

ASSIGNMENT No. 2

Q.1 What are the effects of ear mould modification and the techniques involved in its modifications?

It is a popular belief among some hearing care professionals that digital electronics has rendered knowledge of basic earmold modifications unnecessary. This statement is supported by the following observations:

- 1) Most clinicians rely on software to electronically adjust the gain and frequency response of the hearing aid. Although this is certainly an effective way to modify the acoustic parameters of a modern hearing aid, there may be times when adjustments to the acoustical plumbing of the device are useful.
- 2) Many graduate-level audiology programs offer little hands-on or academic training on earmold modifications and how they affect the acoustical characteristics of the fitting. For example, the Handbook of Clinical Audiology, long a staple reading for audiology graduate students, eliminated its chapter devoted to earmolds after the third edition, which was published in 1985.
- 3) Published reports in the pertinent journals are scarce, as a recent search uncovered less than a dozen articles related to earmold acoustics and earmold modifications.

The purpose of this article is to revisit some of the more practical considerations surrounding the selection and modification of earmolds and how those factors contribute to a more successful hearing aid fitting.

The belief that digital electronics supplants the need for modifications to earmolds is not without merit. It is indeed true that many changes to the acoustic parameters of a modern hearing aid can be readily adjusted with a few clicks of a mouse or computer keyboard, using the manufacturer's fitting software. Many traditional earmold modification techniques that lost favor in the '80s and '90s due to the surge in custom product popularity need to be re-examined with the surge in behind-the-ear (BTE) product use since 2005.

One of the likely factors contributing to the disregard of earmold acoustics and how they contribute to a successful fit can be attributed to the popularity of open-canal (OC) technology. Mini-BTE devices, which are usually coupled to the ear with a noncustomized thin tube and dome ear tip, comprise a significant part of total OC sales. As others have demonstrated,¹⁻³ the fitting range of mini-BTE OC products can be extended with the use of a custom earmold. Although no longer considered an open-canal fitting, mini-BTEs—when coupled to a custom-made earmold using either a thin tube or a thin wire—maintain their cosmetic appeal.

When sales of OC products are combined with conventional BTE hearing aids, well over half of all hearing aids sold in the United States have the potential to be coupled to the ear with a custom earmold. Thus, it is prudent to revisit some of the basic science surrounding earmolds and earmold acoustics, especially as it relates to thin tube/thin wire mini-BTE technology.

As conventional wisdom would dictate, the choice of earmold material and style depends a great deal on the extent of the hearing loss and the professional's need to meet specific gain and output requirements. Kuk⁴ determined that the canal portion of the earmold contributes the most to maximum gain requirements of the BTE. This would suggest that skeleton and canal style earmolds are appropriate for hearing losses up to about 75 dB HL.

Another important consideration is the type of material used to make the earmold. In general, softer materials, such as silicon and vinyl, are used for hearing losses greater than 75 dB HL.

Regardless of the earmold style or material, Lybarger⁵ noted three requirements of a properly fitted earmold:

- 1) **Acoustic seal.** The earmold needs to direct sound toward the eardrum without acoustic feedback.
- 2) **Comfort.** The earmold should fit as comfortably as possible without causing irritation to the external ear.
- 3) **Aesthetic appearance.** The earmold needs to be as inconspicuous as possible within the limits set by the acoustic requirements of the patient.

More than 44 years since Lybarger made these observations—and even though electronic feedback cancellation algorithms exist in many modern hearing aids—these three basic requirements still hold true. In fact, given the proliferation of mini-BTE products, these three considerations take on a renewed importance addressed in the final section of this article. First, however, the basic acoustic factors affecting earmold performance will be reviewed.

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Q.2 Explain the different criteria of selection of hearing aid systems to be used in classrooms.

Audiologists generally recommend that children with hearing loss utilize prescribed hearing technology during all waking hours. A recent report from a multisite study reported hearing aid use time in 272 children with hearing loss, ages 6 months to 7 years, using parent estimates and data logging records (Walker et al., 2013). Data logging reports from 133 of the original 272 children revealed that average daily hearing aid use time was 8.3 hr per day, with some children showing no use of hearing aids and others showing as much as 16 hr of use per day. Such results suggest that some children are not following the recommendation of full-time hearing aid use during the first 7 years of life.

Walker et al. (2013) also used parent-estimated daily use time to investigate factors that influence hearing aid use in these same 272 children. Children who were older, children who had moderate-to-severe hearing loss, and children whose mothers completed college had parents who reported more hours of daily hearing aid use than younger children with mild-to-moderate hearing loss and those with mothers who did not complete college. Such findings provide valuable information regarding factors that may place children at risk for not using

hearing aids consistently from birth through 7 years of age. Research that examines trends of daily hearing aid use, as well as factors influencing this use in children with hearing loss who are older than 7 years of age, is extremely limited.

As children grow older, factors other than those addressed by Walker et al. (2013) may influence whether the child wears hearing aids. One potential factor that might contribute to school-age children wearing hearing aids less than full time could be a lack of perceived benefit due to hearing aid malfunction. Several early studies documented that hearing aid malfunction rates can occur in 27%–60% of devices used by school-age children with hearing loss (Bess, 1977; Gaeth & Lounsbury, 1966; Riedner, 1978). These studies provide information regarding a potential reason for limited use of early generations of hearing aid technology. However, these studies do not provide sufficient information regarding the ages of children represented in their samples, making it difficult to generalize their results to today's population of school-age children with hearing loss.

Another factor that might influence hearing aid use beyond 6 years of age is the changing educational environment as children continue through primary and into secondary school. For instance, full-day academic instruction often requires children to spend 6–8 hr in classrooms with 15–30 other children and only one or two teachers. As children advance through primary school, they often receive instruction from multiple teachers in multiple classrooms. Because this educational structure yields an environment in which the teacher may have increased difficulty monitoring the use of hearing assistive technology for one of his or her many students, the responsibility to maintain consistent hearing aid use is generally transferred to the child. This may occur before the child is responsible enough to take on the role of hearing aid management. During this time, social pressure to “fit in” with peers with normal hearing may also negatively influence how the child shoulders this new responsibility. For instance, Keilmann, Limberger, and Mann (2007) found children with hearing loss between the ages of 6 and 11 years to show less self-confidence than their peers with normal hearing as they reach higher grades. This reduction in self-confidence is likely a result of increased social pressure as children advance through primary school (Elkayam & English, 2003). Low levels of self-confidence have been shown to result in reduced use of prescribed eyeglasses in school-age children (Castanon Holguin et al., 2006; Dias, Hyman, Manny, Fern, & COMET Group, 2005). It is reasonable to posit that children in this age range who have hearing loss might show a similar decline in consistency of hearing aid use that is reflective of this reduction in self-confidence.

Understanding hearing aid use patterns in school-age children is a first step in beginning to examine factors that might place children at risk for inconsistent hearing aid use in the classroom. The primary purpose of this pilot study was to document the use of hearing aids during regular classroom instruction in a small sample of children with mild-to-moderate hearing loss between the ages of 6 and 12 years. In addition, we explored the impact of factors known to affect hearing aid use in a younger population of children (degree of hearing loss and grade level of the child) on hearing aid use in this sample of school-age children.

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Educators, audiologists (experts who diagnose and treat hearing problems), speech therapists, parents, and students with hearing loss can work together to create an educational plan. This may include setting up an individualized education program (IEP) or 504 plan to help kids reach their full potential. Plans may include a classroom aide or interpreter to assist with communication and more. As a child grows, this plan will change.

To support students in your classroom:

- **Make seating changes.** Kids with hearing loss may need to sit closer to the front of the class to speech read (read lips) or hear more clearly. Also consider arranging chairs in your classroom in a U-shape or circle so that students with hearing loss can better interact with classmates.
- **Minimize background noise when possible.** This may mean finding quiet areas for a student to work.
- **Use an FM system.** This device helps a child with hearing loss or listening problems hear their teachers better in a noisy classroom. To use the system, a teacher wears a microphone/transmitter and the student wears the receiver, which amplifies sound.
- **Face students when you speak.** Most students with hearing loss can speech read to some extent. To help them, face them when you talk, talk slowly and clearly, and don't yell. As long as they have their devices on, you can speak in a normal tone.
- **Use lots of pictures, graphics, and text labels.** Many students with hearing trouble are visual learners.
- **Use technology to make learning easier.** This includes having real-time captioning on any videos used in the classroom and using voice-recognition software on computers. For more ideas, ask the student's family, the audiologist, or special education teacher.
- **Have a plan for missed instruction, assignments, and testing.** Students with a hearing difficulty may miss class time to go to doctor visits. Know how the student will make up for missed time.
- **Talk about and celebrate differences.** Students with hearing loss want to be accepted like everyone else. But sometimes they're targeted by others who see them as "different." Talk about and celebrate differences, and focus on the interests that kids share. Be mindful of bullying, and keep a zero-tolerance policy for that behavior.
- **Encourage participation** in classroom activities, physical education, and extracurricular activities.

Q.3 What are the different ranges of accessories required for the hearing aid?

Because hearing aids are meant to be worn daily, they require occasional upkeep to stay in working order. Some of the necessary accessories needed to care for and maintain your hearing aid may be provided by your hearing care provider as part of your hearing aids purchase. Others you may need to purchase separately, and are purely optional.

In addition, if you have hearing loss, you might also be interested in purchasing an assistive listening device (ALD) to boost your hearing experience. ALDs can make it easier to talk on phone, watch TV, attend public events and participate in work meetings.

Must-have hearing aid accessories

Batteries

Batteries are a must-have for hearing aids.

All hearing aids require a power source to function. Unless you have rechargeable hearing aids, you're going to need an ongoing supply of disposable hearing aid "button" batteries.

Hearing aid batteries are available in four different sizes. From smallest to largest, these are: 10, 312, 13 and 675. Your hearing aids will run on one of these specific types of batteries, and your hearing care provider will usually provide a small number of batteries to get you started. Batteries use a standardized color coding system to help ensure you get the right type.

- Size 10 batteries - yellow
- Size 312 batteries - brown
- Size 13 batteries - orange
- Size 675 batteries - blue

Always carry spare batteries with you so you're prepared for your day and can keep your hearing aids running without interruption. Also, because batteries are an ongoing purchase, ask your provider about any battery clubs or mail order programs that can make battery purchases convenient and economical.

Always carry spare batteries with you.

Cleaning tools

Cleaning and hearing aid care should be part of your daily routine.

Regular cleaning, along with routine maintenance from your hearing care provider will keep your hearing aids working reliably and will extend their useful life. These are the most common tools to use for everyday cleaning.

Optional hearing aid accessories

While batteries and cleaning equipment are essentials for every hearing aid wearer, these optional accessories might make caring for your devices easier or help you get more benefit from them.

- **Hearing aid dryer/dehumidifier:** If you perspire heavily, live in a humid climate or enjoy lots of outdoor activity that might expose your hearing aids to damaging moisture, these accessories can help.
- Basic dehumidifiers use a desiccant to draw out moisture overnight. The desiccant will last a long time with regular reactivation. Some desiccants are contained in a soft pouch that can be reactivated

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in the microwave oven for about 1 minute. Others are housed in a metal tin that can be placed in an oven heated to 325° for about 30 minutes.

- The more sophisticated ReNew hearing aid dry box is a small electronic device that uses UV light to dry and sanitize hearing aids overnight. These are available for purchase online or through your hearing care professional.
- **Bluetooth streaming devices:** Most advanced hearing devices are already Bluetooth compatible, making it easy to connect wirelessly to various devices like cell phones, MP3 players and televisions. You will probably need a relatively inexpensive external streaming device designed to work with your specific hearing aids.
- **Assistive listening devices:** These accessories can help your hearing aids work better in very specialized listening environments like classrooms, lecture halls, music venues and theaters. Some work with your home telephone to make conversations easier and still others can vibrate to wake you in the morning or alert you when someone is at your door.
- **Carrying case.** If you're a fan of swimming or other outdoor activities, you may need to occasionally remove your hearing aids when out and about. Waterproof, shatterproof carrying cases, such as the AidKeeper, can be a great idea to keep your hearing aids safe and dry.

Hearing aid accessories for lifestyles

The examples above are just a few of the numerous hearing aid accessories tailored to specific lifestyles. If you enjoy golf, biking or running, sweatbands will help keep perspiration from reaching delicate hearing instruments. Other accessories have clips that enable you to participate in sports or physical activities while keeping devices clean, dry and prevent them from falling out.

Other accessories like colorful charms and decals can help make wearing hearing aids more fun whether you're a fashion-conscious adult or a child who wants to express individuality.

Q.4 How classrooms can be more beneficial for the social development of children with exceptions?

Explain the means of improving acoustic conditions in classrooms.

Parent involvement typically involves parents' behaviors in home and school settings meant to support their children's educational progress. Measures of parent involvement commonly include the quality and frequency of communication with teachers as well as participation in school functions and activities (Dearing, McCartney, Weiss, Kreider, & Simpkins, 2004; Dearing, Kreider, Simpkins, & Weiss, 2006; Machen, Wilson & Notar, 2004). Parent involvement also characterizes parents' values and attitudes regarding education and the aspirations they hold for their children (Catsambis, 2001; Englund, Luckner, Whaley, & Egeland, 2004). Although values and attitudes may not directly influence academic outcomes, they may enhance academic achievement indirectly by promoting children's motivation and persistence in challenging educational tasks.

Parent involvement bridges two key contexts in children's early development, namely the home and school settings. Within an ecological framework (Bronfenbrenner & Ceci, 1994), the home and school contexts are characterized as autonomous microsystems and parent involvement is conceptualized as a mesosystem, which is made up of interactions between key microsystems. Although each setting can independently influence a child, together the home and school contexts interact to offer a unique influence. In this study parent involvement is conceptualized as a product of the interaction between the influences of school and home settings by providing continuity between the two environments. For example, if parents are aware of a teacher's instructional goals, they may provide resources and support for those learning aims at home. Similarly, in terms of social development, parent involvement may facilitate the development of consistent disciplinary approaches across home and school. Accumulating evidence suggests that these parenting practices are associated with higher academic success in the early grades, although links to socioemotional outcomes remain less clear.

Academic Achievement

Past research on parent involvement and children's academic skills is mixed. Some studies have found no significant association between parent involvement and academic achievement and a few have even detected negative associations. Yet, positive associations between parent involvement and academic achievement have been demonstrated repeatedly in the literature. A recent meta-analysis by Fan and Chen (2001) finds moderate associations between parent involvement and an array of learning-related or academic skills, such as achievement motivation, task-persistence, and receptive vocabulary, during preschool and kindergarten. With a predominant research focus on parent involvement and achievement in either preschool and kindergarten or high school, the potentially supportive role of parent involvement during middle childhood remains understudied.

Past non-experimental research on parent involvement commonly investigates contemporaneous associations between parent involvement and academic achievement. These studies typically examine within-grade associations of parent involvement and academic skills. Other work incorporates contemporaneous research in the early grades with longitudinal follow-up data later in elementary school or beyond. For example, Miedel and Reynolds (1999) detected positive associations between parent involvement in preschool and kindergarten and reading achievement in kindergarten and in eighth grade. Izzo and colleagues (1999) also found significant positive associations between average parent involvement in early elementary school and socioemotional development and achievement in later elementary school. Such studies reflect the common practice of considering parent involvement as a static predictor of concurrent achievement or educational outcomes in later school years. A notable exception is a study by Dearing and colleagues (2006) which employed longitudinal data on parent involvement and reading achievement to examine within- and between-family associations of parent involvement and literacy across elementary school. Findings suggested that differences in levels of parent involvement between-families and changes in parent involvement within-families were both predictive of children's literacy skills, and increasing parent involvement during elementary school improved literacy growth.

Recent research in neuroscience, developmental and learning sciences, education, sociology, and many other fields confirms that a “whole child” approach is not only desirable but necessary to ensure that children learn well. According to two comprehensive reviews of the science on children’s development and learning:

- Brain development is shaped by consistent, supportive relationships; responsive communications; and modeling of productive behaviors. The brain’s capacity develops most fully when children and youth feel emotionally and physically safe; and when they feel connected, engaged, and challenged.
- Learning is social, emotional, and academic. Positive relationships, including trust in the teacher, and positive emotions, such as interest and excitement, open up the mind to learning. Negative emotions, such as fear of failure, anxiety, and self-doubt, reduce the capacity of the brain to process information and learn. Children can build skills and awareness to work with emotions in themselves and their relationships.
- Adversity—poverty, housing and food insecurity, abuse, or neglect—produces toxic stress that affects learning and behavior, but how schools respond matters. Positive, stable relationships—when adults have the awareness, empathy, and cultural competence to understand and listen to children—can buffer the effects of even serious adversity.

Q.5 What is education audiology? What is its role in schools of children with speech and language difficulties?

Hearing loss can affect a child mildly or in a very profound way. Profound hearing loss may mean that a child is “deaf.” Kids are born with hearing loss or can lose their hearing through injuries, infections, or long exposure to loud noises.

Signs that a child has hearing loss include:

- having limited or unclear speech
- not following directions or paying attention
- hearing only parts of a conversation; asking for information to be repeated
- not being able to hear everyday sounds, like a school bell or morning announcements
- learning problems

Hearing loss can be temporary. But when it’s not, there are technologies, therapies, and other treatments to help. Devices like hearing aids and cochlear implants can improve a child’s ability to hear. Learning sign language or speech reading can also make it easier to communicate.

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Speech and language disorders can affect the way children talk, understand, analyze or process information. Speech disorders include the clarity, voice quality, and fluency of a child's spoken words. Language disorders include a child's ability to hold meaningful conversations, understand others, problem solve, read and comprehend, and express thoughts through spoken or written words. The number of children with disabilities, ages 3-21, served in the public schools under the Individuals with Disabilities Education Act (IDEA) Part B in Fall 2003 was 6,068,802 (in the 50 states, D.C., and outlying areas). Of these children, 1,460,583 (24.1%) received services for speech or language disorders. This estimate does not include children who have speech/language problems secondary to other conditions.