(Approved by the Board of Directors of the Educational Audiology Association March 2014)

Hearing Assistance Technology[1]

Common Technologies and Applications

Purpose

Hearing assistance technology (HAT) is used in educational settings to improve auditory access to the teacher or talker by mitigating the effects of noise, reverberation, and distance from the talker. All learners need access to communication and instruction in their classrooms and other instructional settings; learners who are deaf and hard of hearing, or who have other auditory deficits, require special technology to receive comparable auditory access. HAT may be prescribed through an individual family service plan (IFSP), individual education program (IEP), or a 504 Plan. HAT devices are selected, fitted, and verified by an audiologist. For infants and toddlers HAT decisions are generally made with the parents and early intervention provider; for school-age children with the student and the IEP team.

HAT Options

Three basic wireless delivery options:

1. Personal HAT device in which the speech signal is modulated onto a wireless carrier (e.g., frequency-modulation [FM] or adaptive digital wireless transmission technology running on the 2.4 GHz band [Roger]) to be picked up by a wireless receiver on the listener, retrieved, and passed to a hearing aid or other hearing device.

2. Classroom audio distribution systems (CADS):

   (1) Large area, in which the speech signal is sent to one or more strategically positioned loudspeakers to distribute the signal throughout the room

   (2) Targeted area, in which the speech signal is sent to a single loudspeaker placed close to the listener or target group

3. Induction loop systems in which the speech signal is delivered to the telecoil of the personal hearing aid, cochlear implant, or other hearing device via a magnetic signal generated by a loop of wire or other inductor.

Four basic wireless delivery modes:

1. FM – radio frequency modulated on the 72mhz band
2. Roger - adaptive digital wireless transmission on the 2.4 GHz band
3. Infrared – light
4. Induction loop - magnetic

Technology Descriptions

Classroom Audio Distribution System (CADS)

CADS may be necessary to ensure an audible and consistent distribution of the talker's voice throughout a classroom or learning space. Such systems may assist all students but may be particularly useful for those with hearing and listening problems. These systems may also improve the audibility of talkers (e.g., teachers and students) with low amplitude voice levels. Systems may be designed for an entire classroom or a targeted area (e.g., a small group or for an individual such as desktop placement).

CADS serve to maintain a consistent speech-to-noise ratio (SNR) to overcome the effects of loud noise sources such as ventilation systems. They are not a substitute for personal hearing instruments or inadequate acoustical treatment of the learning environment.

Receivers

There are several options for coupling the HAT receiver with the individual's personal hearing instrument.

- Receiver attached to personal hearing aid via coupling boot/shoe (FM, Roger)
- Receiver attached to a streamer
- Self-contained receiver within behind-the-ear case (e.g., Oticon Star, Phonak iSense)
- Neck loop with internal receiver (e.g., Oticon Arc, Phonak MyLink)
- Speaker(s)

1 This description represents common HAT technologies used with children and youth in educational settings in 2014.

Transmission Methods

Signal transmission from the microphone/transmitter to the receiver may occur through one of the following methods:

- Frequency modulated radio – FM
- Infrared light
- Induction Loop
- Roger - an adaptive digital wireless transmission technology running on the 2.4 GHz band. Audio signals are digitized and packaged in very short (160 µs) digital bursts of codes (packets) and broadcast several times, each at different channels between 2.4000 and 2.4835 GHz. Frequency hopping between channels, in combination with repeated broadcast, avoids interference issues. End-to-end audio delay is well below 25 ms, and Roger systems are tap-proof.

  The frequency hopping Roger employs is adaptive, which means only free channels are used. Roger receivers regularly talk back to the transmitting wireless microphones, informing the system about which channels are steadily occupied (by any other nearby system operating at 2.4 GHz, like a WiFi network) and which channels are free. The Roger wireless microphone then automatically “hops” around these occupied channels. The Roger wireless microphones can also sense the presence of a WiFi network, and respond to this accordingly.

Microphones

Microphone options include technology and style:

- Technologies: Directional, Omni-Directional
- Styles: Lapel, cheek, boom, conference

References

American Academy of Audiology Clinical Practice Guidelines: Remote Microphone Hearing Assistance Technologies for Children and Youth Birth-21 Years (2008); available from www.audiology.org
Oticon Inc., www.oticonus.com
Phonak Hearing Systems, www.phonak.com