates the custom mold for the clinician's amplification device. Schauer very aptly called these "Laura Listening Tubes" and says she was

"floored by the sound quality" and now other clinicians who wear amplification devices have reached out to Pacific Coast Laboratories to have their custom tubes created (Schauer, 2020).

## Peer and Professional Communication

### *Communication with Clinical Preceptors*

The working relationship between a clinical preceptor and a student clinician is built around successful, clear communication. At times, that communication can experience some breakdowns, as successful communicative strategies, such as a clear line of sight to the speaker, effective lighting, etc., go by the wayside due to time or logistical constraints in the context of a fast-paced healthcare setting. An FM system worn by the instructor would allow the student clinician to receive a clearer message in these instances. Another solution is having the instructor write down the steps to common tasks, such as manipulating hearing aid programming software, to save time and effort for both the instructor and the clinician (Bethel & Mormer, 2020).

### *Telephone Accommodations*

Other accommodations that clinicians might require include Bluetooth devices that allow connection between the clinicians' hearing aids and landline or internet-connected telephones in the clinician's work environment. While the accepted limit of human hearing is approximately 20 kHz, traditional narrowband telephones range between .3 – 3.4 kHz (Cox et al., 2009), this cutoff makes speech understanding more difficult for clinicians with hearing loss, particularly in noisy situations (Picou & Ricketts, 2013).

A 2013 study by Picou and Ricketts examined the speech understanding of 18 adults with moderate-to-severe sensorineural hearing loss (SNHL) over the telephone in noisy environments. Four criteria were tested: acoustic coupling to the telephone, unilateral telecoil, unilateral wireless streaming, and bilateral wireless streaming. Scores were tested both in speech

recognition scores and subjected ratings. Speech recognition was lowest in the acoustic coupling situation, but highest in the bilateral streaming situation (Picou & Ricketts, 2013). Other studies suggest that direct Bluetooth connection is better and that some intermediary Bluetooth devices are not as successful in aiding speech understanding in noise (Leavitt et al., 2016). However, if the clinician perceives a benefit from the device, they should be encouraged to use it.

**Professional Organizations**

Many professional organizations strive to provide accommodations for anyone with hearing loss. This includes workers in general, medical professionals, any individual with a hearing difference, and even audiologists within their field. These organizations provide a voice for individuals with hearing differences and fight for equality and understanding in both a social and legal manner.

***Table 2.1***

*Compilation of some professional organizations and their duties.*

| Name of Organization | Target Population | Information about |
|---|---|---|
| Hearing Loss Association of America (HLAA) | All individuals with hearing loss | With 250 chapters in the United States, the HLAA strives to provide a voice for all individuals with hearing loss through education, information, support, and advocacy. |
| Alexander Graham Bell Association for the Deaf and Hard of Hearing (AG Bell) | All individuals with hearing loss | Utilizing advocacy, education, research, financial aid, AG Bell strives to safeguard the opportunity to have access for every child and adult with hearing loss. |
| Association of Late-Deafened Adults (ALDA) | Individuals with hearing loss later in life | ALDA supports the empowerment of late-deafened adults, who may have lost access to language that they had in the earlier stages of life. |
| Hearing Health Foundation (HFF) | All Individuals | The HFF strives to promote hearing health through groundbreaking research and other accommodations. |
| Local Division of Vocational Rehabilitation (DVR) | All working individuals with any disability | The DVR is a resource for any individual who wants to work, or is currently working, but is limited by any disability. They work to promote a thriving employment environment for any individual. |
| The Association of Medical professionals with Hearing Losses (AMPHL) | Deaf and hard-of-hearing healthcare professionals | AMPHL is a non-profit organization that provides information, as well as other resources, including amplified stethoscopes and other accommodation methods, to individuals with hearing loss in the medical field. |
| Students with Hearing Loss Subcommittee of the American Academy of Audiology | Graduate and undergraduate students with hearing loss | This group strives to equip students with hearing loss the tools they'll need to be successful in their fields in the future. Including resources for accessibility, empowerment, and education. |
| American Academy of Audiology (AAA) | All Audiologists, Including those with Hearing Loss | AAA is a governing body of audiology and has an annual conference. During that conference, the Deaf-and-Hard-of-Hearing Audiologists meeting is held, striving to provide resources for members who have a hearing loss. |

The table above is not comprehensive but aims to provide a starting place for resources for audiologists who have hearing loss. The above organizations are designed to be helpful and can provide further resources that may be necessary.

## Summary

Other incidences will arise for clinicians with hearing loss that will require some quick thinking and problem-solving. When asked where graduate audiology students found solutions to communication challenges they faced, 33 percent reported that they came up with it themselves, 32 percent reported that their supervisor came up with it, 15 percent from other places in their program, 10 percent from social media, and 10 percent from other sources (Bethel & Mormer, 2020). The clinician needs to find for themselves what works best for them. Experience in a clinical setting will allow for a better understanding of their needs, as well as the best way to overcome any challenges faced.

# CHAPTER III

# CRITICAL REVIEW OF THE LITERATURE

The research literature on the topic of audiologists with hearing loss is limited in terms of available research. In this chapter, specific limitations to the literature regarding this topic will be discussed. These limitations can be related to the scope of this writing project, but also the scope of available research in this topic area. Furthermore, every individual has unique hearing and communication needs, and as such, a decision on appropriate accommodations should be taken on a case-by-case basis. The individual goals and needs of each person should be paramount, all variables should be accounted for to produce the best possible outcomes. That makes research design and implementation challenging. There is a need for more case studies regarding audiologists with hearing loss. This section will dive deeper into the present limitations in this topic area.

## Audiology Focused

This manuscript focused mostly on the field of audiology, and not on other medical fields. All individuals are subject to hearing loss, and therefore all professions are subject to requiring accommodations for individuals with hearing differences. There is a need to address the scope and depth of which accommodations are available for each population.

## Medical School Population with Hearing Loss

As stated earlier, the total population of individuals with hearing loss represents roughly 20% of the global population (World Health Organization, 2018). Eickmeyer et al. (2012) investigated the current state of medical schools using appropriate accommodations for students who have physical and sensory disabilities (PSDs), which includes SdDHH. Surveys were sent to 163 medical schools either accredited by the Liaison Committee on Medical Education (LCME) or the American Osteopathic Association (AOA), with a response rate of 52.8% (86 schools). Out of those 86 schools that responded, 470 students were identified as having PSDs. Difficulty with hearing (including d/Deafness) was the most common impairment or limitation to activity gathered from the survey, with 83 students falling into that category. This, also given that the rate for students who have PSDs of any kind is approximately 0.2% of all students in medical school, would suggest that SdDHH would be underrepresented in medical schools (Eickmeyer et al., 2012).

## Nursing School Population with Hearing Loss

There are no studies where the researchers examine the exact number of nursing school students who have hearing loss. However, Spencer and Pennington (2015) predict that approximately 450,000 to more than half a million registered nurses experience hearing loss and are currently working in the field. The predicted population, however, assumes that the percentage of nurses, and therefore nursing students, is an accurate correlation to the total population of people who experience hearing loss in the US. To arrive at the population estimation, the hearing loss prevalence rate for the overall adult population (15-17%) was

applied to the more than 3 million licensed nurses in America, according to the American Academy of Colleges of Nursing.

## Absence of Research

There is presently a lack of research in the area of what accommodations work best for audiologists with hearing loss. Bethel and Mormer (2020) are one of the few examples of a document that outlines what if any, accommodations are utilized the most, as well as the perceived benefit from those accommodations. More published literature and case studies are needed in this subject area to draw definite conclusions and better describe the audiology work settings/situations where hearing loss is most challenging. Most of the information in this area is anecdotal, oftentimes shared between professionals or in social media posts. The development of a more structured research base can allow for further development of standardized guidelines, not only within the field of audiology but within the medical field as a whole. However, the field of audiology is a small field, with the individuals meeting the requirement of having a hearing loss even smaller. The absence of a large population inhibits the ability to perform larger-scale studies that can yield statistically significant results.

## Usage Limitations

Whether it be simply not knowing that a hearing loss is present, or resistance to admitting that there is a hearing difficulty, the number of people who could benefit from some sort of HAT is smaller than the number of people who use them. Nassiri et al. (2021) reported that approximately 21% of the candidate population for hearing aids used the devices in the year 2015, which leaves the majority (79%) of potential candidates not utilizing hearing aids at all, whatever the reason for that non-usage may be.

Another limitation to HAT usage is understanding how to care for and maintain the devices. McNicholl et al. (2021) outline that assistive devices can be beneficial for students, but require education and resources for support and training, for the devices to work properly. If the devices are not maintained, they may begin not to work properly, which can lead to not using the devices at all. It is also not well understood who is responsible for accommodating hearing loss in the workplace, especially for small employers.

## Summary

Appropriate accommodation for audiologists with hearing loss should be considered on a case-by-case basis. There will likely be some trial-and-error, as individuals with hearing loss try and find the most effective way to get the communication cues they need while imposing on their day-to-day activities as little as possible. Overall, there is an underutilization of hearing devices (Nassiri et al., 2021) that needs to be addressed. Education on HAT devices are vital for effective and long-term use (McNicholl et al., 2021), hopefully with more knowledge the utilization rates for amplification devices and other assistive devices will increase. There is a need to educate employers and support healthcare workers with hearing loss. More research on appropriate accommodations within the field of audiology, as well as all medical fields, is warranted.

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