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Early identification: Language skills and social functioning in deaf and hard of hearing preschool children

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ABSTRACT

Objective: Permanent childhood hearing impairment often results in speech and language problems that are already apparent in early childhood. Past studies show a clear link between language skills and the child's social–emotional functioning. The aim of this study was to examine the level of language and communication skills after the introduction of early identification services and their relation with social functioning and behavioral problems in deaf and hard of hearing children.
Study Design: Nationwide cross-sectional observation of a cohort of 85 early identified deaf and hard of hearing preschool children (aged 30–66 months).
Methods: Parents reported on their child's communicative abilities (MacArthur-Bates Communicative Development Inventory III), social functioning and appearance of behavioral problems (Strengths and Difficulties Questionnaire). Receptive and expressive language skills were measured using the Reynell Developmental Language Scale and the Schlichting Expressive Language Test, derived from the child's medical records.
Results: Language and communicative abilities of early identified deaf and hard of hearing children are not on a par with hearing peers. Compared to normative scores from hearing children, parents of deaf and hard of hearing children reported lower social functioning and more behavioral problems. Higher communicative abilities were related to better social functioning and less behavioral problems. No relation was found between the degree of hearing loss, age at amplification, uni- or bilateral amplification, mode of communication and social functioning and behavioral problems.
Conclusion: These results suggest that improving the communicative abilities of deaf and hard of hearing children could improve their social–emotional functioning.

1. Introduction

Permanent Childhood Hearing Impairment (PCHI) is a chronic handicap that affects approximately 1–1.3 out of every 1000 live births [1,2]. As a result of diminished auditory input, hearing impairment causes speech and language problems [3–6]. These problems can reduce the child's ability to communicate and to understand the refinements of social language [7].

Extensive research in young hearing children has shown a clear relation between language delays and poor acquisition of social and emotional competencies which lead to behavioral problems[5,8–11]. Both impaired language development and social–emotional problems are linked to poorer social skills and academic achievement, and fewer friendships [8,11]. Others have observed this link in deaf and hard of hearing (DHH) children [12]. Besides language problems, these children have also been shown

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to develop more social and emotional problems than hearing peers [13–17]. For example, DHH children experience a lower quality of life and more mental health problems such as anxiety, depression, and behavioral problems than their peers without hearing loss [18–27]. However, these studies were conducted before the introduction of early identification services.

Early identification and intervention programs have improved speech and language development in DHH children [7,28,29]. It is expected that these improvements also benefit the child's ability to communicate with others as the child becomes more able to express him or herself and to interact with peers. Yet, it remains unknown if this increased ability to communicate and participate in a sound-dominated world also benefits social functioning and prevents the development of behavioral problems. In this nationwide study, we examine the level of language and communication skills after the introduction of early identification services and their relation with social functioning and behavioral problems in DHH children.

2. Materials and methods

2.1. Procedure

This study was conducted as part of the large DECIBEL-study in the Netherlands [2]. DECIBEL is an acronym for Developmental Evaluation of Children: Impact and Benefits of Early hearing screening strategies Leiden. Its purpose was to define the effect of early identification and intervention services which were introduced in the Netherlands since 2002 compared to the previously used distraction screening method. The DECIBEL collaborative study group identified and evaluated all children with a positive screening result during either the Newborn Hearing Screening (NHS) or the distraction hearing screening in whom PCHI was confirmed at an audiological center after diagnostic testing. PCHI was defined as a hearing loss of 40 dB or more in the better ear. All children were born in the Netherlands between January 2003 and December 2005. For the present study, only DHH children who had been identified by the NHS were included since this is regarded as standard care in Western society nowadays.

Between 2008 and 2010, parents of DHH children who were born after introduction of the NHS completed several questionnaires after informed consent was obtained. With their permission, audiological and medical records were checked for background information and hearing-loss-related outcomes such as the auditory thresholds, mode of rehabilitation and speech and language development. Permission for this study was granted by the Medical Ethics Committee of the Leiden University Medical Center.

2.2. Participants

During the introduction of the NHS from January 2003 till December 2005, 279 babies were identified and confirmed to have bilateral permanent childhood hearing impairment (PCHI) [30]. All these children were invited to participate in our study. Parents of 98 children granted permission to participate and 85 of these completed the questionnaires. The final study sample consisted of 85 children with bilateral hearing loss; 47 boys and 38 girls. At the time of assessment, children were between the ages of 30 and 66 months old (mean age 46 months). The degree of hearing loss varied widely. Thirty-eight children (45%) experienced moderate losses (41–60 dB), 28 children (33%) experienced severe losses (61–90 dB) and 19 children (22%) were diagnosed with profound hearing loss (>90 dB). Most children were equipped with conventional hearing aids ($n = 61$; 72%), 20 children (24%) were fitted with a cochlear implant (CI) of which 4 were bilaterally implanted. Three children were amplified with a bone conduction device (BCD). In one case, the child did not wear any form of hearing amplification anymore because of poor device acceptance due to psychomotor retardation. The majority of children communicated via spoken language ($n = 37$; 44%) or sign-supported language ($n = 35$; 41%). The remaining children either used sign language ($n = 9$; 10%) or an individually tailored form of communication using other senses, because of additional disabilities ($n = 4$; 5%). In the families of nine participating children, at least one of the parents was DHH. Two children were born to families in which both parents were DHH. Background information regarding the study sample can be found in Table 1.

2.3. Materials

2.3.1. Receptive and expressive spoken language

The Dutch translation of the 'verbal comprehension' scale of the Reynell Developmental Language Scale (RLDS) was used to determine receptive language skills. The Schlichting Expressive Language Test (SELT) measures vocabulary by means of the subtest 'word development' and syntax by means of the 'sentence development' subtest [31]. These tests are standardized oral language tests that are part of the clinical follow-up for children with PCHI in the Netherlands and were derived from the child's medical records. As a consequence, they were conducted at a different time and age of the child than when parents completed the questionnaires. Therefore, time of assessment varies considerably in this study (mean difference between tests 7.0 months ± 10 months *SD*). However, age-equivalent scores which represent the

Table 1
Demographic characteristic of participants.

	Total study population $N = 85$
Age at time of assessment	
Mean—in months (*SD*)	46 (10)
Range—in months	30–66
Gender (%)	
Male	47 (55)
Preferred mode of communication (%)	
Oral language only	37 (44)
Sign-supported Dutch	35 (41)
Sign language only	9 (10)
Other	4 (5)
Type of education (%)	
Mainstream education	21 (25)
Special education for the hearing impaired	51 (60)
Special education for developmental disabilities	6 (7)
Unknown	7 (8)
Degree of hearing loss—low fletcher index (%)	
Moderate 41–60 dB	38 (45)
Severe 61–90 dB	28 (33)
Profound >90 dB	19 (22)
Hearing amplification type (%)	
Hearing aid	61 (72)
Cochlear implant	20 (24)
BCD	3 (3)
No adjustment	1 (1)
Age at diagnosis of hearing loss—in months (*SD*)	7 (11)
Age at first amplification—in months (*SD*)	14 (13)
Duration of amplification use—in months (*SD*)	31 (13)
Additional disabilities (%)	13 (16)
CI characteristics	
Age at implantation—in months (*SD*)	25 (14)
Duration of CI use—in months (*SD*)	18 (11)
Bilateral CI (%)	4 (5%)

Abbreviations: BCD, bone conduction device; CI, cochlear implant; HA, hearing aid; SD, standard deviation.