

Hearing Screening for Children 3 Years of Age and Older: Factors to Consider When Selecting Screening Methods



Approximately 3 in 1,000 babies are born deaf or hard of hearing. Most newborns receive a hearing screening shortly after birth, allowing early intervention to be provided soon thereafter for those who need support with hearing and language development. However, hearing loss can occur at any point in childhood. By school age, the prevalence of permanent hearing loss doubles to 6 in 1,000 and continues to rise, affecting an estimated 4%–5% of all children (or 4–5 per 100) during the school-age period. Because hearing is crucial for language, communication, and learning, the American Academy of Pediatrics (AAP) recommends periodic hearing screenings throughout childhood. Professionals who work with children can play a key role in providing this essential service.

Implementing evidence-based hearing screening requires decision-makers to think about equipment and methodology within the context of the setting, the capacity of those conducting the screening, and the age and number of children being served. Professionals are advised to work with a pediatric audiologist to define screening goals and to determine the optimal method(s) and protocol based on careful consideration of multiple factors, including:

- Is the goal of screening primarily to help identify children who have permanent hearing loss (PHL)?
- How many children (in what age range) need to be screened and within what time frame?
- How many screeners are available and what screening skills do they have/need?
- Where and when can screening be conducted? Can rescreening be conducted when needed?
- Who will track children who fail the screening and ensure they receive necessary follow-up care?

No screening method can detect every potential type/degree of hearing loss. The “gold standard” for identifying a hearing disorder involves a comprehensive evaluation performed by an audiologist. What hearing screening can do is to help identify the subset of children who need to be referred for an evaluation. Any child manifesting overt speech/language delays or hearing problems should also be included in that referral subset regardless of screening method or outcome.

Since the mid-1960's, **Pure Tone Audiometry (PTA)** screening has been the primary method used with school-age children and it has also been employed on a more limited basis with preschool children. In a quiet room, the screener conditions the child to react to sound by raising a hand (or placing an object in bucket, etc.) The screener then manually manipulates the audiometer to present a series of tones via headphone to each of the child's ears, documenting responses/non-responses, then tallying responses to obtain a result. Children under 3 years of age cannot dependably engage in PTA screening and 20% of children 3 – 5 years of age are also typically unable to complete it.



PTA Screening

In the late 1990's, **Otoacoustic Emissions (OAE)** innovation helped to advance newborn hearing screening nationwide. OAE screening does not require a behavioral response and can be conducted in diverse settings where other children/adults may be present. The screener initially places an earphone, fitted with a sensitive microphone, into the child's ear canal. The connected OAE unit then delivers automated tone stimuli into the ear while the microphone picks up inner ear (cochlear) responses which are analyzed by the unit to generate a “pass” or “refer” result. Distortion Product (DP) OAE screening has gained recognition as the most reliable method for screening children 0 - 3 years of age in a variety of early care and education environments. Its effectiveness with older children is also increasingly being documented.



OAE Screening

In 2011, the American Academy of Audiology *Clinical Practice Guidelines: Childhood Hearing Screening* recommended:

- OAE screening for children 0 - 3 years of age.
- PTA screening for children 3 years of age and older with OAE screening for the subset who cannot complete PTA screening.

Programs using the PTA method therefore need to be prepared to conduct OAE screening on a potentially significant subset of children or to refer this subset to a pediatric audiologist. Some audiologists point out that formal guidelines rely heavily on traditional precedent and are slow to reflect current research and practical application. Their experience in overseeing screening program implementation suggests that OAE technology is equally effective in identifying the most common types of PHL while also being objective and faster/easier for lay screeners to learn to use with children of all ages. In addition, ensuring that school-age children not passing the screening receive follow-up evaluation is likely to have a more pronounced effect on the overall identification rate than which screening method was employed.

Thus, administrators and decision-makers are advised to check state regulations, consult with a pediatric audiologist, and consider the following factors when choosing screening methodology.

Pure Tone Audiometry and Otoacoustic Emissions Screening Consideration Comparison

Considerations	Pure Tone Audiometry (PTA)	Otoacoustic Emissions (OAE)
Auditory system	<ul style="list-style-type: none"> • Screens entire auditory system--including child's ability to listen and respond 	<ul style="list-style-type: none"> • Screens cochlear function (most common site of permanent hearing loss) + outer and middle-ear pathway
Automation & Objectivity	<ul style="list-style-type: none"> • Screener conditions child to listen & respond to tones, then manually presents screening stimuli in a set protocol during screening (w/out providing visual cues) • Subjective measure requiring screener to observe child's responses to tones • Screener documents & tallies responses to determine pass/refer outcome 	<ul style="list-style-type: none"> • Equipment automatically presents screening stimuli in a set protocol • Objective physiological measure of cochlear response • Automated pass/refer outcome
Historical & present use with children	<ul style="list-style-type: none"> • Used widely in school-based screening programs for over six decades and on a more limited basis with preschool children 	<ul style="list-style-type: none"> • Used widely in newborn screening and early childhood programs for over two decades; utility increasingly being explored with school-age children
Children's developmental age and language	<ul style="list-style-type: none"> • Children over 3 years may be conditioned & screened (but approx.. 20% of 3 - 5 year-olds can't be conditioned to respond reliably) • Screener/child language differences may present barrier to conditioning/screening 	<ul style="list-style-type: none"> • Children of all ages & developmental levels may be screened because no instruction or response is required • No screener/child language barriers
Time	<ul style="list-style-type: none"> • Up to 5 min. to condition child + 4 - 7 min. to complete screening 	<ul style="list-style-type: none"> • 1 to 3 min. per child
Location and ambient noise	<ul style="list-style-type: none"> • Dedicated room or space with minimal distractions for child and where ambient sound level remains under 50 dB 	<ul style="list-style-type: none"> • Range of settings (classroom, home, clinic, etc.) Other children/adults and some background noise may be present
Scope of Screener Training	<ul style="list-style-type: none"> • Training involves learning to: Set up screening room & measure sound level, condition child to respond to tones; conduct screening by manually varying tone stimuli in a set protocol, document child's responses; determine whether pass criteria were met, engage in follow-up when children who do not pass 	<ul style="list-style-type: none"> • Training involves learning to: Select probe cover size, properly insert probe, manage child's behavior during screening, engage in follow-up when children who do not pass