STUDY BRIEF 2023

Assessment of Early Intervention Outcomes

for children who are Deaf or Hard of Hearing

What did we learn?

WAISMAN CENTER
UNIVERSITY OF WISCONSIN-MADISON
University Center for Excellence in Developmental Disabilities

This brief report describes the study design, data collected and results from the AEIOu research study conducted at the University Center for Excellence in Developmental Disabilities (UCEDD) at the Waisman Center from 2008-2018. Over one hundred young children diagnosed with hearing loss and their families participated, most of them at multiple stages. This brief report is intended for participating families and stakeholders, which includes interdisciplinary researchers, students, state employees and collaborators from other states.

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The purpose of the Assessment of Early Intervention Outcomes (AEIOu) project was to learn more about how children who have a hearing loss developed communication skills over time.From 2008-2018, the Wisconsin Early Hearing Detection and Intervention (EHDI) program, called Wisconsin Sound Beginnings (WSB), and researchers at the Waisman Center UCEDD, collected developmental outcome data in a research protocol called the "Assessment of Early Intervention Outcomes for Young Children who are Deaf or Hard of Hearing." AEIOu researchers also contributed Wisconsin data to a national research project called the National Early Childhood Assessment Project (NECAP) at the University of Colorado-Boulder.

This overview is designed to give participating families and research partners information about how and what data were collected over 10 years, and provide some long-term perspectives on the developmental outcomes measured in children at two or three time points between the ages of 14 months and 5 years of age.

Research Partners

WSB
Wisconsin Sound Beginnings Wisconsin's Early Hearing and Intervention (EHDI) Program

AEIOu
Assessment of Early Intervention Outcomes Study at the University of Wisconsin, Madison

CDC
Centers for Disease Control and Prevention

NECAP
National Early Childhood Assessment Project Study at the University of Colorado

The AEIOu and NECAP Studies-Family Participation

WI children between the ages of 12-14 months diagnosed with hearing loss (HL) and referred to early intervention (EI=in Wi, called the Birth-to-Three Program) were determined by the WI EHDI program to be eligible to participate in the AEIOu study.

NECAP

Phase 1 n=118

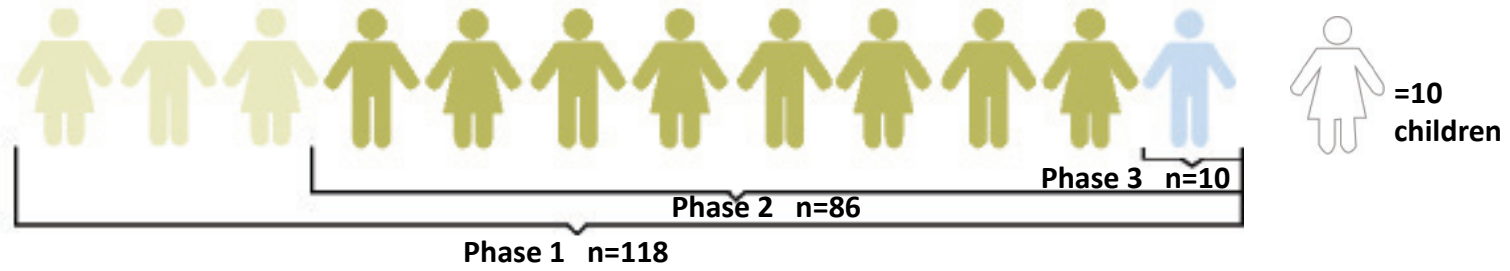
- Families were contacted by phone, given general resources, and also asked if they wanted to participate in the AEIOu/NECAP study.
- If the family agreed to participate, they were sent a packet of forms, which included a consent form, releases to allow EI and audiologists to share information with AEIOu and NECAP studies and parent-completed developmental assessment forms.
- When Phase 1 forms were signed and returned, families received a gift card.

Phase 2 n=86

- Families enrolled in the study were recontacted when their child reached the age of 26 months and asked to complete Phase 2 forms.
- Thirty-five families completed an optional video play assessment when their child was 16-35 months of age.

Phase 3 n=10

- Families whose children were turning 5 years old in 2017 were recontacted to complete pre-literacy language assessments.
- Phase 3 included in-home assessments with a speech language pathologist in addition to parent-completed questionnaires.



Who participated?

Of the 118 children enrolled in the AEIOu study, 57 (48%) were male, and 72 (61%) had no other diagnoses other than hearing loss. Eighty-nine children (75%) had bilateral and 29 children (25%) had unilateral hearing loss (see background page 4). Parents of 38 children (32%) reported that their child had a condition other than hearing loss that impacted their speech/language development. This included many different kinds of medical and developmental conditions.

One hundred and two families (86%) were white and 113 (96%) were not Hispanic. One family who identified as Hispanic did complete the Spanish language versions of the forms, other Hispanic families chose to complete the forms in English. Nine families (8%) indicated that one or more parents had a hearing loss. Seventy-six mothers (65%) reported having a Bachelor's degree or higher education.

THANK YOU to all the families who participated in our research project. Your commitment of time and effort, and willingness to share information, has led to an increase in what we know about language development for children who are deaf/hard of hearing.

Developmental Assessments Completed

Phase 1 and Phase 2:

- Demographic Form
- Minnesota Child Development Inventory
- MacArthur Words and Sentences
- MacArthur Words and Gestures
- Little Ears Auditory Questionnaire
- Greenspan Social Emotional Growth Chart
- Kent Developmental Skills

Families received written summaries of assessment forms from the University of Colorado describing their child's developmental information at that age.

Optional: Parent Child Early Relational Assessment (video assessment in home)

Phase 3:

- Clinical Evaluation of Language Fundamentals Preschool-Second Edition
- Leiter International Performance Scale-Revised
- Peabody Picture Vocabulary Test-Fourth Edition
- Test of Preschool Early Literacy-Phonological Awareness
- AZBio Pediatric Sentences
- Lexical Neighborhood Test

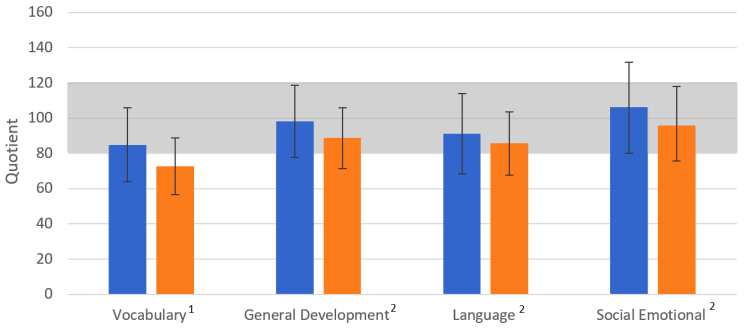
Phase 3 assessments were summarized at UW-Madison and sent to families.

AEIOu RESULTS: Children identified with hearing loss at or before 3 months of age had better developmental outcomes reported at age 2 ½ years than those children who were diagnosed later.

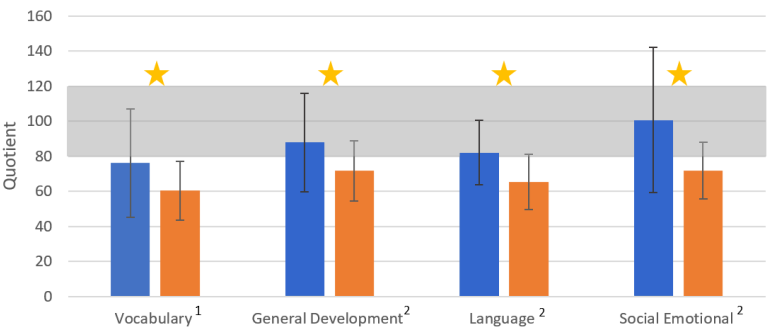
Developmental Quotients by Age Hearing Loss were Identified

Results from two developmental assessments are shared here. The MacArthur-Bates Communicative Development Inventories[5] measures expressive vocabulary skills (words and/or signs produced). The Minnesota Child Development Inventory[6] measures abilities across multiple areas of development, and presented here are general development (a summary measure) and two subscales: comprehension/conceptual language and social emotional skills (interactions).

Phase 1: Average Age 14 months (n=118)



Phase 2: Average Age 32 months (n=86)



Blue bar = average for children whose hearing loss was identified by 3 months of age
Orange bar = average for children whose hearing loss was identified after 3 months of age
The quotient is calculated from the score (age) on the language assessment form taking into account the child's age. A quotient of 80-120 is considered to be in the average range (grey shaded area).

[1]MacArthur
[2]Minnesota Child Development Inventory

Phase 1: Most quotients were in the normal range (grey shaded area on the graph above), though children whose hearing loss was identified later had lower quotients for all assessments.

Phase 2: Most quotients for children whose hearing loss had been identified by 3 months of age were still in the normal range. **Children whose hearing loss was identified later had significantly lower average quotients on three assessments, and the average quotient was below that expected for children of their age in all areas.**

Phase 3: Phase 3 involved more in depth in-person assessments for children who were 5 years of age when the pilot was conducted. Ten children participated, with a range of hearing loss and additional disabilities. The focus was on language skills related to "school readiness." Five participants demonstrated above average print knowledge skills (e.g., identifying letters) and four participants demonstrated below average ability to hear all the letters in a word. One individual, whose hearing loss was diagnosed after they were six months old, and had subsequent frequent use of hearing aids and exposure to both sign and spoken words, demonstrated above average language skills related to school readiness.

What is the significance of this study?

Children who were diagnosed with hearing loss before age 3 months of age had improved language and other development outcomes measured at 2 ½ years of age. However over time even those children diagnosed earlier did not meet the same language milestones as their typically-hearing peers. AEIOu results replicate findings from similar research studies. In this group of children, having a unilateral or bilateral hearing loss did not result in significantly different language development. Children who had additional disabilities had poorer language development than children who had only unilateral or bilateral hearing loss, which was expected. These findings reinforce the JCIH recommendation to have hearing loss diagnosed before 3 months of age.[1]

Next steps

From the wealth of data gathered, additional analyses are being conducted, including looking at social-emotional development and language development. Information gathered from this research project will contribute to improving intervention plans to promote language development for children who are deaf/hard of hearing.

Background

The Joint Committee on Infant Hearing (JCIH)[1] developed guidelines to help promote early detection and early intervention for all infants who are, or who are at risk of being or becoming, deaf or hard of hearing. The goals of early hearing detection and intervention (EHDI) systems are to expand language, communication, and learning capability, as well as promote social and emotional well-being for children who are deaf or hard of hearing.

EHDI goals are met by following the 1-3-6 EHDI guidelines

1 Month

All infants should complete a hearing screening no later than 1 month of age, ideally before discharge from the birth hospital

3 Months

All infants who "Refer" on an initial hearing screen and follow-up rescreening should complete further diagnostic testing to confirm the infant's hearing status by 3 months of age

6 Months

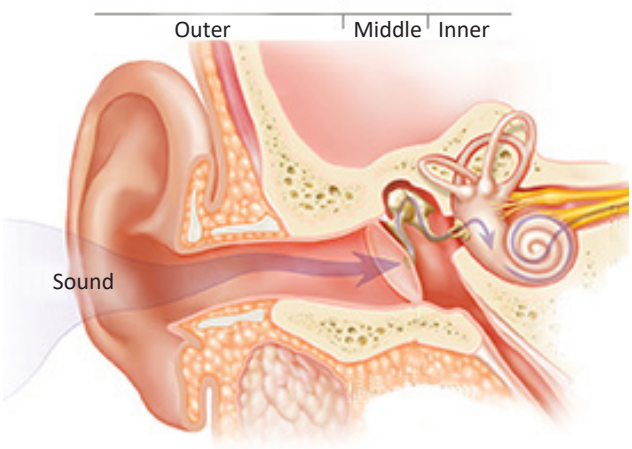
Early intervention services should be offered to an infant with confirmed hearing loss as soon as possible, ideally by 6 months of age

According to the Centers for Disease Control and Prevention, 1 to 3 per 1,000 children are born with hearing loss.[2] Hearing loss is measured through a combination of loss of volume (level of sound) and a loss of a specific pitch or frequency. Hearing loss can impact only one ear (unilateral) or both ears (bilateral). There are many causes of permanent hearing loss in children ranging from viral infection in utero, genetic conditions, to malformation of the outer, middle, or inner ear.

Human Ear[3]

Conductive Hearing Loss (CHL)

Hearing loss caused by a factor within the outer ear and/or middle ear



Sensorineural Hearing Loss (SNHL)

Hearing loss caused by a factor within the inner ear

Mixed Hearing Loss (MHL)

Hearing loss with both sensorineural & conductive factor

References

[1]Joint Committee on Infant Hearing (JCIH). Year 2019 Position Statement: Principles and Guidelines for Early Hearing Detection and Intervention Programs. Journal of Early Hearing Detection and Intervention, 4(2), 1-44. DOI: https://doi.org/10.15142/fptk-b748 https://digitalcommons.usu.edu/jehdi/vol4/iss2/1/

[2]Centers for Disease Control and Prevention (CDC), National Center on Birth Defects and Developmental Disabilities. (2021, May). 2019 Summary of National CDC EHDI Data https://www.cdc.gov/ncbddd/hearingloss/2019-data/01-data-summary.html

[3]Human Ear adapted from https://www.texaschildrens.org/departments/audiology/types-hearing-loss

[4]Effects of Hearing Loss on a Child's Development. Wecapable.com. Web. May 25, 2022. https://wecapable.com/hearing-loss-affects-child-development/

[5]Fenson, L., Marchman, V. A., Thal, D. J., Dale, P. S., Reznick, J. S. (2007). MacArthur-Bates Communicative Development Inventories: User's Guide and Technical Manual. Baltimore, MD: Brookes.

[6]Ireton, H. (1992). Child Development Inventory (CDI). Minneapolis, MN: Behavior Science Systems.