

Unilateral Hearing Loss in Children



*Best Practice Guidelines
for Professionals*

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What is unilateral hearing loss?

Unilateral hearing loss (UHL) is defined as having a hearing loss in one ear only, ranging from mild to profound in degree, while the hearing in the opposite ear is normal.

What types of hearing problems are caused by UHL?

Because children with UHL have one ear with normal hearing, they typically hear the best when in close proximity to a speaker in a quiet environment. In less than ideal listening situations, children with UHL experience greater hearing difficulty than children with binaural (two ears) hearing.

A child with UHL may experience difficulties with the following tasks:

- Locating the source of a sound – With one-sided hearing, children hear sounds in their better ear. Therefore, the child perceives that the sound is coming from the direction of the ear with normal hearing. As a result, the child might have to scan the environment visually to find the location of the sound source. This difficulty with localizing poses a safety risk for children with UHL. For example, children with UHL are unable to determine the direction of approaching cars that are out of their visual field. For that reason, children with UHL should be equipped with mirrors on their bicycles and taught the importance of using them.
- Understanding distant or soft-spoken speech.
- Listening within noisy or echoey environments – In these conditions, a child with UHL may have difficulty paying attention or following directions.
- Hearing and understanding speech directed towards the ear with hearing loss – Due to this difficulty, the child should be seated appropriately. S/he should be close to the person speaking. The child's better hearing ear should also be towards the talker.



What are some causes and types of UHL?

A hearing evaluation will not reveal the cause of UHL. Rather, the audiogram will only specify the type (i.e., conductive, sensorineural, or mixed) and degree of the hearing loss. The exact cause of UHL varies among children and depends upon his or her case history (see possibilities in the discussion below). Children can be born with a UHL (congenital) or acquire a UHL later in life.

Hearing loss occurs when there is a disruption in the flow of sound through the ear. The type of hearing loss is dependent upon the location where the disruption of sound is occurring. The ear comprises three parts-- the outer, middle, and inner ear.

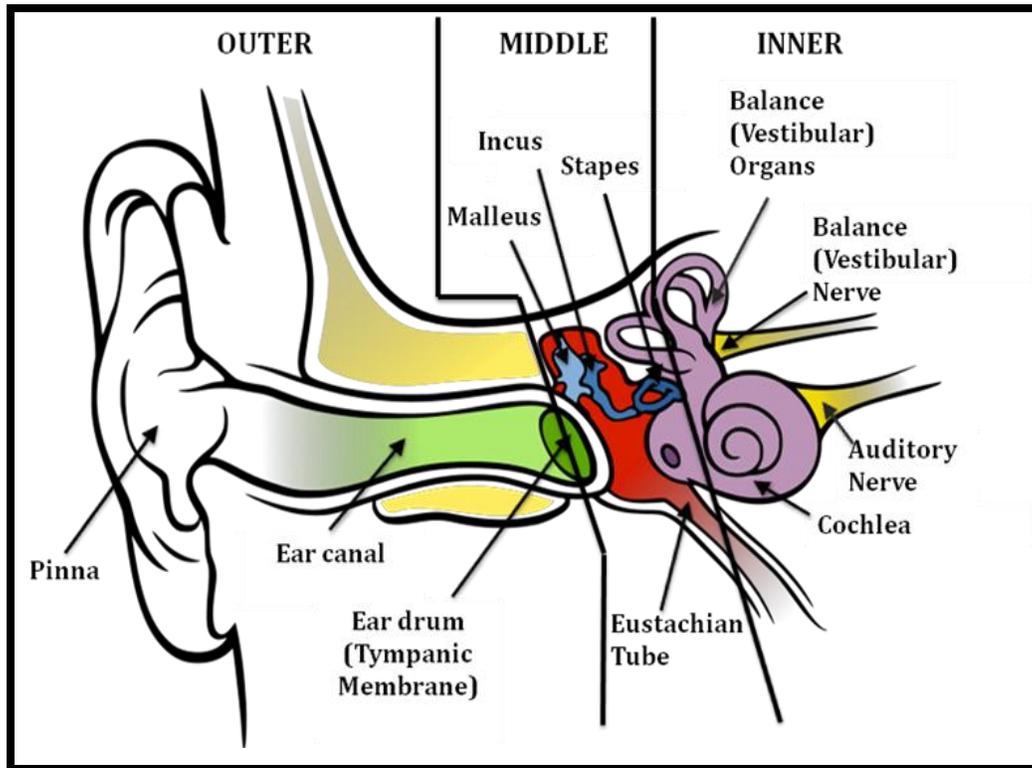


Figure 1. Anatomy of the human ear. Adapted from http://commons.wikimedia.org/wiki/File:Anatomy_of_the_Human_Ear_blank.svg.

The outer ear includes the pinna and the ear canal. The eardrum (i.e., tympanic membrane) separates the outer ear from the middle ear space.

Possible outer ear pathologies:

- Pinna or ear canal structural abnormalities (e.g., misshapen or absent pinna, narrow or absent ear canal)
- Foreign objects in the ear canal
- Excessive wax or wax impaction (i.e., the ear canal is completely blocked with wax)
- Ear drum perforation or scarring
- Growths in the ear canal (e.g., cholesteatoma, exostosis)
- Infection in the ear canal (otitis externa – “Swimmer’s ear”)

The middle ear is an air-filled space behind the ear drum that houses the three bones of the ear, the malleus (“hammer”), the incus (“anvil”), and the stapes (“stirrup”), known collectively as the ossicles. The opening of the Eustachian tube is also in the middle ear, as it connects this space to the back of the throat.

Possible middle ear pathologies:

- Fluid or infection (otitis media)
- Structural abnormalities or damage to the ear bones (ossicular disarticulation)

Pathologies affecting the outer and/or middle ear prevent the conduction of sound to the inner ear where the organ for hearing is located. Therefore, a hearing loss involving the outer and/or middle ear spaces is known as a conductive hearing loss. A conductive hearing loss can be temporary or permanent. In many cases, the effects of a conductive hearing loss can be corrected by a physician through surgery or medicine or remediated by an audiologist through an amplification device.

The inner ear is a fluid-filled cavity that houses the organs for hearing and balance. The cochlea contains thousands of sensory hair cells, which transmit sound to the auditory nerve. This neural signal or message is then sent through the central auditory nervous system to the brain for processing.

Any damage to the hair cells or the auditory nerve and/or central auditory nervous system results in a permanent hearing loss. Noise exposure, medication, trauma, viruses, infections, or genetic causes can damage the cochlea and hair cells. Any disruption located in the inner ear is known as a sensorineural hearing loss.

A hearing loss with both conductive and sensorineural components is referred to as a mixed hearing loss.

Will UHL affect a child's speech and language development?

Some children with UHL develop speech and language as expected. However, children with UHL are at risk for speech and language delays even prior to beginning school. Children with UHL typically say their first word around 12 months of age. However, putting two words together around 2 years of age may pose a challenge for this population.² Additionally, their expressive and receptive language can be delayed.³ This risk of speech and language delays can be reduced if a child with UHL receives appropriate intervention services before 6 months of age.

Will UHL affect a child's academic performance?

Many children with UHL perform well academically. However, children with UHL typically have more difficulties in language-based subjects, such as reading, writing, and spelling, in comparison to their peers with normal hearing.⁴ Children with UHL are more likely to repeat a grade level. A typical learning environment poses many challenges for children with UHL. Excessive background noise levels and lack of proximity to the instructor might cause a child with UHL to miss portions of the spoken message. As a result, a child with UHL might need to focus more of his or her energy on attending to the instructor's message instead of learning the concept. Please review the "Communication Strategies" section to learn how children with UHL can be helped in their learning environments.

What is the psychosocial impact of UHL?

UHL can be deceptive. Children with UHL generally hear well in quiet situations when in close proximity to the talker. In adverse listening conditions, however, they experience greater difficulties than their peers with normal hearing. As a result, children with UHL may be accused of selective listening, when in reality their ability to hear well is situational (i.e., noisy vs. quiet environment, distant vs. close speech, etc.). Children with UHL must place more energy on attending to the message, which becomes tiring. Their fatigue can be mistaken for being uncooperative, inattentive, or unmotivated.⁵ Furthermore, a child with UHL might exhibit other behavior issues (i.e., "act out") due to the frustration that s/he experiences in adverse listening conditions.⁶ The people involved in the child's life should be informed of his or her UHL and these possible psychosocial issues. The list of communication strategies should also be shared with these individuals to facilitate the management of the child's UHL and reduce the potential occurrence of negative behavior.

What are some special considerations for a child with UHL?

All individuals should use hearing protection in situations with loud noises, such as music concerts or when operating loud machinery. Hearing protection is especially crucial for a child with UHL in order to prevent additional hearing loss. An audiologist can recommend appropriate hearing protection devices for a child with UHL.

Another factor to consider is middle ear fluid and/or infections (i.e., otitis media), which can result in a temporary reduction of hearing. Middle ear fluid and/or infections should be aggressively managed to reduce

the impact on a child's UHL. The child's primary care physician should be consulted if middle ear fluid is suspected in the child's ears.

Can a child with UHL benefit from amplification?

A child with UHL may benefit from using one of the following devices. It is important to discuss the management of the child's UHL with his or her primary care physician. An audiologist and/or ENT will discuss which option will be the most appropriate for a child with UHL, if any.

Hearing aid

Depending on the type and degree of UHL, a hearing aid may be appropriate. A hearing aid might help a child with UHL hear environmental sounds and understand speech in his or her impaired ear.



Osseointegrated auditory device

This device, more commonly known as a Baha, is either worn on a soft headband or surgically implanted in the bone behind the impaired ear (i.e., mastoid bone).



The microphone on the Baha collects incoming sound. The processor then transmits the information to the ear with normal hearing by vibrating the skull bone (i.e., bone conduction). Baha candidates include individuals with conductive or mixed hearing losses or single sided deafness (SSD).

Frequency Modulating (FM) system

An FM system might help a child with UHL overcome the difficulties experienced in challenging listening environments, such as excessive background noise and lack of proximity to the speaker. An FM system requires two components--a microphone (i.e., transmitter) and a receiver. The talker wears the microphone either around his or her neck or attached to his or her shirt. The microphone should be placed about 6 inches away from the talker's mouth. The receiver can either be worn on the child's ear or placed in a speaker. The microphone collects the talker's message and wirelessly transmits the information to the child's receiver. As a result, a child with UHL will be able to hear the talker's message above any background noise in his or her environment.



Photo courtesy of Oticon⁹

The Wisconsin Infant/Children's Statewide Hearing Aid Exchange Services (WISHES) program loans hearing instruments (hearing aids and/or FM systems) for a six-month period to newly identified deaf and hard of hearing children who are not Medicaid eligible or do not have hearing aid insurance coverage. The

temporary assistance provided by WISHES attempts to bridge the gap between identification of hearing loss and obtaining the financial means to purchase personal amplification. Priority is given to children ages 0-3 years. Please talk to an audiologist for more information about this option.

What are the next steps after a child is diagnosed with a UHL?

Referral Source

The audiologist will refer the child back to the referral source, most likely his or her primary care physician. This will allow the child's family and provider to become partners in the care and management of the child's UHL.

Examination by an Ear, Nose, and Throat (ENT) doctor

An appointment with an Ear, Nose, and Throat (ENT) doctor is recommended as one step in determining the cause of the child's hearing loss. An ENT will examine the child's ears and possibly order additional tests. An evaluation by an ENT will help guide the management of the child's UHL and potentially reveal other areas of concern associated with hearing loss.

Regular hearing checks

After the initial hearing evaluation, hearing should be tested every 6 to 12 months or sooner if a change in hearing is suspected. If the hearing loss is permanent, annual hearing tests are used to monitor the hearing loss and to detect if any changes have occurred. If the hearing loss has been medically managed, the physician should order a hearing evaluation before any follow-up appointments to determine the effectiveness of the treatment. The results from routine hearing evaluations are used to make any necessary adjustments to the treatment plan and/or hearing device.

Speech-Language Evaluation

A child with any type and degree of hearing loss is at risk for speech and language delays. Therefore, a child with UHL should undergo a speech-language evaluation to detect the presence of any delays and monitor his or her development.

Vision Test

A pediatric ophthalmologist or optometrist should examine the child's vision. A child with UHL will need to rely more on visual cues in his or her environment to compensate for his or her hearing loss. Any vision impairments should be corrected.

Genetic Testing

Genetic testing may be recommended for a child with UHL. His or her siblings should also undergo genetic testing if it is suspected that the child's UHL was inherited.

Early Intervention Programs

In WI, any child with a hearing loss, including children with UHL, should be referred for birth to 3 services or for services through the public school system. Anyone can refer a child for these services if any developmental concern is suspected. If you are unsure about where to refer a child, please call Wisconsin First Step at 1-800-642-7837. Wisconsin First Step is a resource and referral hotline providing information relating to all children with special needs, ages 21 years and younger, and their families.

Additionally, parents of children with UHL should be directed to the Guide-By-Your-Side (GBYS) program. GBYS connects parents of children with hearing loss to parent mentors who can provide emotional support and information about caring for a child with hearing loss.

What communication strategies are helpful for a child with UHL?

To use at home:

- Be mindful of the position of a child with UHL when you are conversing with him or her, such as at the dinner table or when riding in the car. Ensure that his or her better ear is towards the speaker and away from sources of noise (e.g., dishwasher, radio, TV, open windows, fans, etc.).
- Do not talk to a child with UHL from a different room.
- Reduce the amount of background noise in the home.
 - Reduce loud environmental noises whenever possible. Turn off loud appliances (e.g., dishwasher, washing machine, dryer, TV, radio, etc.) when speaking to a child with UHL or when s/he is working or focusing on schoolwork.
 - Place thick curtains on the windows.
 - Place carpet on the floors and sound-absorbing textiles on the walls.
 - Change light bulbs or fixtures if they are buzzing.
 - Ensure that the room has good lighting and is free of reflective materials and glares so that a child with UHL can see all visual cues.

To use in the learning environment:

- Information about UHL should be shared with the child's intervention or educational team. The child's team should be informed of the potential impact of UHL on the child's development and behavior, as well as the listening challenges s/he may experience in learning environments. Continual communication with the child's team will ensure that the child is receiving appropriate and effective accommodations in his or her learning environment in order to succeed academically. Other personnel, more specifically an educational audiologist, should be included in the management of the child's UHL.
- Preferential seating is critical. A child with UHL should be seated near the area of the learning environment from which the instructor usually addresses the class, with his or her good ear directed towards the instructor at all times. The child should be seated away from noise sources such as fans, media equipment, windows, and doorways, which should help him or her concentrate on the instructor's voice. Seating should be located in a position that s/he is easily able to turn and face his or her peers during discussions. Keep in mind that the placement of the child may need to change depending upon the activity.
- Implement the buddy system. For example, older children with UHL should be allowed to copy class notes from another classmate. A younger child, however, would benefit from a peer who can guide him or her through daily activities.
- Audiotape lectures and/or use audiobooks so a child with UHL can access any missed information.
- Whenever possible, auditory information should be supplemented with visual aids (e.g., pictures, an overhead projector, or a chalkboard/SMART board) and written materials to help reinforce concepts or directions.
- Small group or individual instruction time in a quiet environment may be beneficial.
- Reduce background noise in the environment.

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- Cover the legs of chairs and desks with felt or tennis balls.
 - Keep the windows and hallway doors closed.
 - Place thick curtains on the windows.
 - Place carpet on the floors and sound-absorbing textiles on the walls.
 - Change light bulbs or fixtures if they are buzzing.
 - Turn off loud equipment (e.g., overhead projectors, computers, etc.) in the room when not in use.
 - Ensure that the room has good lighting and is free of reflective materials and glares so that a child with UHL can see all visual cues.

To use in all settings:

- Be aware that a child with UHL may have difficulty localizing sound. S/he may not be able to tell from which side of the room someone is speaking unless s/he can see the speaker.
- Speak naturally to a child with UHL, while maintaining good eye contact. Be aware of your rate of speech; do not speak too fast or so slowly that your words are over-exaggerated.
- Ensure that you have the child's attention before speaking. Use a cue or a signal, such as a tap on the shoulder, to signify that s/he needs to focus on what will be said.
- Give information/instructions in short, concise steps.
- Check for understanding regularly by asking the child to summarize what was said.
- If your message was not understood, do not keep repeating it verbatim. Instead, rephrase it.
- Turn on captioning when watching TV or movies.
- If a hearing aid and/or FM system has been recommended, encourage its routine use. However, keep in mind, use of either device does not provide normal hearing.
- Parents, teachers, and other professionals should be patient and show compassion to the child with UHL.
- The importance of self-advocacy should be emphasized early on with the child. A child with UHL should be encouraged to ask for clarification if s/he did not understand or misses what was said. Tell the child to notify his or her caregiver or a member of his or her intervention or educational team if his or her hearing aid or FM system is not functioning appropriately.



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Resources

Wisconsin First Step

<http://www.mch-hotlines.org/>
1-800-642-7837

Birth to 3 Program

<http://www.dhs.wisconsin.gov/children/birthto3/index.htm>

Wisconsin Infant/Children's Statewide Hearing Aid Exchange Service (WISHES)

http://www.wesp-dhh.wi.gov/wesp/out_wishes.cfm

Guide By Your Side (GBYS) Program

Contact: Laurie Nelson

Wisconsin Program Coordinator

1-888-656-8556 (Toll Free)

608-822-3756 (voice/TTY)

Laurie.nelson@wi.gov

http://www.wesp-dhh.wi.gov/wesp/out_gbys.cfm

Development of Communication Skills

<http://www.asha.org/public/speech/development/chart.htm>

FM system information

<http://www.babyhearing.org/hearingamplification/aidchoices/fmsystem.asp>

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