Considerations in Hearing Device Technology in Children with Developmental Delays

University of Colorado Anschutz Medical Campus

Kassandra Madore B.S. [1,2], Emily Claire Nightengale B.A. [1,2], Jennifer Urgino Au.D. [1], Deborah Mood Ph.D.[1,2]

1. Children's Hospital Colorado 2. The Colorado Leadership Education in Neurodevelopmental and Related Disabilities (LEND) program

Children's Hospital Colorado

INTRODUCTION

- Approximately 30-40% of children with reduced hearing also have a comorbid disability that can significantly impact development outcomes, particularly language acquisition (Fitzpatrick et al, 2014).
- Research strongly indicates that the early diagnosis of hearing loss and fitting of amplification in children with complex disabilities are critical factors in the development of language for these children (Kaga et al., 2007).
- Parents of children with developmental differences and hearing loss report that consistency of device use is often challenging due to a multitude of factors (Moeller et al, 2009).
- This project will describe and outline features, accessories, assistive devices and strategies to consider when selecting and fitting hearing technology on children who are deaf and hard-of-hearing with co-occurring developmental differences.
- The aim of this project is to provide an accessible resource for audiologists and families to guide them in making informed decisions regarding hearing device technology that will maximize the use and acceptance of these devices for children with developmental differences.

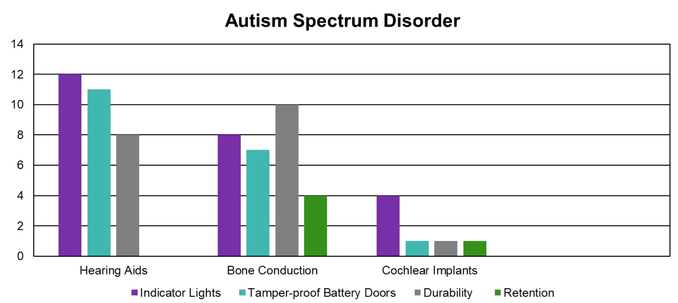
METHODOLOGY

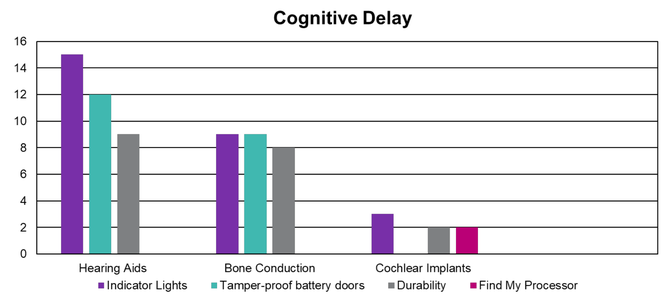
The present study investigated current research on hearing device fitting strategies and the impact on children with developmental differences. A literature review was completed to better understand the impact hearing device programing strategies and available accessories have on children with developmental differences.

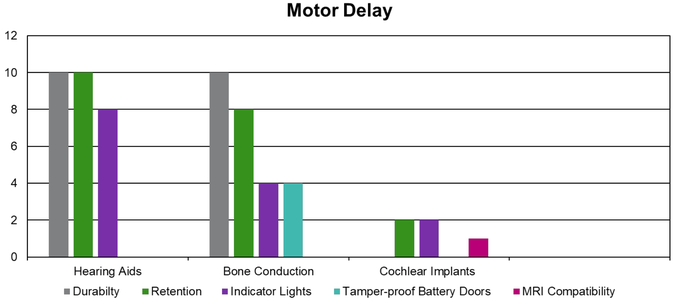
A thorough review of the literature found that there is minimal research regarding specific hearing device features that should be considered for and might benefit children with developmental differences. Due to limited research, a resource aid was created using the professional expertise of audiologists and a developmental psychologist that specialize in the treatment of children with hearing loss and developmental differences. The hope is the resource will aid parents, caregivers, and providers in making thoughtful decisions regarding hearing device choices for patients with developmental differences.

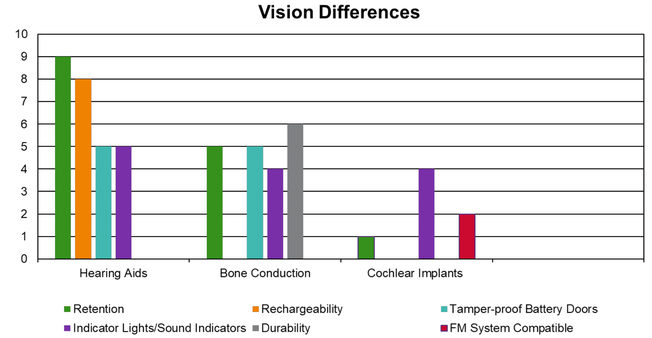
This resource was created for consideration of children age birth to five years old. Four developmental differences were focused on: cognitive delay, motor delay, vision loss, and Autism Spectrum Disorder. Several manufacturers of hearing aids, bone conduction hearing devices, and cochlear implants were compared. These device features were analyzed and clinical judgment was used to consider how features may be useful with particular developmental concerns. To support validity of clinical impressions about usefulness of particular device features with specific developmental needs, additional data was collected from audiologists at CHCO to determine their top three features considered important for children with developmental differences. For ease of comparison, a chart delineating availability of features across devices and usefulness with particular developmental needs was created. A questionnaire was created to poll the audiologists regarding the usefulness of this resource and their willingness to utilize it during hearing device consultations with their families of patients with developmental differences. In total 40 audiologists were polled and approximately 33 responses were received. Of these audiologists, 4 cochlear implant audiologists completed the survey. A comparison of features considered important by CHCO audiologists for each of these developmental differences is listed. An appendix of common terms and their utilization with each type of developmental difference was created to further aid parents in the decision-making process regarding hearing device technology for their child.

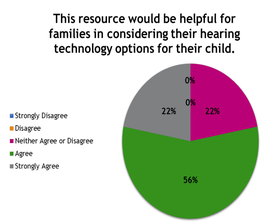
RESULTS

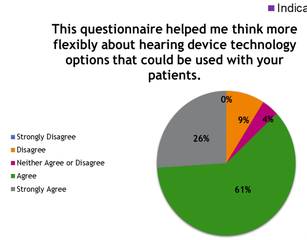


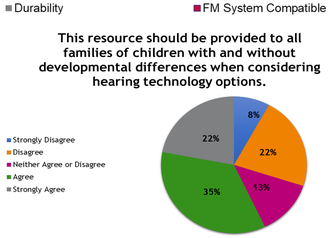


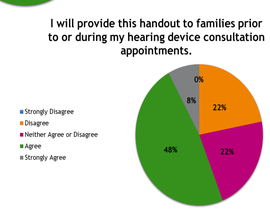


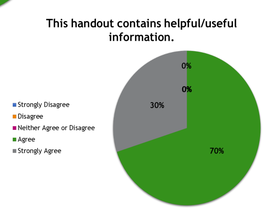












DISCUSSION

- Comparison across devices indicates that several manufacturers include features which could assist with device retention, suggesting good principles of universal design.
- Results indicate a few areas of specific differences between manufacturers which could influence device retention with children with developmental differences (e.g., body worn option).
- In this sample of pediatric trained audiologists, indicator lights, tamper-proof battery doors, and durability were considered the most important considerations when fitting hearing technology for children with developmental differences. The developed resource may be helpful in counseling families how to use these features for device retention.
- Programming features and features such as Find My Hearing Aid, bilateral initialization, MRI capability, and streaming were not identified by audiologists as critical, but may be useful features with this population.
- Areas for improvement identified to assist with device retention of bone conduction devices include modifying materials of the softband to work better with children with craniofacial differences.
- The chart developed may be most useful as a tool for audiologists to counsel families.
- Further research is needed to determine what parents and caregivers of children with developmental differences consider the most important when fitting hearing technology to increase device acceptance and use.

CONCLUSIONS AND FUTURE DIRECTIONS

- Both parents and audiologists must be considerate of device options and accessories to maximize use and acceptance in children with developmental differences.
- Indicator lights, tamper-proof battery doors, and durability were considered some of the most important variables by audiologists when selecting hearing device technology for children with developmental differences.
- Overall audiologists could think more flexibly regarding the use of features and their application towards children with developmental differences.
- 77% of sampled audiologists agreed or strongly agreed that the brochure would be useful.
- Additional survey data from cochlear implant trained audiologists would be helpful to better understand features of cochlear implant processors which are important for children with developmental differences.
- More research is needed to determine how children with developmental differences respond to specific hearing technology programming and accessories in order to increase acceptability and device use.

REFERENCES

- Ching, T. Y. C., O'Brien, A., Dillon, H., Chalupper, J., Hartley, L., Hartley, D., Hain, J. (2009). Directional Effects on Infants and Young Children in Real Life: Implications for Amplification. *Journal of Speech, Language, and Hearing Research*, *52*(5), 1241–1254. doi: 10.1044/1092-4388(2009/08-0261)
- Fitzpatrick, E. M., Lambert, L., Whittingham, J., & Leblanc, E. (2014). Examination of characteristics and management of children with hearing loss and autism spectrum disorders. *International Journal of Audiology*, *53*(9), 577–586. doi: 10.3109/14992027.2014.903338
- Kaga, K., Shindo, M., Tamai, F., & Tanaka, Y. (2007). Changes in auditory behaviors of multiply handicapped children with deafness after hearing aid fitting. *Acta Oto-Laryngologica*, *127*(sup559), 9–12. doi: 10.1080/03655230701596368
- Moeller, M. P., Hoover, B., Peterson, B., & Stelmachowicz, P. (2009). Consistency of Hearing Aid Use in Infants With Early-Identified Hearing Loss. *American Journal of Audiology*, *18*(1), 14–23. doi: 10.1044/1059-0889(2008/08-0010)
- Ricketts, T. A., Picou, E. M., & Galster, J. (2017). Directional Microphone Hearing Aids in School Environments: Working Toward Optimization. *Journal of Speech, Language, and Hearing Research*, *60*(1), 263–275. doi: 10.1044/2016_jslhr-h-16-0097
- Schafer, E. C., Mathews, L., Mehta, S., Hill, M., Munoz, A., Bishop, R., & Moloney, M. (2013). Personal FM systems for children with autism spectrum disorders (ASD) and/or attention-deficit hyperactivity disorder (ADHD): An initial investigation. *Journal of Communication Disorders*, *46*(1), 30–52. doi: 10.1016/j.jcomdis.2012.09.002