



Developmental outcomes of early-identified children who are hard of hearing at 12 to 18 months of age



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ABSTRACT

Aims: To examine the developmental outcomes of early-identified children who are hard of hearing, at 12 to 18 months of age, compared to those for children of similar age with normal hearing; and to investigate parent and child factors that are associated with these developmental outcomes.

Methods: As part of a prospective study, 28 children with mild to severe hearing loss between the ages of 12 and 18 months and 42 children with normal hearing of similar age completed a comprehensive assessment battery. All children with hearing loss were identified by newborn hearing screening and amplified, on average, by 5 months of age. Outcome measures included: Mullen Scales of Early Learning; Preschool Language Scale–4th Ed; MacArthur–Bates Communicative Development Inventory; Infant–Toddler Social and Emotional Assessment; Vineland Adaptive Behavior Scales, Second Edition; Parenting Stress Index–Short Form; and Maternal Self-Efficacy Scale.

Results: Children with hearing loss scored comparably to children with normal hearing on select outcome measures, with mean scores for both groups falling within normal limits. Greater maternal self-efficacy was associated with children's better language skills, adaptive behavior, social–emotional competence, and fewer problem behaviors.

Conclusion: Very young children with mild to severe hearing loss, who are identified early and provided prompt intervention that includes amplification, can demonstrate age appropriate development in multiple domains. Results also underscore the significance of parenting factors, especially perceived maternal self-efficacy, in relation to positive developmental outcomes for these children early in life.

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1. Introduction

Over the past decade, universal newborn hearing screening (UNHS), improved screening techniques, and the committed efforts of Early Hearing Detection and Intervention (EHDI) programs have helped to lower the age at which children with congenital hearing loss are identified. Before the implementation of UNHS, the average age of identification of congenital childhood hearing loss in the United States was 2 to 3

years [1]. However, children with mild to moderate hearing loss frequently were not identified until they entered school [2]. As a result of the widespread adoption of EHDI programs across the country, children with hearing loss of varying degrees are now being identified, on average, by 3 months of age [3].

Although it is well documented that children with congenital hearing loss are at risk for speech–language delays, poor academic achievement, literacy delays, and psychosocial difficulties in comparison to their peers with normal hearing [4], a substantial body of research evidence indicates that early detection and intervention can help reduce negative outcomes for these children [5]. Much of the outcomes research on children with hearing loss, however, has focused on children with severe and profound hearing loss (>70 dB HL) and, more recently, children with cochlear implants. Significantly less attention has been given to developmental outcomes for children who are hard of hearing (i.e., those children with better-ear pure-tone averages between 25 and 79 dB HL, who typically receive benefit from hearing aids and do not use cochlear implants). Of the few studies that have investigated outcomes

Abbreviations: HL, hearing loss; UNHS, universal newborn hearing screening; EHDI, Early Hearing Detection and Intervention; PTA, pure-tone average; BE-PTA, better-ear pure-tone average; MSEL, Mullen Scales of Early Learning; PLS-4, Preschool Language Scale–Fourth Edition; MCDI, MacArthur–Bates Communicative Development Inventory; ITSEA, Infant–Toddler Social and Emotional Assessment; Vineland-II, Vineland Adaptive Behavior Scales–Second Edition; PSI-SF, Parenting Stress index–Short Form; ANOVA, analysis of variance; NIDCD, National Institute on Deafness and Other Communication Disorders.

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for children who are hard of hearing, most have involved school-aged children whose hearing losses were identified after 2 years of age with hearing aids fitted later [6,7]. Consequently, we know relatively little about the developmental outcomes and intervention needs for very young children who are hard of hearing, especially those identified within the first few months of age.

Prior to the implementation of EHDI programs, most studies reported adverse language outcomes for children who are hard of hearing, especially in the areas of phonology, morphology, vocabulary, and syntax [8]. Though relatively limited in scope, more recent research suggests that young children with mild to moderate hearing loss, who are identified early, amplified by 3 months of age, and enrolled early in early intervention by 6 months of age, may not show language delays to the same extent as do children who are later identified (>6 months of age) [9].

Given the well documented associations between language delays and behavioral, social, and emotional difficulties in the general population of hearing children [10], it is not surprising that children with hearing loss have been found to evidence in general more behavioral and social problems than typical hearing peers. In particular, children with severe and profound hearing loss have been noted to exhibit problems with externalizing and internalizing behaviors, attention, emotional regulation, and social understanding [11]. Although there is some evidence that school-aged children with mild and unilateral hearing loss also are prone to elevated rates of emotional and behavior difficulties [6], we do not know whether younger children who have been identified through EDHI programs and provided early intervention services exhibit similar types and frequencies of psychosocial problems.

Over the years, research has linked a variety of child and parent factors with developmental outcomes of children with severe and profound hearing loss. These factors include severity of hearing loss, gender, presence of additional disabilities, maternal education, ethnicity, and family socioeconomic status (SES). Whether these particular variables contribute significantly to early developmental outcomes of children who are hard of hearing is not well known. Further, the extent to which early intervention services may help moderate developmental risks associated with certain child and parent factors (e.g., severity of hearing loss, low SES) has not been adequately examined for children who are hard of hearing.

Recently there has been an increased interest in examining the influences of parenting factors for children with hearing loss [12,13]. This new line of investigation is not surprising, as an extensive body of literature has shown strong relationships between maternal self-efficacy, parenting stress, and developmental outcomes for children with normal hearing. Specifically, higher maternal self-efficacy and lower parenting stress have been linked with more positive child outcomes, including age-appropriate language development, better academic achievement, and healthier social-emotional adjustment [14].

Surprisingly few studies have examined the relationship between self-efficacy of mothers of young children with hearing loss and children's developmental outcomes. In a study by DesJardin and Eisenberg [13], mothers of preschool children with cochlear implants who felt more knowledgeable and efficacious in developing their children's language skills provided their children with higher-level language strategies, including parallel talk and open-ending questioning. Moreover, these facilitative language techniques were positively associated with children's spoken language skills. In a follow-up study, DesJardin [15] found mothers of children with severe to profound hearing loss who used hearing aids to have lower self-ratings of self-efficacy and involvement in their child's sensory device use and speech-language development than mothers of children with cochlear implants. Neither of these studies, however, included children with milder degrees of hearing loss.

Although parenting stress among mothers of children with hearing loss has received considerable attention, research findings have been inconsistent. Some studies report significantly higher levels of stress for

parents of children who are deaf or hard of hearing than for parents of children with normal hearing [16], and other studies reporting no differences between groups [17]. These contradictory findings have been attributed to a variety of factors, including differences in study sample size, child age, degree of hearing loss, and assessment instruments used to measure parenting stress. However, Meinzen-Derr, Yim, Choo, Buyniski, and Willey [18] suggested that the types of parenting stressors experienced by parents of children with hearing loss may be different than those experienced by parents of children with normal hearing and, importantly, that these parental stressors evolve over time. Moreover, they asserted that in order to provide appropriate support services to promote optimal child development, it is imperative we have a better understanding of the specific concerns that burden parents of children with hearing loss across the lifespan. Currently, we have limited knowledge regarding the parenting stress that may be experienced by mothers of very young, early-identified children who are hard of hearing.

The primary aim of this study was to examine the early developmental outcomes, including language skills, social-emotional functioning, and adaptive behavior, for very young children who are hard of hearing compared with those for children of similar age with normal hearing. A secondary aim was to explore the associations between child, maternal, and parenting factors, and developmental outcomes for children 12 to 18 months of age who are hard of hearing.

2. Methods

2.1. Study population

As part of a longitudinal prospective outcome study, a culturally diverse cohort of 28 children ages 12 to 18 months with bilateral mild to severe hearing loss and their parents were identified for inclusion in our investigation. Forty-two children of similar age with normal hearing and their parents were enrolled for comparison purposes. All children and their parents were recruited through two prominent pediatric audiology clinics located in Los Angeles and Indianapolis. Research procedures were approved by each center's Institutional Review Board, and written informed consent was obtained from parents.

Children with hearing loss were eligible to participate if they had: (a) confirmed permanent hearing loss bilaterally, with a 4-frequency pure-tone average of 20 to 89 dB HL in the better ear (PTA-BE); (b) at least one parent or primary caregiver at home who spoke English; and (c) no other known significant physical, neurological, cognitive, or visual impairments. Children with normal hearing were eligible for participation if they met the same criteria except that they demonstrated PTAs of <20 dB HL for both ears.

Two children with hearing loss and three children with normal hearing were excluded due to medical issues and observable developmental delays. Four children with normal hearing were evaluated by the research team but judged inappropriate for inclusion in the final analyses due to apparent neurological impairments or off-task behaviors during testing that deemed test results invalid.

2.2. Procedures

Each child participated in a comprehensive assessment administered by the project's research team comprised of certified speech-language pathologists, audiologists, and a clinical psychologist experienced in working with children with hearing loss. Testing was conducted over a 1 to 2 day period. The child's cognitive, language, and social-emotional skills and adaptive behavior were assessed through standardized, clinician-administered measures, questionnaires, and a semi-structured parent interview. Parents provided sociodemographic information and, when applicable, details about the child's hearing loss, diagnostic history, use of amplification, and participation in early intervention services. In addition, parents completed self-report

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