Audiological Profiles of Children with Autism Spectrum Disorder

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Introduction

- Approximately 30-40% of children with hearing loss (HL) are diagnosed with an additional comorbid disability[1,2] and among individuals with autism spectrum disorder (ASD), past studies report HL incidence of 1-3.5% in this population.[3,4]
- While universal newborn hearing screening (NBHS) can identify HL at birth, some children may develop HL later in life.
- For children identified with ASD and HL, many children are initially fit with hearing aids at around 3 to 5 years of age.[5]
- To date, there is no specified universal protocol in audiological follow-up for children with ASD or other related neurodevelopmental disabilities.
- The purpose of this study is to determine the audiological profile in respect to the method of assessment in children with ASD as well as to characterize interdisciplinary practice as seen through outside referrals made by the clinician.

Methods

- Medical record numbers were collected from chart extraction and used to access audiometric data from HealthLink, an electronic medical records database used by UW Health, an academic regional medical center.
- Current procedural terminology codes for the diagnoses of autism, autism spectrum disorder, and Asperger's syndrome were used to identify potential charts during data extraction.
- Inclusion criteria involved children who were born on or after 1/1/2014 and had been seen for an audiological evaluation between their date of birth and 1/1/2021 at either American Family Children's Hospital, a pediatric medical facility affiliated with UW Health, or the Waisman Center.
- 173 patient charts met criteria and were electronically reviewed for the following information:
  - Demographic information
  - Hearing assessment details and results
    - Includes evoked potentials (e.g. auditory brainstem response (ABR) and auditory steady state response (ASSR) testing) and behavioral testing methods
  - Hearing intervention details and results
  - Referrals made by the audiologist within clinical reports
  - Presence of additional comorbidities or structural/craniofacial abnormalities (e.g., cleft lip and palate, microtia)
  - Newborn hearing screening results
- 439 audiograms/evoked potential reports were reviewed in total, and 375 of those contained frequency-specific information.
- Preliminary analysis was completed using R and Microsoft Excel.

References

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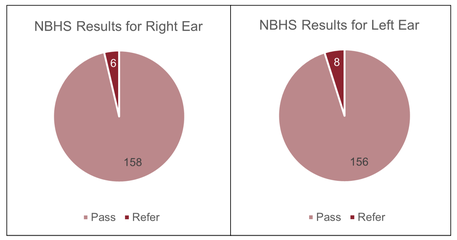
Results

- Figures 1 & 2 present NBHS results indicating pass rates of 91% in the right and 90% in the left ears.
- Presence of additional comorbidities in addition to ASD was seen in 84 out of 173 children (*48.55%*) as presented in Table 1 and Figure 3.
- Structural abnormalities were seen in 11 out of 173 children (*6.36%*) as presented in Figure 4.
- Figure 5 describes audiological assessment pattern across 4 age groups. VRA was the most common assessment method for both the toddler and preschool age groups.
- Table 2 and Figure 6 represent each individual referral given to its respective discipline.



Figures 1 & 2: Newborn hearing screening results per parental report.

Comorbidity	Count (each comorbidity)
Developmental delay	59
Chromosomal abnormality	12
Attention deficit hyperactivity disorder (ADHD)	11
Down syndrome	9
Chiari malformation	5
Cerebral palsy	3
Fragile X syndrome, Pierre Robin sequence	2
APEX1 mutation; CHARGE syndrome; Cornelia de Lange syndrome; Fetal alcohol syndrome; Hypoxic ischemic encephalopathy; Kabuki syndrome; Kawasaki disease; Noonan syndrome; PHACE syndrome; Russel Silver syndrome; Seizure disorder; Stickler's syndrome; Subdural hematoma; Waardenburg syndrome	1

Table 1

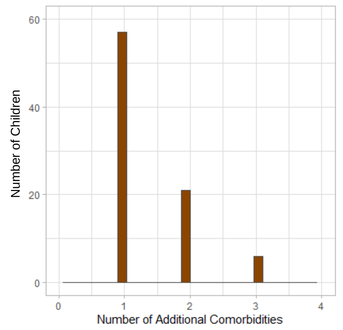


Figure 3: Frequency in presence of additional comorbid disability.

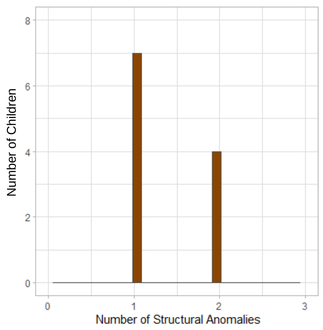


Figure 4: Frequency in presence of additional structural abnormality.

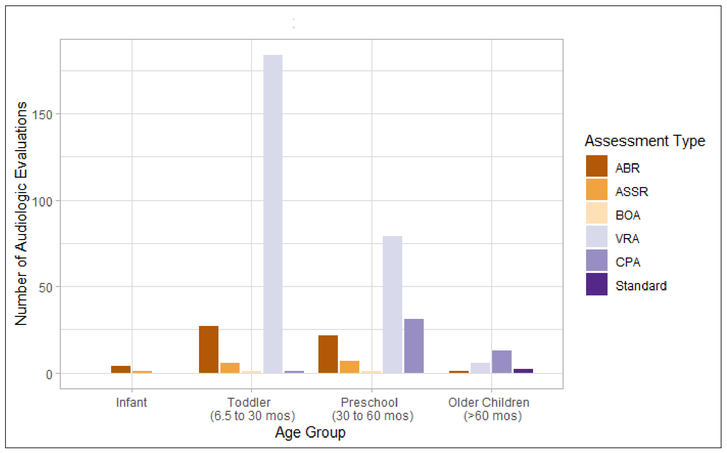


Figure 5: Method of assessment across all 173 subjects. 375 sessions were included in the analysis, as results (e.g. frequency-specific hearing thresholds) were able to be obtained.

Referral	Number of Children
Birth-to-3	28
Developmental pediatrics	33
Otolaryngology	11
Genetics	1
Sedated auditory brainstem response	32
Speech language pathology	55

Table 2

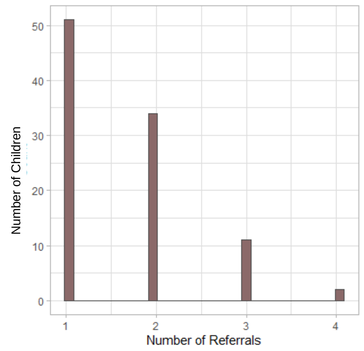


Figure 6: Frequency in the number of referrals made within the audiological report.

Discussion

- Previous studies listed did not indicate newborn hearing screening results for ASD population alone. Methodology in recruiting participants based on comorbidity/structural abnormalities varied in previous studies, as the sample included those with dual diagnosis of ASD and HL.[4]
- Testing methods for younger children are continuing to be used at later ages and can likely attributed to additional comorbidities or developmental delays.
- Important for all audiologists to have necessary knowledge on pediatric testing methods when evaluating a child with ASD.
- Given our sample did not present many children with permanent HL, few additional referrals to recommended disciplines for a new HL diagnosis, such as genetics and ophthalmology, were made. This contrasted to previous studies whose samples include all children with HL.[2]
- Appropriate audiological recommendations (e.g. sedated ABR) are being offered to families when behavioral testing does not provide enough frequency-specific information or if HL cannot be ruled out as a concern.
- Limitation to this study includes the accessibility of NBHS results solely through parental report at time of audiological visit.
- Future directions for this project center on determining how frequently the child completed an audiologic evaluation as well as investigating referral follow-through from families based on the referrals made in Figure 6.

Conclusions

- Behavioral testing methods that are more developmentally appropriate for younger age groups continue to be used when evaluating preschoolers and older children with ASD.
- ABR assessments were used for a portion of sample in both the toddler and preschool age groups.
- The most common referral recommended by audiologists was for a speech/language evaluation.

Acknowledgements

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