

Audiologic Management of Deaf and Hard of Hearing Children with Autism Spectrum Disorder

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Introduction

It has been estimated that nine percent of deaf or hard of hearing (D/HH) children have a diagnosis of autism spectrum disorder (ASD) [1], though not much is known about the success of audiologic intervention for this population. For children in this group who utilize hearing aids (HAs) and/or cochlear implants (CIs), use of their devices is variable, though limited research exists to explain this variability [2]. Characteristics and communication needs of children with ASD vary significantly across individuals, and these factors may impact wear time and overall success with hearing technology.

Purpose

The purpose of this project was to investigate factors that influence hearing device use in children with ASD in order to understand what audiologic interventions have been most successful for this heterogeneous group of children. The findings of this investigation can be used as a basis for understanding appropriate hearing device recommendations and predictors of device use for D/HH children with ASD.

Methods

Data were obtained retrospectively from electronic medical records (via PowerChart) for children up to 21 years diagnosed with ASD and permanent hearing loss (HL) who have been seen through the amplification program at Boston Children's Hospital and utilize hearing technology (hearing aids and/or cochlear implants).

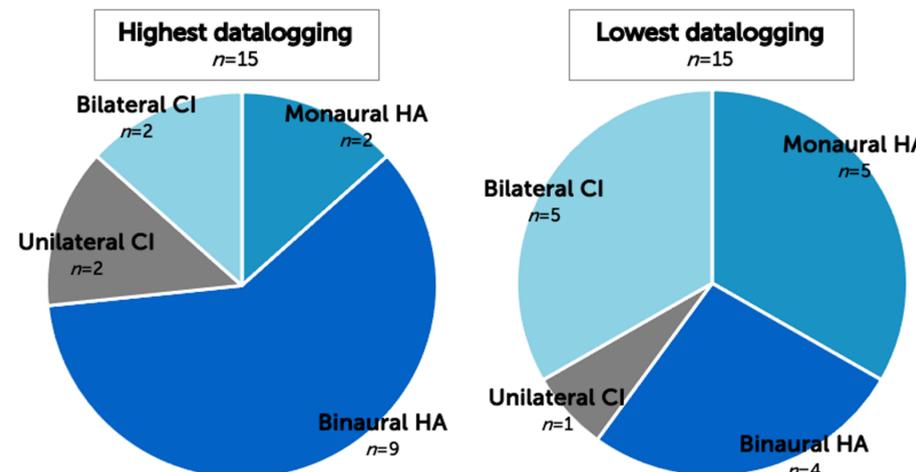
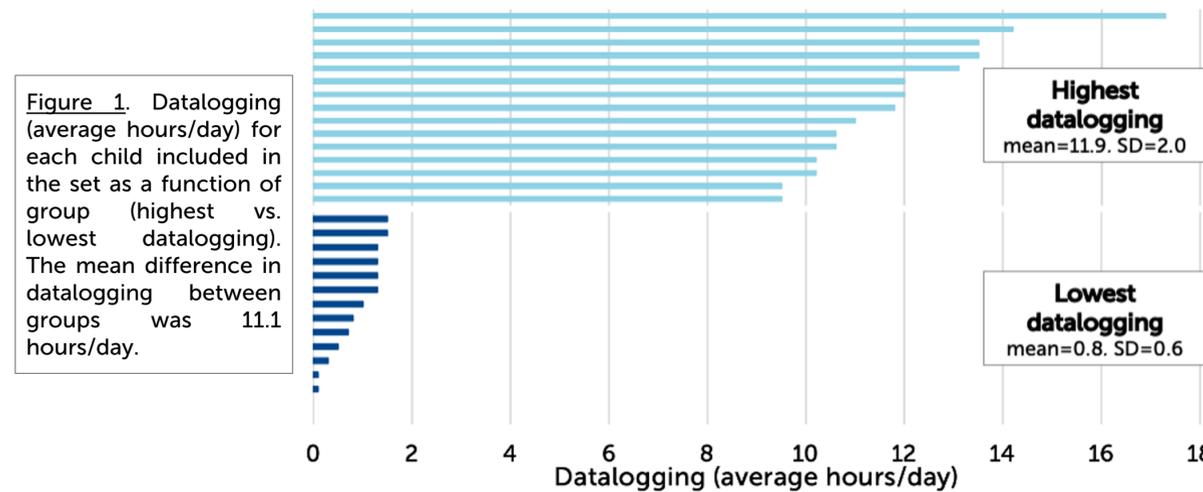
A search of audiology billing codes was conducted to identify children to be included in study. Children with Classification of Diseases (ICD-10) codes of HL and ASD were selected. Of the 168 children identified, 91 were excluded due to lack of hearing device datalogging information. Of the 77 children remaining, those with the highest ($n=15$) and lowest ($n=15$) device datalogging from their most recent audiology appointment were included for analysis, with the goal of identifying commonalities and/or differences between groups that may help predict hearing device use for children with ASD.

Analysis included type of hearing device, datalogging measures, dates of HL and ASD diagnoses, and other relevant data available in audiology, developmental medicine, and neuropsychology evaluations.

Results

	Highest datalogging $n=15$	Lowest datalogging $n=15$
Sex (M:F)	11:4	10:5
HL type		
Sensorineural	12	10
Conductive	1	4
Mixed	2	1
Age at HL diagnosis (years)	3.6	4.2
Age at ASD diagnosis (years)	5.4	5.0

Table 1. Sex, HL type, age at HL diagnosis (years), and age at ASD diagnosis (years) as a function of group (highest vs. lowest datalogging). In both groups, the majority were male and had SNHL.



Conclusions

This study confirms that hearing device use is highly variable among children with ASD.

With an average device use of 11.9 hours/day, most children in the highest datalogging group met or exceeded the average wear time across children D/HH children of 8-10 hours/day [3-5] and the clinical wear time recommendation of 10 hours/day associated with greater language outcomes and speech recognition abilities [6-7]. As such, an ASD diagnosis does not preclude successful hearing device use.

There is much less variability in hearing device use for the lowest datalogging group compared to the highest datalogging group, likely due to the small range of wear times observed among the children with minimal device use (i.e., < 2 hours/day). Given the relative equivalency of sex, HL type, age at HL diagnosis, and age at ASD diagnosis between both groups, it is possible that differences in wear time may be explained by factors not documented or controlled for in this study that have been found to be associated with hearing device use for children without ASD (e.g., maternal education level, additional diagnoses interfering with communication) [5, 8]. As many of these potential factors were not consistently reported in children's medical records, prospective work is needed to investigate whether these factors impact hearing device use for children with ASD.

The classification of support services, communication modalities, assessment instruments, and ASD itself was highly variable across children in the study, even within the same hospital system. Future work is needed in the development of standardized ASD assessment instruments for the D/HH population to reduce variability in reporting and classification and help clarify the relationship between ASD and duration of hearing device use.

References

- [1] Hansen, S., & Scott, J. (2018). A systematic review of the autism research with children who are deaf or hard of hearing. *Communication Disorders Quarterly*, 39, 330-334. doi: 10.1177/15257401177284
- [2] Beers, A. N., McBoyle, M., Kakande, E., Dar Santos, R. C., & Kozak, F. K. (2014). Autism and peripheral hearing loss: A systematic review. *International Journal of Pediatric Otorhinolaryngology*, 78(1), 96-101. doi: 10.1016/j.ijporl.2013.10.063
- [3] Easwar, V., Sanfilippo, J., Papsin, B., & Gordon, K. (2016). Factors affecting daily cochlear implant use in children: Datalogging evidence. *Journal of the American Academy of Audiology*, 27(10), 824-838. doi: 10.3766/jaaa.1538
- [4] Walker, E. A., Spratford, M., Moeller, M. P., Oleson, J., Ou, H., Roush, P., & Jacobs, S. (2013). Predictors of hearing aid use time in children with mild-to-severe hearing loss. *Language, Speech, and Hearing Services in Schools*, 44(1), 73-88. doi: 10.1044/0161-1461(2012)12-0005
- [5] Walker, E. A., McCreery, R. W., Spratford, M., Oleson, J. J., Van Buren, J., Bentler, R., Roush, P., & Moeller, M. P. (2015). Trends and predictors of longitudinal hearing aid use for children who are hard of hearing. *Ear and Hearing*, 36(0 1), 38S. doi: 10.1097/AUD.0000000000000208
- [6] Holder, J. T., Dwyer, N. C., & Gifford, R. H. (2020). Duration of processor use per day is significantly correlated with speech recognition abilities in adults with cochlear implants. *Otology & Neurotology*, 41(2), e227. doi: 10.1097/MAO.00000000000002477
- [7] Tomblin, J. B., Harrison, M., Ambrose, S. E., Walker, E. A., Oleson, J. J., & Moeller, M. P. (2015). Language outcomes in young children with mild to severe hearing loss. *Ear and hearing*, 36(0 1), 76S. doi: 10.1097/AUD.0000000000000219
- [8] Wiseman, K. B., & Warner-Czyz, A. D. (2018). Inconsistent device use in pediatric cochlear implant users: Prevalence and risk factors. *Cochlear Implants International*, 19(3), 131-141. doi: 10.1080/14670100.2017.1418161