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Psychopathology in hearing-impaired children

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CHAPTER 6

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Psychopathology in hearing-impaired children

In revision

ABSTRACT

Background

Children with hearing loss are at risk for developing psychopathology, which has detrimental consequences for academic and psychosocial functioning later in life. Yet, the causes of the extensive variability in outcomes are incompletely understood. Therefore, the aims were to objectify levels of psychopathology in hearing-impaired children with cochlear implants or hearing aids, and in normally hearing peers, and to investigate the influence of various risk and protective factors on psychopathology.

Methods

The population-based sample (mean age = 11.8 years) included three subgroups with comparable age, gender, socioeconomic status, and non-verbal intelligence: 57 with cochlear implants, 75 with conventional hearing aids, and 129 normally hearing children. Psychopathology was assessed by means of self- and parent-reports. The risk and protective factors incorporated medical, auditory, linguistic, intellectual, and sociodemographic factors.

Results

Children with cochlear implants showed similar levels of psychopathology as normally hearing peers, but children with hearing aids had significantly more psychopathological symptoms, while their hearing losses were approximately 43 decibels lower than those of children with implants. Furthermore, several associated factors were identified, including age, language and communication skills, age at detection and intervention, socioeconomic status, and number of siblings.

Conclusions

It is not the severity of hearing loss but rather the type of hearing device that is crucial for the level of psychopathology in hearing-impaired children. Deaf or profoundly hearing-impaired children with cochlear implants have lower levels of psychopathology than hearing aided children with moderate or severe hearing loss. This outcome has major consequences for the next generation of hearing-impaired children because children with profound hearing impairment still have the potential to function as adequately as normally hearing children.

INTRODUCTION

Bilateral permanent childhood hearing impairment affects approximately 1 to 1.3 out of every 1000 live births [1-3]. This physical handicap influences communication and cognitive functioning, but can also result in psychopathology [4-6]. In child psychology and psychiatry, psychopathological symptoms can be divided into two categories: internalizing and externalizing symptoms. Internalizing symptoms involve depressive and anxious feelings, whereas externalizing symptoms refer to hyperactive, aggressive, and antisocial behavior [7]. These symptoms have detrimental consequences for academic and psychosocial functioning later in life, and are risk factors for other psychiatric disorders as well as substance abuse [7-13].

Hearing-impaired (HI) children experience more internalizing and externalizing symptoms when compared to their normally hearing (NH) counterparts [4,14-25]. Various risk and protective factors typical for the HI population have been identified, including linguistic [14,16,26-30], intellectual [14,17], auditory [31-33], medical [34-38], and sociodemographic [14-18,23,26] factors. However, for many of these factors contradictory outcomes have been demonstrated. Furthermore, many of the studies did not include large and representative samples, ruling out drawing firm conclusions for the complete HI population. Yet, to be able to actually help this vulnerable group of children, we have to know which individuals are at risk. Additionally, identifying and understanding the causes of psychopathology will lead to an improvement of targeted screening, intervention, and counseling trajectories [39]. Therefore, the aim of this study was two-fold: 1. to compare levels of internalizing and externalizing symptoms by using a multidimensional assessment, in three representative groups: children with cochlear implants (CIs), children with conventional hearing aids, and NH children; 2. to examine which risk and protective factors affect psychopathology. Based on existing literature, it was expected that HI children would experience higher levels of psychopathology than their NH counterparts and that sufficient language and communication skills would decrease these levels.

METHODS AND MATERIALS

Participants

In total 261 children (mean age = 11.8, *SD* = 1.6) participated in this study. Table 1 shows characteristics of the participants. The inclusion criteria were having a performal IQ ≥ 80, ruling out mental retardations, and living in the Netherlands or the Dutch-speaking part of Belgium. For HI children 3 more inclusion criteria applied: 1. bilateral hearing loss of at least 40 dB in the best ear; 2. that was pre- or perilingually detected; 3. no other comorbidities, such as visual impairment, ADHD, learning disabilities, or Autism Spectrum Disorders.

Table 1 Characteristics of all participants

	Total sample (*N* = 261)		**HI sample (*n* = 132)**	
	HI (*n* = 132)	**NH controls (*n* = 129)**	**Cochlear implant (*n* = 57)**	**Hearing aid (*n* = 75)**
Sociodemographic factors				
Age mean in years (*SD*)	11.9 (1.8)	11.6 (1.3)	11.9 (2.0)	12.0 (1.7)
Age range (in mo)	100 - 197	99 - 176	100- 197	110 - 188
Gender - *n* (%)				
Male	66 (50%)	58 (45%)	27 (47%)	39 (52%)
Female	66 (50%)	71 (55%)	30 (53%)	36 (48%)
Socioeconomic status mean (*SD*) [a]	11.5 (2.3)	12.1 (2.4)	11.7 (2.2)	11.3 (2.4)
Number of siblings mean (*SD*)	2.6 (1.2)	2.3 (1.0)	2.4 (1.1)	2.7 (1.3)
Type of education - *n* (%)				
Regular education	79 (60%)	-	34 (60%)	45 (60%)
Special education	53 (40%)	-	23 (40%)	30 (40%)
Linguistic and intellectual factors				
General Communication Composite mean (*SD*) [b]	91 (19)	74 (18)	93 (19)	93 (19)
Major to mild deficits - *n* (%)	29 (22%)	7 (5%)	13 (23%)	16 (21%)
No deficits - *n* (%)	58 (44%)	85 (66%)	26 (45%)	32 (43%)
Unknown	37 (34%)	37 (29%)	18 (32%)	27 (36%)
Language skills mean (*SD*) [c]	6.4 (2.6)	7.0 (2.0)	6.2 (2.7)	6.6 (2.6)
Preferred mode of communication - *n* (%) [d]				
Oral language only	102 (77%)	-	44 (77%)	58 (77%)
Sign-supported language	28 (21%)	-	13 (23%)	15 (20%)
Sign language only	2 (2%)	-	0 (0%)	2 (3%)
Nonverbal IQ mean (*SD*)	10.3 (2.8)	10.6 (2.6)	10.1 (2.6)	10.4 (3.0)
Auditory and medical factors				
Unaided degree of hearing loss - *n* (%) [e]				
Moderate (40 - 60 dB)	31 (23%)	-	0 (0%)	31 (41%)
Severe (61 - 90 dB)	27 (21%)	-	2 (4%)	25 (33%)
Profound (> 90 dB)	66 (50%)	-	53 (93%)	13 (17%)
Unknown	8 (6%)	-	2 (4%)	6 (8%)
Aided degree of hearing loss - *n* (%) [e]				
Moderate (< 35 dB)	29 (22%)	-	13 (23%)	16 (22%)
Severe (35 - 60 dB)	28 (21%)	-	15 (26%)	13 (17%)
Profound (> 60 dB)	18 (14%)	-	5 (9%)	13 (17%)
Unknown	57 (43%)	-	24 (42%)	33 (44%)

table 1 continued

Age at onset of hearing loss - *n* (%)				
Prelingual (< 3 yrs)	112 (85%)	-	53 (93%)	59 (79%)
Perilingual (3 - 5 yrs)	13 (10%)	-	2 (4%)	11 (15%)
Unknown	7 (5%)	-	2 (4%)	5 (7%)
Mean age at detection in years (*SD*)	1.6 (1.3)	-	1.3 (0.9)	1.9 (1.5)
Mean age at 1st hearing aid in years (*SD*)	2.1 (1.4)		1.5 (0.9)	2.6 (1.5)
Mean age at CI in years (*SD*)			3.8 (2.8)	
Mean duration of CI use in years (*SD*)			8.1 (2.8)	
Implantation - *n* (%)				
Unilaterally implanted			43 (75%)	
Bilaterally implanted			14 (25%)	
Etiology of hearing loss				
Genetic – Syndromal	4 (3%)	-	1 (2%)	3 (4%)
Genetic – Non-syndromal / Developmental	28 (21%)	-	8 (14%)	20 (27%)
Acquired – Non-meningitis	15 (11%)	-	4 (7%)	11 (15%)
Acquired – Meningitis	19 (15%)	-	18 (31%)	1 (1%)
Idiopathic	66 (50%)	-	26 (46%)	40 (53%)

[a] Socioeconomic status score was measured by parental education, jobs, and net income. (Unfortunately, due to privacy reasons, almost half of the parents did not fill out the question concerning the net income, so these were not taken into account.)
[b] Higher scores indicate more language problems.
[c] Language skills were derived from the Clinical Evaluation of Language Fundamentals®; see Materials section for more information.
[d] Verified by child, parents, and medical records.
[e] Degree of hearing loss was calculated by averaging (un)aided hearing thresholds at 500, 1,000, and 2,000 Hertz.

Procedure

To collect a sample that represented a large group of the HI population and to reduce any possible selection bias, we recruited in various ways: in total 28 special schools (i.e., schools for HI children), 5 ambulatory care organizations (Speech and Hearing centers or residential schools), and 2 large academic hospitals were approached, of which 14 schools, 5 ambulatory organizations and 2 hospitals agreed to participate. The others refused for reasons related to time commitment or other research projects. In line with privacy policy, information packages and consent forms were sent to the parents via these schools, organizations, and hospitals. The NH controls were recruited at primary and secondary schools throughout the country, to reach a sample that was sociodemographically diverse. All parents/caregivers gave consent for their child's participation. Children were assured that their reactions would be processed anonymously and instructions were provided in the child's preferred mode of communication. The participant could choose between two versions of assessment: the first version comprised written items exclusively and in the

second version each item was presented in written text and sign language simultaneously (by means of a video clip). Back translation of all signed items showed good convergence with the original items. Approval for the study was obtained by the Medical Ethics Committee of the Leiden University Medical Center under number P10.137.

MATERIALS

In order to optimally measure psychopathology, various questionnaires were used. All questionnaires were validated and standardized for the NH population, except for the questionnaire measuring social anxiety. For social anxiety, a short index consisting of six items was developed especially for this study by a team of child psychologists, targeting the key aspects of social anxiety. The Internalizing index consisted of questionnaires involving depressive symptoms, general and social anxiety, somatization, social phobia/ obsessive compulsive disorder, and generalized anxiety disorder. For the Externalizing index, questionnaires about aggression, delinquency, symptoms of psychopathy, oppositional defiant disorder, attention deficit hyperactivity disorder, and conduct disorder were included. We chose these specific areas, in line with the DSM-IV diagnoses, because they are among the most common psychopathological problems in childhood and can cause severe pervasive impairments.
The majority of questionnaires were filled out by the children themselves, while some reports were completed by parents. The choice of respondent depended on which respondent was assumed to give most appropriate and accurate answers. For example, internalizing symptoms are often better reported by children themselves, because parents are known to underestimate the actual levels [31,40].

Questionnaires composing the Internalizing index

Depression
The shortened version of the *Child Depression Inventory* (26 items) is a self-report that assesses the presence of depressive symptoms in children aged 6 to 17 years old [22,41]. An example item is “I feel lonely”.

Social anxiety
For this study, child psychologists designed a new questionnaire (7 items) that measures the occurrence of different features of social anxiety (e.g., “I’m afraid of talking to someone I don’t know”) [20].

General Anxiety
The shortened version of the *Fear Survey Schedule for Children - Revised* (24 items) is a self-report that measures the intensity of fears (e.g., of criticism, the unknown, small animals, danger, or death) in children from 7 to 17 years [42].

Somatization
The Somatic Complaint List (11 items) examines the amount of self-reported physical symptoms in school-aged children [43]. The reason for including this self-report is that internalizing symptoms in children can come to expression by somatic complaints only [44]. An example item is: "I have a stomach ache".

Generalized anxiety disorder and Social phobia/Obsessive compulsive disorder
The *Child Symptom Inventories* are parent-reported scales that screen for emotional and behavioral disorders [7,45]. Only the two internalizing scales were used, assessing Generalized anxiety disorder (7 items) (e.g., "Has difficulty controlling worries") and Social phobia/Obsessive compulsive disorder (3 items) (e.g., "Cannot get distressing thoughts out of his/her mind, for example, worries about germs or doing things perfectly"). Parents were asked how often these symptoms occurred.

Questionnaires composing the Externalizing index

Aggression
In the *Self Report Instrument for Reactive and Proactive Aggression* (36 items) participants were asked how often they performed several aggressive behaviors (e.g., kicking or arguing) in the last four weeks.

Delinquency
The self-report *Delinquency Questionnaire* (10 items) involves delinquent offences (e.g., shoplifting or stealing from parents) [21,46]. Children were asked how many times they had committed these offences in the past year.

Psychopathy
The parent-completed *Psychopathy Screening Device* (20 items) reflects psychopathic behavior of the child (e.g., "Keeps his/her promises") [47]. Parents were asked how often the behaviors occurred.

Behavioral disorders
Three externalizing problems were derived from the *Child Symptom Inventories* [7,45]. The scales assessing Attention Deficit Hyperactivity Disorder (17 items) (e.g., "Has difficulty paying attention to tasks or play activities"), Oppositional Defiant Disorder (8 items) (e.g., "Does things to deliberately annoy others"), and Conduct Disorder (15 items) (e.g., "Has run away from home overnight") were used.

Composition of the Internalizing and Externalizing indices
Pearson's correlations between all areas were computed to rule out large conceptual overlap. With correlations below .65, no collineairity appeared implying that all areas contributed uniquely to the total index. Next, mean scores per area were calculated, which were standardized to eliminate scale differences between the questionnaires, using a

mean of 100 (*SD* of 10), based on the NH group. With the standardized scores, two composite indices for Internalizing and Externalizing symptoms were computed. The indices had excellent internal consistencies, both with Cronbach's Alpha's of .91. Alpha's retained their excellent values when examining HI children's responses exclusively.

Language and intelligence tests

The nonverbal intelligence was obtained with two tests (*Block design and Picture arrangement*) of the *Wechsler Intelligence Scale for Children (WISC) - Third Edition* [48,49]. Age-equivalent norm scores based on Dutch standards (10 = average) were used to calculate one mean score. A random sampling (n = 23) across HI children who were assessed with a complete intelligence test earlier (either the Snijders-Oomen Nonverbal Intelligence Test [50] or the WISC) showed a high correlation between the scores of our tests and the IQ score, r = .79, p < .001. The tasks were not administered to 8 HI and 17 NH children, due to time constraints.

Two tests (*Sentence comprehension and Story comprehension*) of the Dutch version of the *Clinical Evaluation of Language Fundamentals® - Fourth Edition* (CELF®) were administered [51,52]. Norm scores were corrected for chronological age and one mean score was computed. When clinical or school records already contained CELF scores, these scores were used instead. To 22 HI and 16 NH controls the Sentence comprehension task was not administered and to 19 HI and 16 controls the Story comprehension task was not administered, due to time constraints. The two HI children who used sign language exclusively, received specific subtests of the *Assessment Instrument for Sign Language of the Netherlands* (AISL) [53]. They both had sufficient sign language skills to interpret all questionnaires correctly.

The Dutch version of the *Children's Communication Checklist version 2* was used to identify communication skills indicated by parents or caregivers [54,55]. This questionnaire (with 70 items divided over 8 scales) has been predominantly designed for assessing social and pragmatic language of children aged 4 to 16. The General Communication Composite (GCC) is conventially obtained by using the scales Speech production, Syntax, Semantics, Coherence, Inappropriate initiation, Stereotyped conversation, Use of context, and Non-verbal communication. Each item could be scored from 0 (*never or less than 1 time a week*) to 3 (*several times a day or always*). The higher the GCC was the more communication deficits were present. Furthermore, the GCC was categorized by communication deficits (mild to major deficits: GCC ≥ 105, or no deficits: GCC ≤ 104). Approximately 30% of all parents did not fill out this questionnaire and these non-responders were equally spread over the three groups (CIs, hearing aids, or NH).

Statistical analyses

The levels of Internalizing and Externalizing symptoms between participants were compared using Multivariate Analysis of Variance (MANOVA) with subsequent post-hoc tests. Furthermore, Pearson's correlations and regression analyses were carried out to examine risk and protective factors for psychopathology. When equal variances were not assumed between groups (using Levene's test), the corrected p-value was used instead.

Furthermore, although Type of school can be an important factor, it is frequently the result of children's functioning and not the cause, and this factor was therefore omitted from the analyses. The program *SPSS* version 20.0 (IBM Corp., Armonk, NY) was used. When a score or variable was not available, the participant was excluded from the analysis concerned.

RESULTS

Internalizing and Externalizing symptoms

HI children with CIs, with hearing aids, and NH children were compared on the Internalizing and Externalizing indices (Figure 1 and 2, respectively). It first has to be said that the HI and NH participants were similar regarding age, gender, socioeconomic status (SES), and nonverbal intelligence. Yet, HI children exhibited lower language and communication skills than NH children (Language skills, Δ = 0.6 [95% Conf.Int., 0.0-1.2] and Communication skills, Δ = 19.3 [95% Conf.Int., 13.8-24.7], respectively). Between HI children with CIs or with hearing aids, the above-mentioned variables were distributed equally. The distribution involving type of school and mode of communication also was similar.

A 3 (Group: CIs, hearing aids, NH) x 2 (Internalizing or Externalizing) MANOVA revealed a multivariate effect for Group, $F(4,516) = 4.82$, $p < .001$. Post-hoc tests showed that CI recipients were not significantly different from NH children for both indices. Yet, children with hearing aids had significantly higher scores on both indices than NH children (Internalizing, Δ = 3.6 [95% Conf.Int., 1.7-5.5] and Externalizing, Δ = 3.4 [95% Conf.Int., 1.2-5.7]), meaning that the children with hearing aids experience more symptoms. Additionally, children with hearing aids had significantly higher scores on the Internalizing index than CI recipients (Δ = 2.8 [95% Conf.Int., 0.4-5.3]).

When evaluating how many participants functioned above 1 standard deviation (*SD*) from the mean scores based on the NH controls, we found that 13% of the CI recipients, 36% of the children with hearing aids, and 15% of the NH children scored above 1 *SD* for the Internalizing index, χ^2 (4) = 15.69, $p < .004$. For the Externalizing index a statistical trend was found; 21% of the CI recipients, 29% of the hearing aided children, and 12 % of the controls had scores higher than 1 *SD*, χ^2 (4) = 9.46, $p = 0.052$. (Table 2).

Factors associated to Psychopathology

Table 3 shows which factors were investigated for the HI children (of which Communication scores were available). Pearson's correlations showed that better Communication skills, better Language skills, lower Age at detection, lower Age at intervention, and higher SES were significantly related to lower levels of Internalizing symptoms. Note that for all HI children, Age at intervention was the age at first hearing aid, because every HI child starts with a 6-month trial of hearing aids due to potential maturation of the auditory system. To differentiate between hearing aided children and implant recipients, Age at first hearing aid or CI was plotted separately (Figure 3). Irrespective of the age of amplification, children with hearing aids had higher Internalizing indices than NH children.

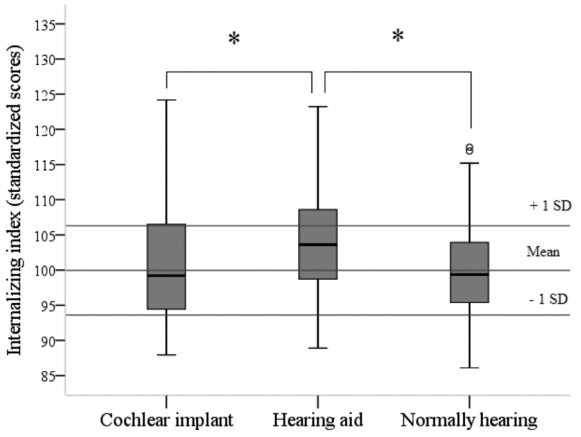

Figure 1 Internalizing index divided by group.
*$p < .05$.

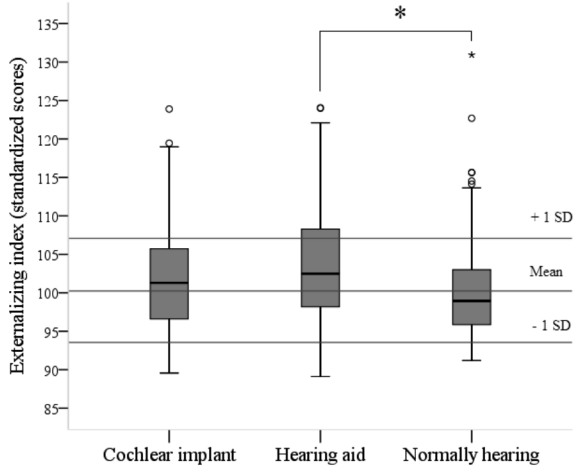

Figure 2 Externalizing index divided by group.
*$p < .05$.

Table 2 Distribution of Internalizing and Externalizing indices

	Internalizing index			**Externalizing index**		
Group	< 1 *SD*	Mean	> 1 *SD*	< 1 *SD*	Mean	> 1 *SD*
Cochlear implant (*n*; %)	11 (19.3%)	31 (54.4%)	15 (13.3%)	6 (10.5%)	39 (68.4%)	12 (21.1%)
Hearing aid (*n*; %)	5 (6.7%)	43 (57.3%)	27 (36.0%)	7 (9.3%)	46 (61.3%)	22 (29.3%)
Normally hearing (*n*; %)	21 (16.3%)	89 (69.0%)	19 (14.7%)	19 (14.7%)	94 (72.9%)	16 (12.4%)

When investigating the factors that affect the Externalizing index, we found that fewer Externalizing symptoms were related to better Communication skills, Language skills, and fewer siblings. Unaided degree of hearing loss was also tested, but due to redundant outcomes (i.e., the higher the degree, the less psychopathology, which is related to the fact that children with more severe losses received CIs) it was omitted from the results presented here.

The influence of Type of hearing device on Psychopathology

In order to examine whether Type of device had a direct impact on Internalizing (Table 4) and Externalizing (Table 5) symptoms, two hierarchical regression analyses were performed, while controlling for age, gender, and the significantly associated factors shown by Table 3. It was found that Age, Language skills, and Type of hearing device contributed uniquely to the prediction of Internalizing symptoms. The explained variance for this model was approximately 65% ($p < .006$). For Externalizing symptoms, only Communication skills contributed significantly. For this 2nd model, the value of the explained variance reached 54% ($p < .019$).

Table 3 Pearson's correlations for associated factors for psychopathology in HI children (*n* = 87)

	Internalizing symptoms	Externalizing symptoms
Linguistic and intellectual factors		
Communication skills (CCC-2)	.24*	.43***
Language skills (CELF)	-.24*	-.21*
Preferred mode of communication	n.s.	n.s.
Nonverbal IQ	n.s.	n.s.
Auditory and medical factors		
Aided degree of hearing loss	n.s.	n.s.
Age at detection of hearing loss	.20*	n.s.
Age at intervention	.28*	n.s.
Uni or bilateral implant(s)	n.s.	n.s.
Sociodemographic factors		
Gender	n.s.	n.s.
Socioeconomic status	-.40**	-.35*
Number of siblings	n.s.	.21*

*p < .05; ** p < .01;*** p < .001.

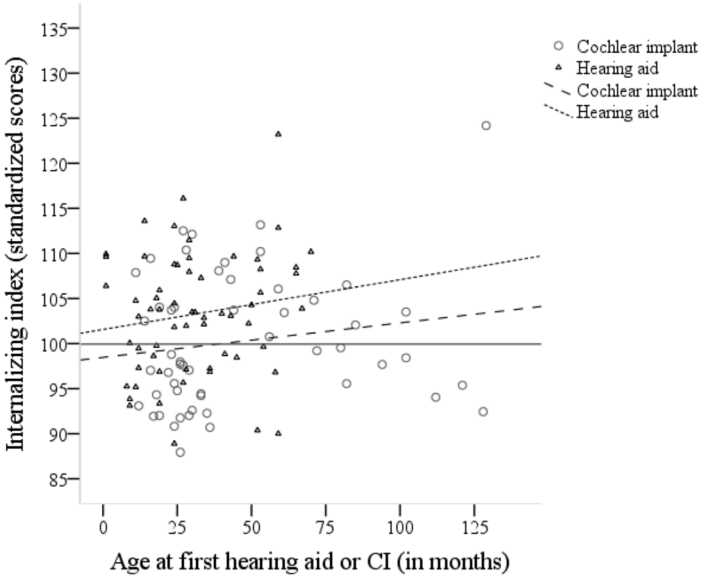

Figure 3 Internalizing index as function of Age at intervention divided by Type of device

Table 4 Hierarchical regression analysis for Internalizing symptoms (n = 87)

	R^2_{adj}	*B*
	.65**	
Age		-.38*
Gender		.01
Communication skills (CCC-2)		.02
Language skills (CELF)		-.36*
Age at detection		-.10
Age at intervention		.14
Socioeconomic status		-.30
Hearing device		.36*

* $p < .05$.

Table 5 Hierarchical regression analysis for Externalizing symptoms (n = 87)

	R^2_{adj}	*B*
	.54*	
Age		.10
Gender		-.18
Communication skills (CCC-2)		.31*
Language skills (CELF)		.09
Socioeconomic status		-.26
Family size		.05
Hearing device		-.17

* $p < .05$.

DISCUSSION

This study makes a novel contribution to the literature by showing that CI children had lower levels of psychopathological symptoms than children with conventional hearing aids, despite the fact that these CI children experience more severe hearing losses. So, not the severity of hearing loss, as also found in past research [20,31,56,57], but the type of hearing device is crucial when evaluating levels of psychopathology. In fact, levels of psychopathology in CI children can equal those of NH children. Additionally, lower age and sufficient language and communication skills contribute uniquely to the prediction of psychopathology, although longitudinal data should confirm the causality. Furthermore, various associated factors for psychopathology were detected, including age at detection of hearing loss, age at intervention, SES, and number of siblings.

To the best of our knowledge, this study is one of the first study that investigated psychopathology to a very large extent and in a multidimensional way, in three age- and gender-matched groups. Although past research showed that hearing loss [4,17,24] and its associated factors (such as etiology, physical comorbidity, and communication problems) [56] have been associated with more internalizing and externalizing symptoms, the finding that not all HI children in general, but mainly HI children with hearing aids are at risk for developing psychopathology, is new. Even with a major disadvantage involving degree of hearing loss (children with hearing aids had mean hearing losses of 68 dB, while children with CIs had circa 111 dB losses), the latter group reported less symptoms of psychopathology. More than two times as many children with hearing aids (36%) had high levels of Internalizing symptoms (i.e., more than + 1 *SD*) than CI children (12%). When speculating what the causes for the strikingly positive outcomes for implanted children could be, we have to bear in mind that all other important factors for psychopathology were distributed similarly among both groups, including age, gender, SES, nonverbal intelligence, language and communication skills, type of school, and mode of communication. Only age at detection and intervention differed, but we controlled for these factors. So, the difference cannot be the result of one of these factors, but actually appears to be the consequence of the CI and possibly its rehabilitation program, with more attention for the HI child and with increased access to specialized care. Alternatively, parents of children with CIs might have higher expectations after implantation, and encourage and stimulate their child more. It could be hypothesized that when children with hearing aids had underwent similar rehabilitation programs, they would also have had levels of psychopathology that equaled those of NH children, just like the CI children. A follow-up study design could provide the opportunity to draw firmer conclusions on causality. Additionally, it should be noted that many more factors could be relevant for the development of psychopathology. For example, concomitant handicaps, parent-child attachment, or intrapersonal factors could be contributive in this respect.

The negative effects found for HI children can be reduced by adequate language and communication skills. Our study confirmed the findings that better oral communication skills are related to lower levels of psychopathology [16,26-29]. These findings stress the fact that social language, pragmatic language, and communication are of the utmost

importance for preventing psychopathology. Acceptance by hearing peers is also more likely when communication skills are good [58] and in addition, better skills increase the chance that HI children attend regular schools, where they will meet and interact with more NH children, even further improving their social interactions and communication skills. Hence, parents and professionals who work with HI children must focus on and encourage well-developed and age-appropriate communication skills.

CONCLUSION

Despite significantly less severe hearing losses, HI children with hearing aids have higher levels of psychopathology than CI children. Thus, not the degree of hearing loss, but implants are essential for the level of psychopathology in HI children.

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