

# Hearing problems and the evolution of children



Hearing is an important aspect of our everyday lives. If there is some sort of damage to either one's outer ear, middle ear, or inner ear, hearing loss can arise. Hearing loss can occur both at the time of birth or over time as a result of an injury or disorder. Any type of hearing loss that emerges in children will affect their ability to hear, but it can also alter their ability to develop speech, language, and social skills as they evolve in life.

The different varieties of hearing loss are known as conductive, sensorineural, mixed, and central. Conductive hearing loss is described as an issue occurring in either the outer or middle ear. One of the main problems could occur from an obstruction to the external ear canal which results in sound not being able to move to the tympanic membrane to the middle ear to the inner ear and finally to the brain. Another cause of conductive hearing loss is when there is fluid present in the middle ear, which is called otitis medias. These are examples of how a conductive hearing loss can occur over time. However, this hearing loss can also emerge because an individual is born with an irregularity to their tympanic membrane or to their ossicles that are located in the middle ear. In many cases, this type of hearing loss is considered temporary. In this case, it is able to be treated with medicine or if needed, surgery. Sensorineural hearing loss is a category which differs from conductive as it results from an issue that arises in the inner ear as opposed to the outer or middle ear. It stems from damage to the hair cells in the inner ear that help in transducing mechanical movements into electrical impulses which are then sent to the brain. With damage to the hair cells, sound vibrations are not able to be converted into electric signals and those signals do not get sent to the brain. Typically, a sensorineural hearing loss happens

at birth, or, in other words, it is genetic. However, as with conductive hearing loss, sensorineural can also develop over time. If a child is exposed to loud noises for a long period of time, this can result in damage to the hair cells and even death of hair cells, creating the same issue in the inner ear as those with the genetic condition. Unlike conductive hearing loss, this normally cannot be treated with medicine or surgery, it has been found to be permanent. Mixed hearing loss is described as a combination of the two hearing losses already discussed, conductive and sensorineural. Lastly, central hearing loss occurs when the cochlea appears to be functioning properly, but there are other parts of the brain that are not. This type of hearing loss is much more difficult to diagnose and therefore, more difficult to treat.

In this class, we talked a lot about frequency. Frequency can be defined as the amount of cycles that occur in a set amount of time. This is closely related with pitch and is an essential concept when talking about hearing loss. As discussed before, an inner ear hearing loss comes with damage to the hair cells that are found in the cochlea. This causes a hearing loss in a specific frequency range. This idea can be described by the place theory which says that our recognition of sound depends on where on the basilar membrane the vibration occurs and at what frequency. The basilar membrane is inside the cochlea and detects high frequencies at the base and low frequencies at the apex. If there is hair cell damage to the base of the basilar membrane, that child will experience hearing loss of high frequency sounds and just the opposite if there is hair cell damage to the apex, they will experience hearing loss of low frequency sounds.

All the hearing losses listed above can affect a child's life in many different ways. The earlier one of these hearing losses develops, the greater the effect is on how that child evolves. However, if the problem is identified early, that impact will be less severe. Not only are the child's hearing abilities altered, but their speech and language are as well. If a child cannot hear, they may not be able to produce speech the same way as a child with no hearing deficits. It makes it much more difficult for them to develop speech and language which then affects how these children will learn. Hearing loss can create obstacles and frustrations in children academically and socially.

As discussed before, there are different categories of hearing loss, but there are different degrees of hearing loss as well. These can range from mild to profound. If a child has some sort of mild hearing loss, they will be able to hear sounds at around 25-40 dB but may have trouble hearing and understanding soft speech and/or speech from a distance. If a teacher turns their back to write something on a board, but they continue to talk, this makes it very difficult for a child with a mild hearing loss to get what the teacher was saying and can cause them to miss a lot of the lesson. This could cause some sort of delay in academic performance as they are missing a portion of what their other classmates are not. A child with a moderate hearing loss, will be able to hear sounds at around 40-55 dB. They will most likely have trouble hearing regular speech, even if they are in close distance of the where the sound is coming from. Within moderate hearing loss, one could be diagnosed with moderately severe hearing loss. Individuals are able to hear sounds within 55-70 dB but nothing quieter than 55 dB in most cases. With severe hearing loss, children are able to hear sounds at around

70-90 dB. With this degree of hearing loss, most normal speech is unable to be heard, children generally can only hear shouting. Lastly, a child with a profound hearing loss will hear sounds at around 90 dB and above but nothing below that. These children may be able to recognize loud sounds as vibrations, but they are not able to hear much with this degree of hearing loss. It has been shown that children with any type of hearing loss, no matter what level of degree listed above, struggle with social skills and pragmatics. Communication is crucial for relationships, and children with a hearing loss may develop certain social skills slower than other children their age. For example, a child may not be able to hear their own voice when speaking, therefore children cannot tell if they are speaking loudly or not loudly enough. This type of problem affects a child's social skills, as it interferes with what is perceived as "normal" in a conversation which can then lead to social isolation for these children.

How a child develops is heavily reliant on their ability to process sound. It aids the development of speech, language, and basic communicational skills. However, there are many problems that can arise with hearing. There are different hearing losses that can be either genetic or occur as one develops in life, but they are pretty common for children. It is important to be aware of these different varieties of hearing loss and what these children may be experiencing academically and socially. This will help them succeed and provide them with guidance as they adjust to different learning strategies. With concepts relating to Physics, we can further understand the different varieties and degrees of hearing loss that occur in children and use that information to aid in assisting them. As a future educator, it is critical to be

informed on these different impairments as we want to make sure that every child is able to learn and achieve their goals throughout their lives.

## References

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