

Development of Hearing in Children: Are they not hearing you or just not listening?

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SPEECH
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Why Is Hearing Important?

- Hearing is the primary sense that connects a child to his/her environment
- Hearing is essential for the development of normal speech and language
- Hearing allows parent and child to communicate



Why Is Hearing Important?

- Hearing impairment in a young child causes frustration for parent and child, which can lead to
 - anger
 - a feeling that the child does not love the parent and vice versa
 - neglect by parent (because the child does not respond, there is no point in trying to communicate)



Hearing

- Fetuses hear at 20 weeks gestation
- Infants hear and respond at birth



Deaf or Hearing Impaired?

- Not the same!
- Behavior of child who is deaf is different from behavior of hard-of-hearing child
- Deafness is easier to diagnose
- Hearing impaired children can fool parents, physicians, teachers!



Deaf

- Audiological definition: profound hearing loss
- Hears very little or nothing
- May not be helped by hearing aids
- Will respond to visual and vibrotactile stimuli
- Easier to diagnose at a younger age



Hard of Hearing or Hearing Impaired

- Partial hearing loss
- Hears some sounds without hearing aids
- Will hear significantly better with hearing aids
- Harder to diagnose: they appear to hear sometimes and not others



Infant Responses

- Whole body startle
- Moro reflex
- Crying
- Eye blink



Can You Test Hearing By Looking At These Responses?

- No
- Unreliable and invalid way to measure hearing
- Baby may startle at the same time that sound occurs, but not *because* sound occurred
- Baby may fail to startle even though hearing is normal



Parent Observation

- Astute parents can assess over time
- A pattern emerges
 - Baby *usually* startles or
 - Baby *never* startles



Newborn Screening

- Program in California
- Now screening all births
- California's program started July 1999, and now ALL BABIES have their hearing screened at birth
- 26 different birthing hospitals refer their babies to Providence for rescreening



How Are Babies Screened?

- Hospital screenings use one of two techniques
- Both methods are OBJECTIVE, meaning that the baby does not have to show a “behavioral” response to sound
- Both methods are fast, reliable and repeatable, and can be performed by nurses, volunteers, technicians, etc.



Otoacoustic Emissions

- “OAE”
- An “echo” of sound that the ear produces
- Shows if the inner ear is working
- Can be abnormal if there is vernix in ear canal or fluid in the middle ear
- Baby cannot be crying or vocalizing



Auditory Brainstem Response

- ABR
- Also called “BAER”, “BSER”, etc.
- Tests the auditory neural function
- Electrodes to measure brain activity in response to sounds
- Can be abnormal if there is middle ear fluid or neurological dysfunction



If Baby Fails “Refers” Screening

- Baby should be re-screened prior to discharge
- If he/she refers again, should be seen for outpatient screen by one month of age
- If baby refers again, he/she should be seen by pediatric audiologist immediately



If Baby Passes...

- Babies can pass newborn screen and still have a hearing loss! “False negative”
- Delayed-onset hearing loss
- Progressive hearing loss



The Moral of the Story

- Just because baby passed newborn screening, he/she is not exempt from future hearing loss
- If parent expresses concern, refer for audiology
- If speech and language are delayed, refer for audiology
- Hearing needs to be tested to see if that is the reason for speech delay
- **CHILD CAN'T SPEAK WELL IF HE CAN'T HEAR WELL.** The two systems work together.



More---

- If there are risk factors for delayed-onset or progressive hearing loss, refer for audiology
 - CMV
 - Speech delay
 - Meningitis
 - Genetic
 - Chronic middle ear effusion



How Can Baby's Hearing Be Screened At Home?

- Astute parents can observe behavior and report accurately
- Noisemakers are not reliable!
- Interview or parent-checklist are best choices



Baby's Behavior Can Trick You!

- Deaf babies respond to visual and tactile stimuli
- A deaf baby will smile and coo when spoken to if the speaker has a smile on his/her face!
- A deaf baby will respond to a noisemaker or a hand clap if he/she can see or feel the object!
- Deaf babies babble until age 11 months when they stop



Birth to 3 Months

- Startles or jumps when there is a sudden, loud noise
- Stirs, wakes up or cries when someone talks or makes a noise
- Recognizes parents' voices and quiets when spoken to



3 to 6 Months

- Turns eyes toward interesting sounds
- Appears to listen
- Awakens easily to sounds
- Responds to “no”
- Enjoys toys that make noise



6 to 12 Months

- Turns head toward soft sounds
- Understands “no” and “bye-bye”
- Begins to imitate speech sounds
- Understands words for common items like “shoe”
“juice”



12 Months

- Says first words, such as “dada”, “mama” or “bye-bye”
- Understands simple commands



One to Two Years

- Points to pictures in a book when they are named
- Points to body parts
- Follows simple commands
- Learns more words every month
- Uses two-word sentences and questions



Two to Three Years

- Follows two requests: “Get the ball, and put it on the table”
- Understands meanings of words and concepts: “go”, “stop”; “big”, “little”; etc.
- Uses 2-3 word sentences
- Speech is understandable most of the time



Three to Four Years

- Strangers usually understand the child's speech
- Hears and responds when called from another room
- Hears TV at the same loudness level as others in the family
- Hears on the telephone
- Answers "wh-" questions
- Most speech sounds are clear



Four to Five Years

- Hears and understands most things at home and school
- No concern from teacher or caregiver about hearing
- Pays attention to stories and asks simple questions about a story
- Communicates easily with other children and adults



Ear Infections

- Children with “ear infections” (“effusion”) do not hear normally
- It may not be obvious when a child has effusion
- Repeated episodes of effusion can cause hearing loss, delayed speech and language, frustration, poor communication



Recommendations

- Any baby whose parents or caregivers express concern about his/her hearing should be seen for a full audiologic evaluation, even if the baby passed newborn hearing screening
- Any baby with chronic ear infections should have a complete audiologic evaluation
- Any baby or child who is not showing age-appropriate speech and auditory development should have a complete audiologic evaluation
- Any baby with a risk factor should have a complete audiologic evaluation, even if he/she passed newborn screening



Risk Factors for Delayed Onset Loss

- Meningitis
- Cytomegalovirus (CMV)
- Chronic middle ear effusion (“Ear infection”)
- Persistent pulmonary hypertension (PPHN)
- Family history of hereditary childhood hearing loss



Risk Factors for Delayed Onset Loss

- Neurofibromatosis
- Head trauma associated with loss of consciousness or skull fracture
- Signs of a genetic syndrome
- Ototoxic medications including chemotherapy and aminoglycoside antibiotics



Any questions? Thank you!

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