

AUDIOLOGICAL ASSESSMENT OF CHILDREN WITH AUTISM SPECTRUM DISORDERS

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Project Objectives

- ▣ To collect background information relevant to the survey
- ▣ To obtain qualitative data related to challenges testing individuals with developmental disabilities, focusing on autism spectrum disorders
- ▣ To learn what challenges are often experienced when testing children with developmental disabilities
- ▣ To understand strategies practicing audiologists use to evaluate the hearing of children with developmental disabilities effectively

Presentation Objectives

- ▣ Review research on the auditory characteristics of children with developmental disabilities, challenges that they present during testing, and strategies that are recommended for audiologists to obtain accurate results.
- ▣ Share results of the survey
- ▣ Discuss conclusions and recommendations for audiologists and parents

Survey Purpose

- ▣ To receive statistical information on the number of children with developmental disabilities seen for hearing evaluations per month by Connecticut Audiologists
- ▣ To receive recommendations and strategies from practicing audiologists on effective ways to evaluate the hearing of children with developmental disabilities

Survey Purpose (cont.)

- ▣ To compare findings with past research data related to the audiological assessment of children with developmental disabilities
- ▣ To create a brochure with recommendations for audiologists on how to best assess this difficult to test population
- ▣ To include strategies for parents to use at home to prepare their child for their future hearing evaluation

Research

What makes a child with autism spectrum disorder (ASD) difficult to test audiologically?

- ❑ Increased/ decreased senses
- ❑ Hyperactivity
- ❑ Cognitive dysfunction
- ❑ Inattentiveness
- ❑ Language comprehension differences
- ❑ Difficulty adapting to new situations
- ❑ Do not like their ears being touched
- ❑ Increased false positive and false negative responses
- ❑ Increased anxiety
- ❑ Habituate to stimuli very slowly/quickly
- ❑ Often do not tolerate headphones/inserts

Research

- ▣ Auditory characteristics in children with ASDs:
 - Hyper-/hyposensitivity to sound
 - Difficulty listening in background noise
 - Difficulty maintaining focus to auditory information
 - Unresponsiveness to certain sounds (e.g. verbal commands, environmental sounds)
 - Middle ear problems

Research

- ▣ Hearing loss is variable across children with autism and has been found to range from 0-100% prevalence. No conclusive data as of now.
- ▣ The risk of overestimating the prevalence of hearing loss is common due to the inability to receive accurate thresholds with behavioral testing
- ▣ Mostly high frequency hearing loss
- ▣ Conductive or sensorineural hearing loss common
- ▣ Tympanometry usually demonstrates greater fluctuating negative pressure in the middle ear in children with ASDs.

Rosenhall et al. (1999)

Rabidoux, P. (2005)

Research

- ▣ Study by Rosenhall et al. (1999):
 - 199 children with autism and varying severities of mental retardation were studied
 - More otitis media (ear infections) due to low-set ears causing Eustachian tube dysfunction and conductive losses
 - Found low percentage with hearing loss (5.3%), however, numbers were higher than the general public.
 - Hyperacusis (oversensitivity to sound) was higher in children with autism when compared to the typically developing group (18% and 0%, respectively)

Research

- ▣ Some of the auditory sensory issues that children with autism often present with, like hypo/hypersensitivity to sound, have been theorized as being a result of a brainstem abnormality or a cortical or subcortical involvement.
- ▣ It has also been hypothesized that auditory sensory deprivation may contribute to the cause of autism since hearing loss was found in 5% of this population.
- ▣ This study's findings emphasize the need for audiologic evaluation of individuals with autism
 - To refer those with profound hearing loss for aural habilitation.
 - Monitor mild-moderate hearing loss in children on the spectrum for deterioration.

Research

- Unfortunately, there is not a lot of research and evidence-based practice of auditory behaviors in children and adolescents with ASDs.
 - Systematic research tends to take a back seat to anecdotal evidence
- One common anecdote has been that children with autism are difficult to test via behavioral audiometry.
 - Hogan (1973) found that 80% of children with severe disabilities could not be tested by clinical behavioral methods
- This has led many clinicians and researchers to measure audition of children with ASDs using objective methods such as otoacoustic emissions (OAEs) and electrophysiological testing.
 - Test results of auditory brainstem response (ABR) testing were equivalent to typically developing matches, while half showed behavioral thresholds outside of the normal limit.

Downs, D., Schmidt, B., & Stephens, T. (2005)

Robier et al. (1983)

Tharpe et al. (2006)

Research

- ▣ Best testing methods for children with developmental disabilities:
 - Auditory Brainstem Response (ABR): Measure of the brainstem response to auditory stimulation
 - Good for multiple handicapped children
 - High specificity
 - Sedation available for those who cannot sufficiently relax or sleep for testing
 - Study by Robier et al (1983) found that conductive hearing loss, sensorineural hearing loss, and sensory integration issues could all be measured using brainstem evoked response (BER) testing and auditory evoked potential (AEP) measurements.
 - Larger I-V interwave latency would suggest a conductive hearing loss. This delayed conduction is common in children with ASDs.
 - Elevated thresholds without change in wave latency would suggest a sensorineural loss
 - Late potentials amplitudes have been found to be lower in children with autism, implying possible sensory integration issues.

Gans, D. and Gans, K.D. (1993)

Robier et al. (1983)

Tharpe et al. (2006)

- Cross-check principle: more than one test should be implemented to form a battery
 - Behavioral and physiological assessment
 - Provides supplemental information to better understand the child's auditory abilities

Davis, R. & Stiegler, L. (2005)

Research

- ▣ A 2003 survey from audiologists regarding best testing methods for their patients with autism found:
 - Otoacoustic emissions, play audiometry, visual reinforcement audiometry, immittance testing, ABRs, and behavioral observation audiometry were most frequently mentioned as best testing methods for these patients.
 - Conventional pure tone testing, speech threshold testing, word recognition tests, and functional measurements of auditory behavior were rarely chosen.
- ▣ Madell (1998) stated, “Because these children may ‘tune out’ to voices, it is usually best to avoid speech stimuli, at least initially”

Downs, D., Schmidt, B., & Stephens, T. (2005)

Madell, J. (1998)

Recommendations for Parents

- ▣ Past study suggestions for testing children with ASDs:
 - Prepare your child for the testing to reduce discomfort
 - Bring child into office for walk-through before the day of testing
 - Introduce headphones and make the touching of their ears less uncomfortable

Recommendations for Audiologists

- Provide a picture schedule of the order of the testing so there are no surprises throughout the session and the transitions between tests are easier
- When testing, make sure to test at least one low and one mid-high frequency (500 & 2000 Hz)
- Alter test setting based on what parents report their child can tolerate (animals, sounds, headphones, etc.)
- Be persistent
- Understand that another session may be necessary to complete testing

Recommendations for Audiologists

- ▣ Ask parents questions either before the test day or during the history portion of the assessment:
 - Does your child separate easily
 - Are they comfortable in small rooms/spaces
 - Will they wear headphones
 - What is the best time of day for them
- ▣ If headphones are not okay, use sound field
- ▣ Do not change testing procedures too quickly to reduce transition issues
- ▣ Give directions slowly

In addition to testing...

- ❑ In many cases children on the spectrum are referred for an audiologic evaluation before receiving a developmental diagnosis due to suspicions of having hearing loss.
- ❑ Audiologists may be in the forefront of the diagnosis, and therefore, must have a thorough understanding of normal child development.
 - This is important so the proper referrals and intervention can be started.
- ❑ If there is no hearing loss and parents have concerns or the child is not developmentally age appropriately, the audiologist should refer for a developmental evaluation.
- ❑ If there is a hearing loss, hearing aids or assistive listening devices (ALDs) should be recommended, especially because the developmental course is most pliable 4 years of age and younger.
- ❑ It is critical to know the local resources in order to refer the family to a developmental program (e.g. Birth-3 programs)
- ❑ It is also optional for an audiologist to fill out the quick Checklist for Autism in Toddlers (CHAT)

Roles of the Audiologist

- ▣ Whether hearing loss is contributing to a child's communication difficulties, their auditory behaviors and delayed auditory development may impair development in other areas (e.g. cognition, speech acquisition, etc)
- ▣ In addition to referring out appropriately, audiologists should provide the child and family with communicative strategies and modifications that can be made to the environment to ensure the best communication possible.
- ▣ As part of the audiologist's role, one must counsel the family on the emotional impact of hearing loss (if present).
- ▣ Audiologists may also be part of an interdisciplinary team if the child has an IEP or 504 plan through the school.

Method

- ▣ Participants:
 - 21 Connecticut Audiologists sent the survey
 - ▣ Only audiologists who see patients within the pediatric population were sent the survey
 - ▣ Names were obtained from online sites and other Connecticut audiologist reports
 - ▣ Recipients were encouraged to forward the survey to audiologists they knew who worked with the pediatric population

Method (cont.)

▣ Materials Used:

- Online survey using www.surveymonkey.com
- Mix of open-ended, single choice, and multiple selection questions
- Questions included:
 1. About how many children (between the ages of newborn and 18) do you evaluate per month?
 2. About how many of the children you evaluate have a developmental disability, such as autism?
 3. If you see children with developmental disabilities such as autism, what are some common challenges you encounter when testing their hearing?
 4. What strategies do you use that are helpful when faced with any of the challenges discussed in question 3?
 5. What method of behavioral testing do you use with these children to acquire thresholds most effectively?

Method (cont.)

▣ Questions (cont.)

6. Which test have you found most effective as the first test in the battery?
7. What frequencies do you place the most emphasis on when testing children with developmental disabilities and the challenges discussed earlier?
8. Which transducer do you tend to use most with this population of children?
9. What percentage of children that you test who have developmental disabilities are you able to acquire accurate results?
10. What recommendations, if any, do you give to parents to help you for the next evaluation if you were unable to obtain enough information about the status of the child's hearing?

Method (cont.)

- ▣ Procedure:
 - An email was sent to Connecticut Audiologists with a link to the survey.
 - The purpose of the survey and the manner in which the results will be implemented was communicated to the email recipients in a short introductory paragraph.
 - No identifying information from the respondents was collected.

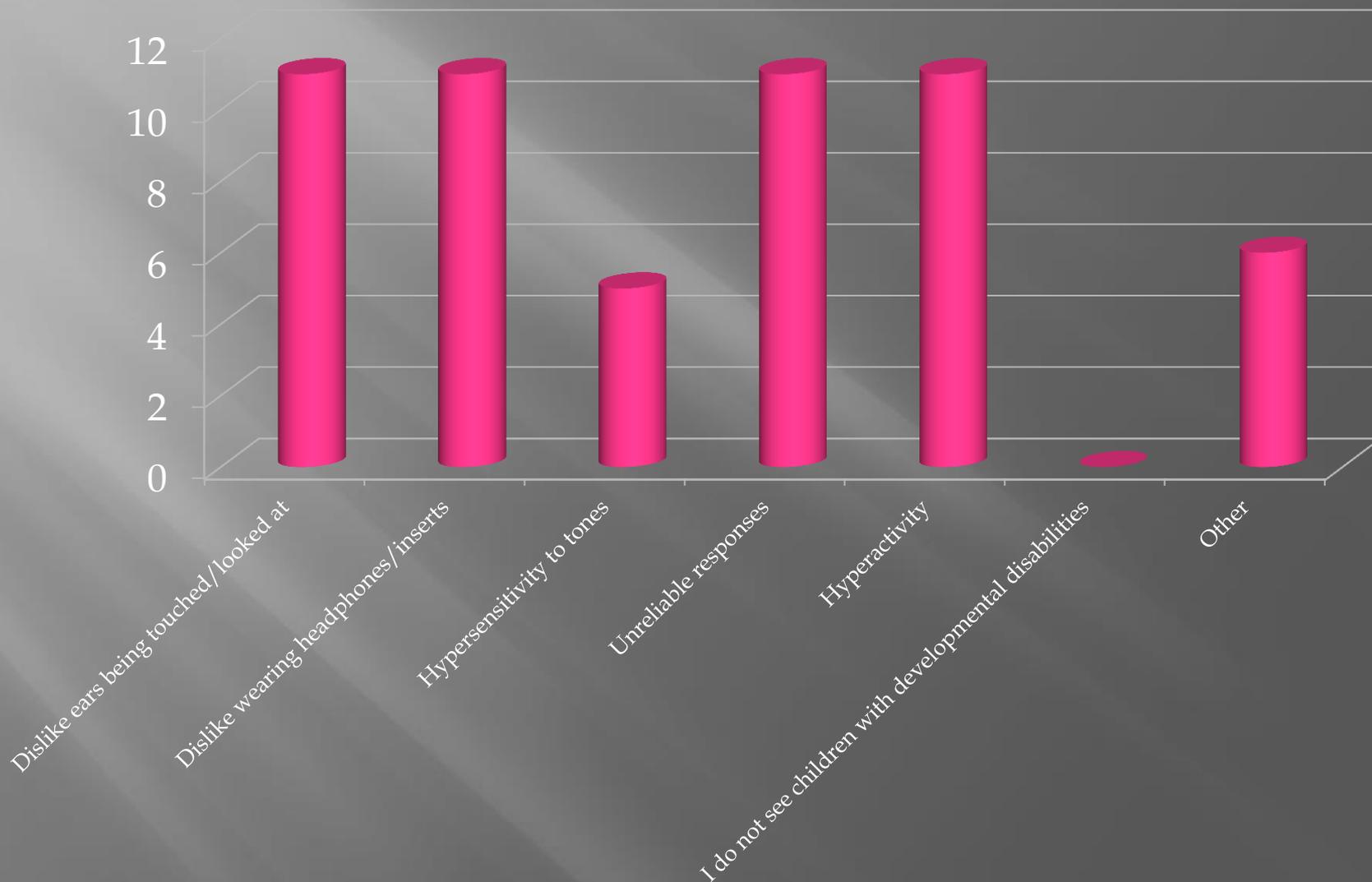
Results

- ▣ 11 out of the 21 (52%) people who were sent the survey answered the questions
 - Because no identifying information is available, it is questionable as to whether the respondents were on the initial list
- ▣ 9 out of 11 answered all of the questions to complete the survey

Results

- ▣ A range of 10-130 children are seen on average per month by the audiologists surveyed.
- ▣ Of this range, 5-38% have a developmental disability, such as autism.

Audiologic Testing Challenges with Children with Developmental Disabilities



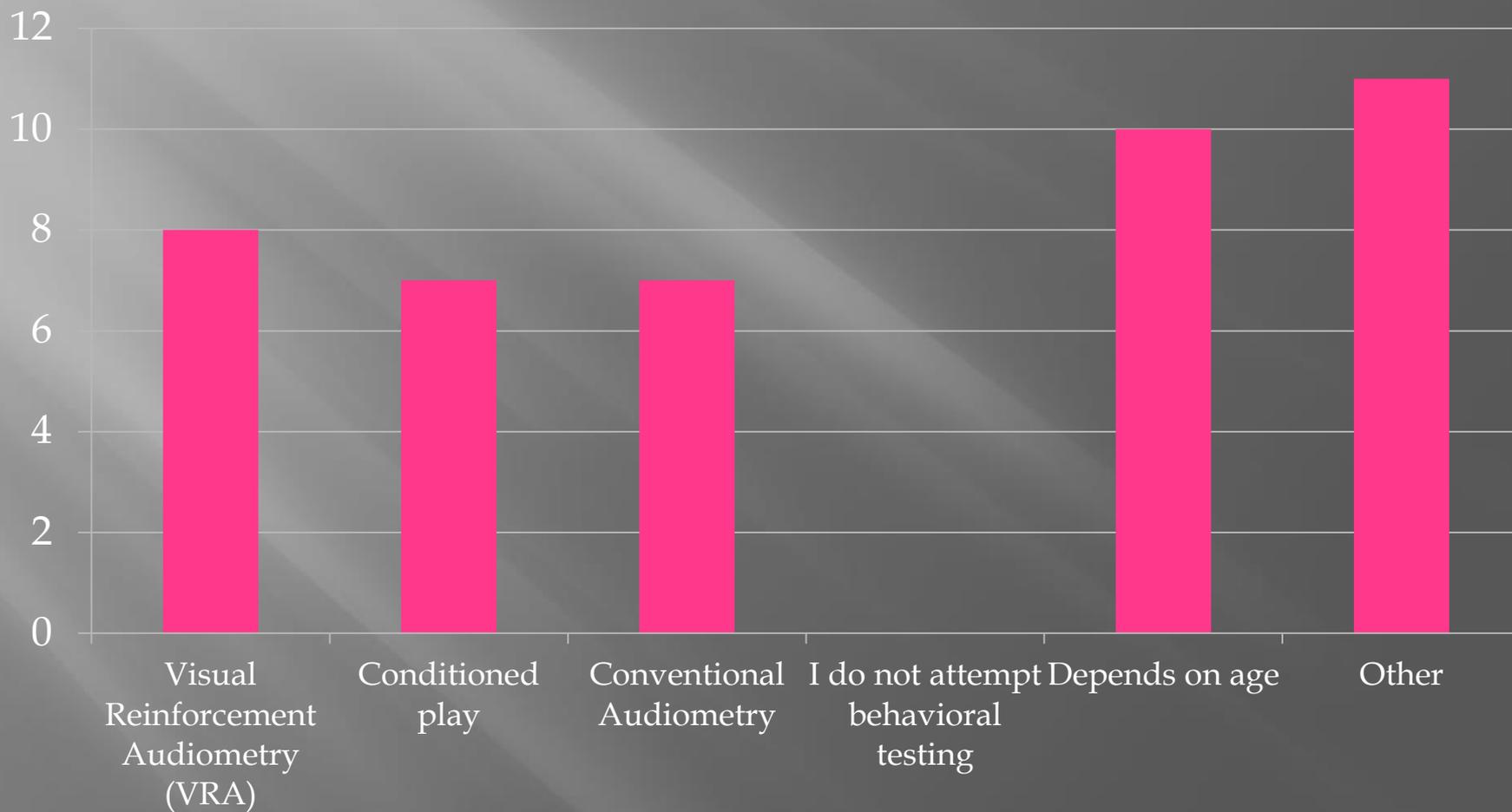
“Other” Responses

- ▣ Inability to engage/disinterest in test tasks
- ▣ No speech/no ability to communicate
- ▣ No acknowledgement of being spoken to
- ▣ Inability to follow instructions
- ▣ Echolalia
- ▣ Anxiety related to the test booth and/or a strange person in the room with them
- ▣ Unresponsive to auditory stimuli

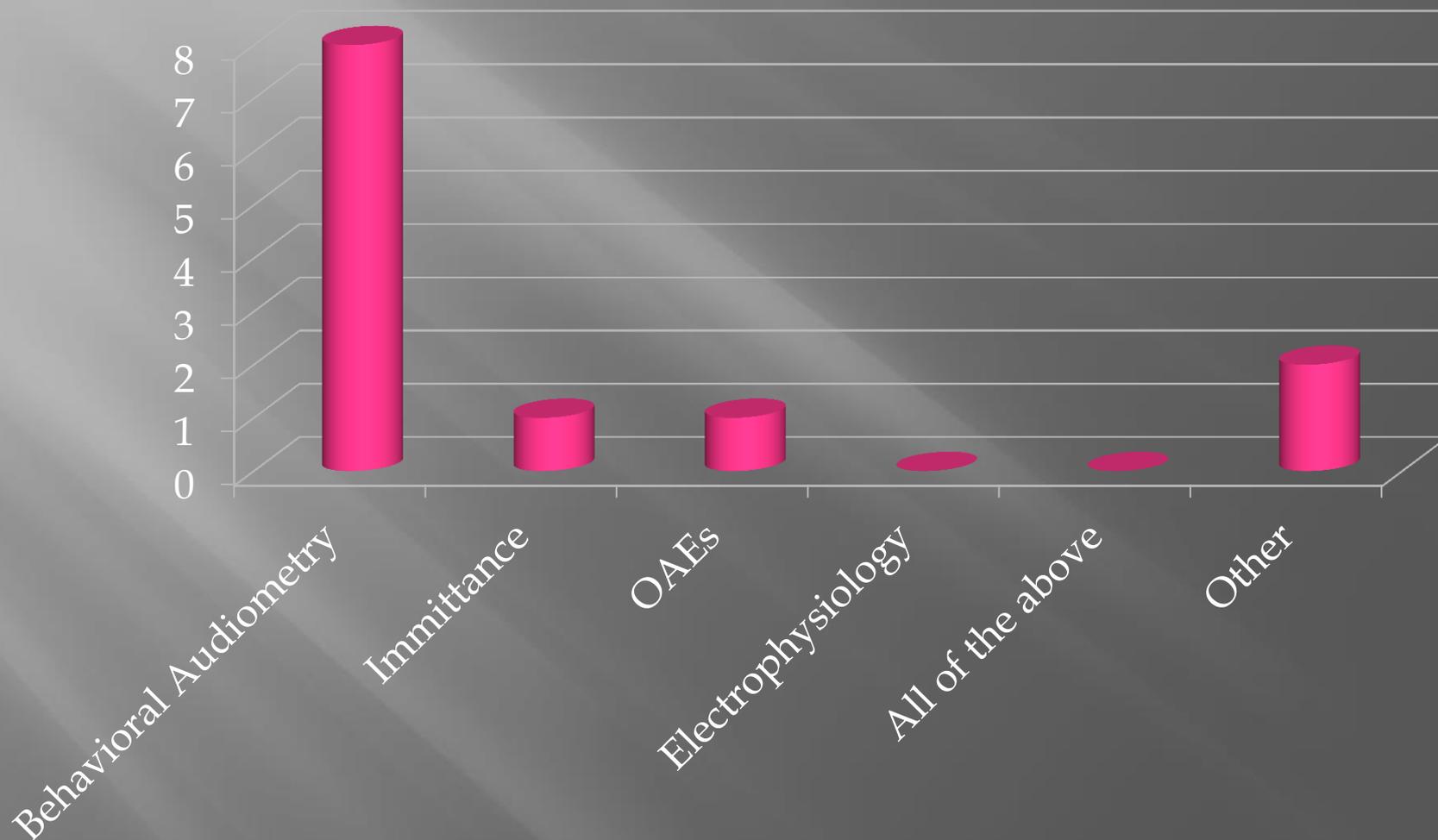
Helpful Strategies for Audiologists When Testing

- ▣ Use a “2 tester” approach/use an assistant audiologist
- ▣ Start testing in sound booth before otoscopy, tympanometry, and OAEs so the child does not get upset from having their ears touched
- ▣ Use a Tripp Trapp highchair to limit mobility
- ▣ Use the cross check principle
- ▣ For hyperactivity/fading attention, sing a song or play with bubbles to regain the child’s attention to continue testing
- ▣ Use interesting speech sounds and a soft tone of voice/vary tonal stimuli
- ▣ Allow parents to step in when the child needs comforting and to foster cooperation
- ▣ Teach the parent the best way to distract or hold the child
- ▣ Allow the child time to get used to the room before testing
- ▣ See the child over multiple test sessions

Which tests do you tend to use when faced with children with Developmental Disabilities?



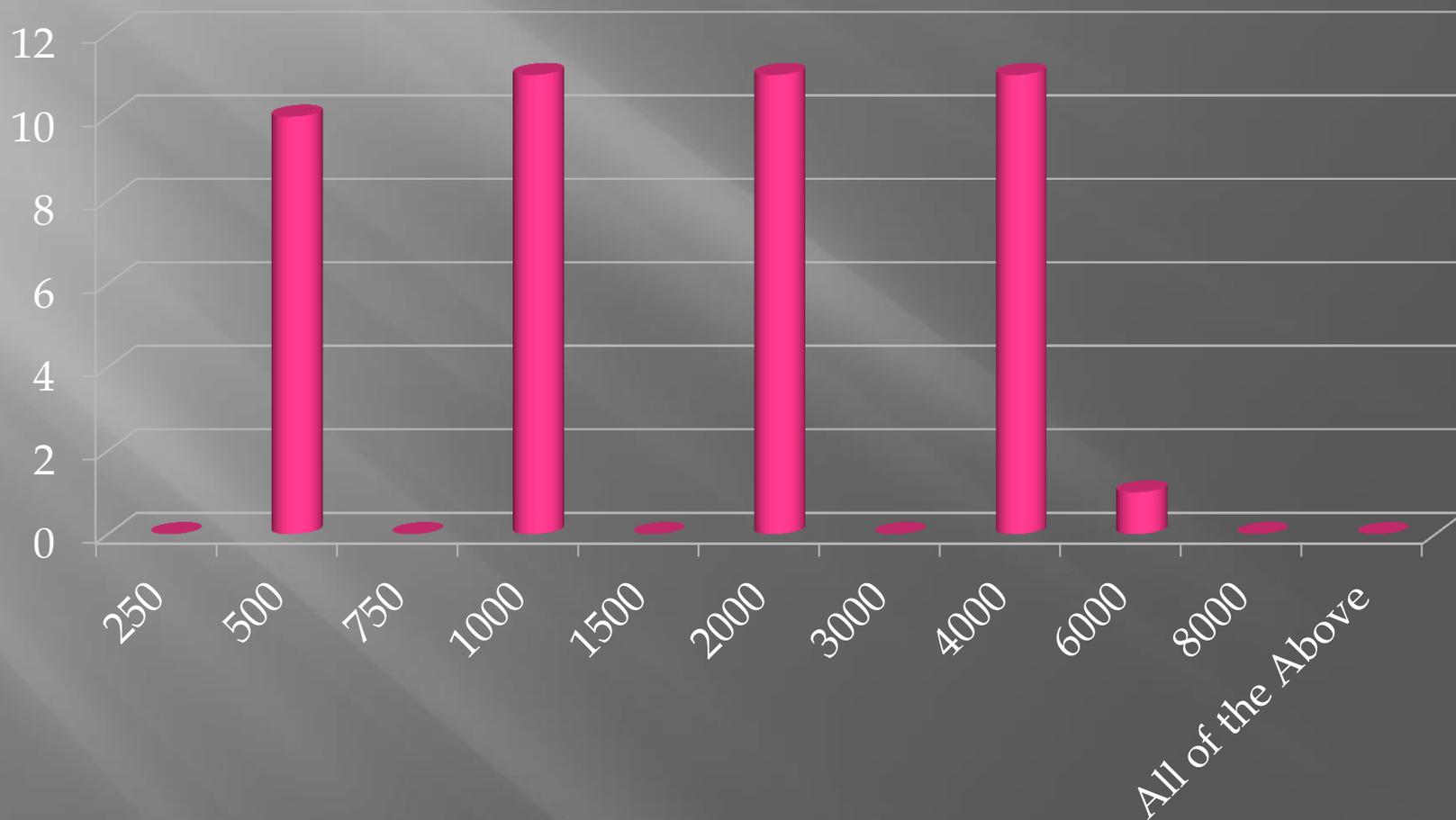
Most effective test to perform first



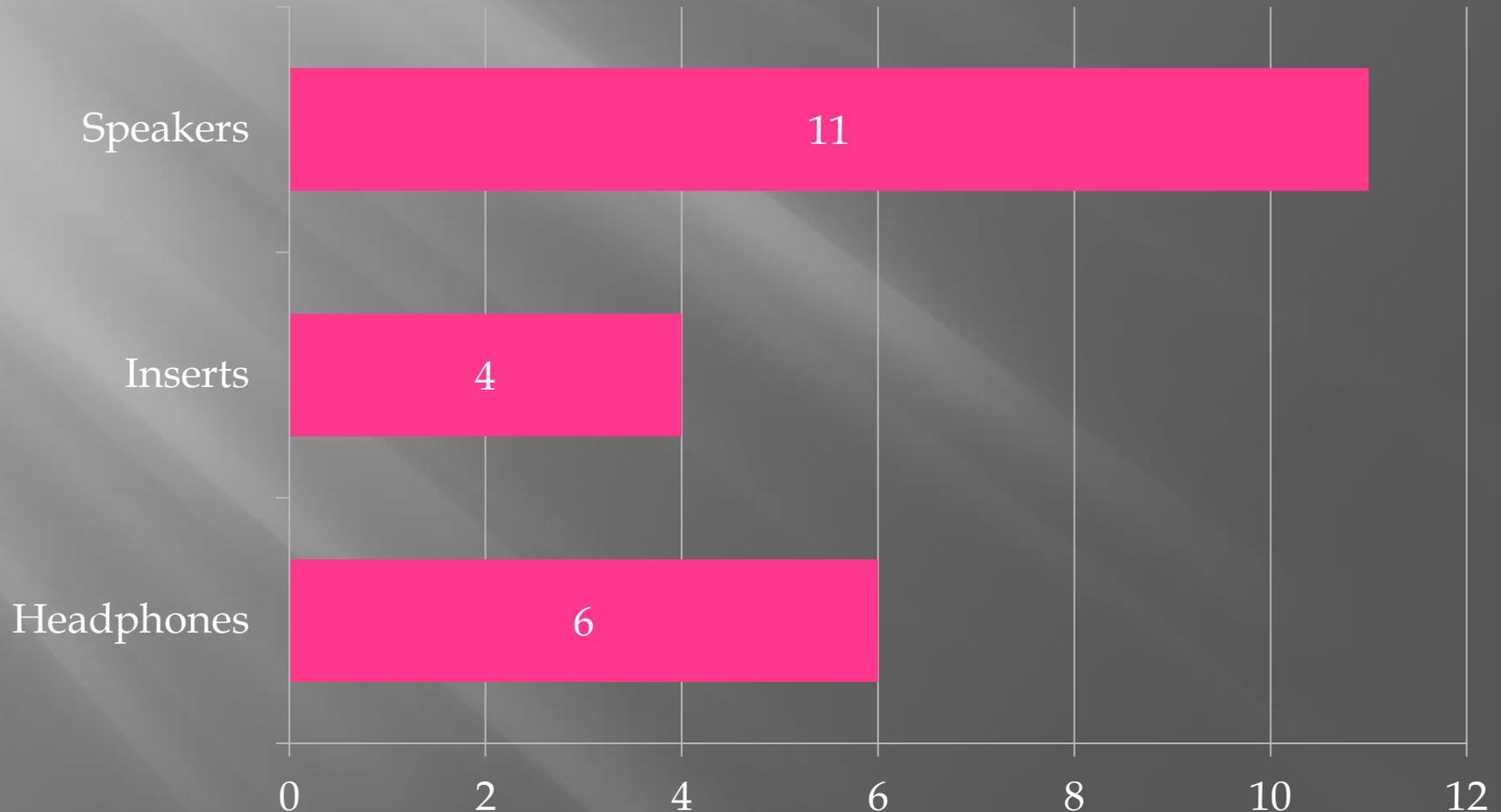
First test in Battery

- ▣ The majority thought behavioral audiometry was the most effective test to use first.
- ▣ Comments to this question included:
 - “If possible, OAEs and immittance first. Behavioral first if child does not like their ears touched.”
 - “Depends on child’s sensitivities”

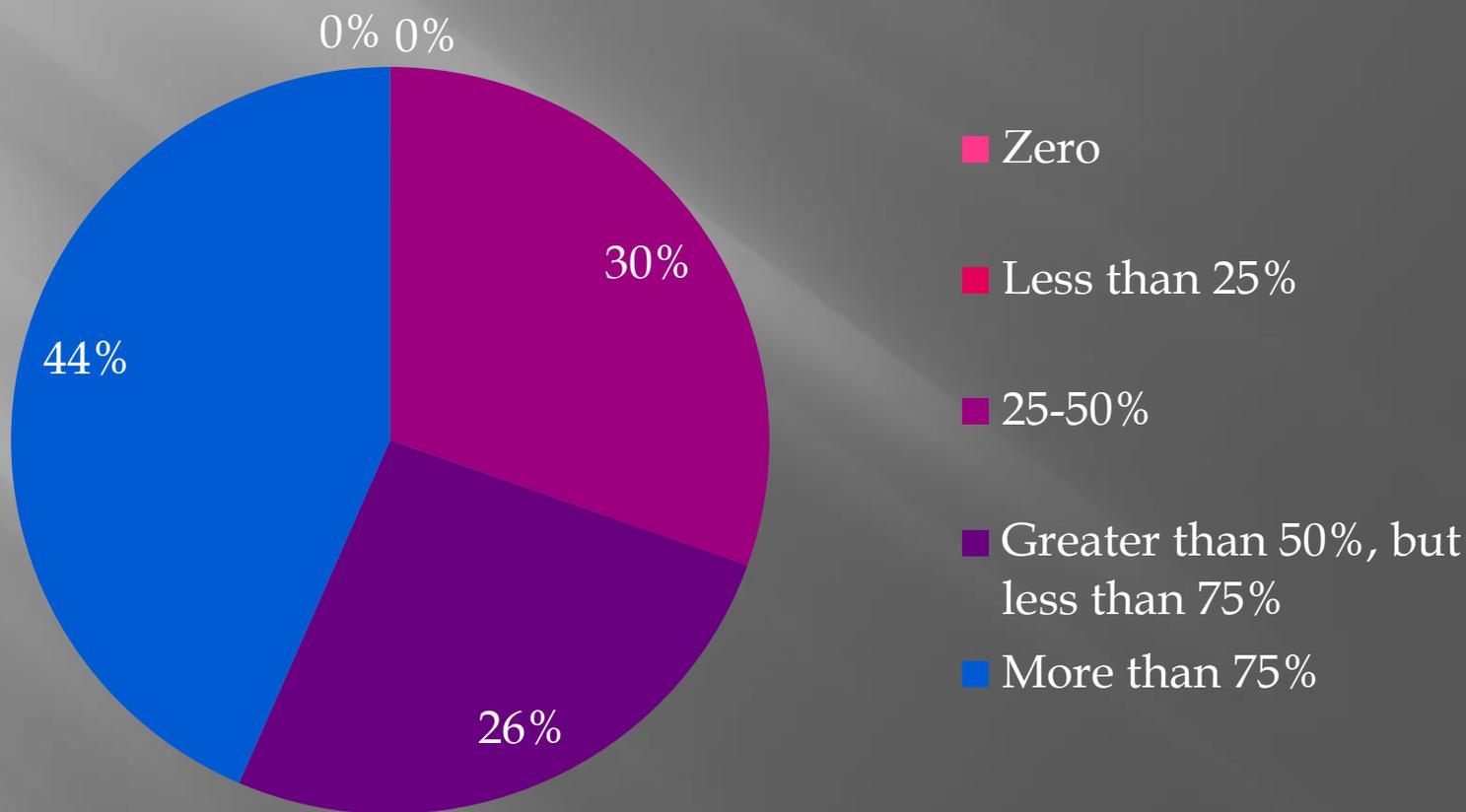
What frequencies do you place the most emphasis on when testing children with developmental disabilities and the challenges discussed earlier?
(Check all that apply)



Which transducer do you tend to use most with this population of children? (Check all that apply)



What percentage of the children that you test who have developmental disabilities are you able to acquire accurate test results?



What recommendations, if any, do you give to parents to help you for the next evaluation if you were unable to obtain enough information about the status of the child's hearing?

- ❑ Work on desensitizing the child of having their ears touched and practice with headphones in order to get ear specific information when the child returns to finish testing
- ❑ Practice getting the child to look towards a sound that the parents makes, play audiometry tasks, and “wait and listen” games at home
- ❑ Bring an interesting toy that is not too distracting to the next appointment to use during behavioral testing
- ❑ Prepare the child so he/she will know what to expect prior to the evaluation (e.g. with a social story or schedule)
- ❑ Recommend trying a different time of day on another date (time that doesn't conflict with nap time, feeding time, etc.)
- ❑ Electrophysiological testing using sedation at a different appointment

Discussion

- ▣ Both the auditory characteristics and challenges noted in research were similar to what the audiologists today reported when testing children with developmental disabilities.
- ▣ Research found that behavioral testing was less effective than objective measures; however the majority of CT Audiologists felt behavioral testing was very effective in obtaining information about the child's hearing abilities.
- ▣ Similar recommendations were suggested for audiologists and parents in past journal articles and by the audiologists from this survey.

Conclusion

- ▣ Children with developmental disabilities are often initially believed to have behavioral problems or hearing loss and audiologists may be the first ones in line to begin the evaluation of this population. It is imperative that they are able to know how to effectively test and adapt to the challenges that are often faced with these children. Using the strategies discussed during hearing evaluations, audiologists and parents can make the testing process much easier and yield reliable results imperative for the final diagnosis of children with developmental disabilities.

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