Beyond hearing : social-emotional outcomes following cochlear implantation in young children

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Social competence and empathy in young children with cochlear implants and with normal hearing

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Abstract

This study set out to examine the levels of social competence and empathic behaviors in children with cochlear implants in comparison with normal-hearing children, and to determine whether empathy predicts social competence to the same extent in both groups of children. A total of 150 children (mean age 39 months) participated in the study; 61 with cochlear implants and 89 without hearing loss. Parent reports and observation measures were employed to measure empathy and social competence. Results showed that levels of empathy and social competence in children with cochlear implants and normal-hearing children were similar. Empathic behaviors were predictive of social competence in both groups alike. Emotion acknowledgment was more predictive of social competence for children with cochlear implants than for normal-hearing children. Language skills were unrelated to social competence or empathic behaviors in children with cochlear implants. In conclusion, children with cochlear implants showed no delay concerning social competence or empathic behaviors. The factors contributing to social competence, however, differed between the groups. This should be kept in mind when developing rehabilitation programs for children with cochlear implants.

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Introduction

Social competence, i.e., the ability to engage in social interactions skillfully, is an important predictor of social outcomes such as peer relationships and popularity, but also of academic outcomes such as school readiness and achievement (Denham et al., 2003). Yet, attaining social competence is a challenge for many hearing-impaired (HI) children (Ita & Friedman, 1999). Disruptions in communication prevent these children from optimally benefiting from social learning (Moeller, 2007). Cochlear implantation improves children's language and communicative abilities (Ganek et al., 2012), and is therefore expected to also boost their social skills. Some studies support this claim (Huttunen et al., 2009; Huttunen & Valimaa, 2010; Martin, Bat-Chava, Lalwani, & Waltzman, 2011; Nicholas & Geers, 2003) but the body of literature is small and researchers have paid little or no attention to factors that may contribute to social competence in children with cochlear implants (CI). One important factor that influences social competence of normal-hearing (NH) children is empathy (Eisenberg, Spinrad, & Sadovsky, 2006; Saarni, 1999), which strengthens cooperation and group cohesion (Zahn-Waxler et al., 1992). Children who show higher levels of empathy are better liked by their peers and teachers, and are judged to be more socially competent in general (Eisenberg et al., 2006). Although infants have an inborn propensity for empathy, this ability further develops through social interactions (Decety & Jackson, 2004). Newborns are not yet able to differentiate between themselves and others and they therefore tend to be overwhelmed when witnessing other people in distress. However, it is this affective 'catching' or mirroring of others' emotions that enables the development of concern for others during the second year of life, once the ability to distinguish between self and other has developed, and that will ultimately induce prosocial behaviors such as helping or comforting (Hoffman, 1987; Rieffe, Ketelaar, & Wiefferink, 2010; Zahn-Waxler et al., 1992).

Little is known about the development of empathy in HI individuals. In fact, in only one study seven- to ten-year-old HI children were found to display less prosocial behaviors than their NH classmates (Wauters & Knoors, 2008). To our knowledge no studies have been conducted with children with CI. However, from research into aspects related to empathy we may infer that the development of empathy in HI individuals is impaired. Studies have shown that HI children are less inclined to conceal their own emotions in order to

protect other people's feelings (Hosie et al., 2000), and less often expect their peers to behave empathically (Rieffe & Terwogt, 2006). Furthermore, although HI children are able to attribute basic emotions (i.e., happiness, anger, sadness, fear) correctly in a social context (Rieffe & Terwogt, 2000), they are more prone to errors in the identification and attribution of complex or ambiguous emotions (Dyck et al., 2004; Ludlow et al., 2010; Most & Aviner, 2009). All of these studies were conducted with older children (ages 6 to 17). Studies with younger children with CI (ages 2 to 5) also report impaired emotion recognition skills (Wang et al., 2011; Wiefferink et al., 2013). The current study set out to measure emotional and social skills in very young children, which is challenging because they are not yet able to reflect on their feelings or intentions. Therefore, different instruments were employed to gain an insight into their empathic behaviors and level of social competence. Experimenters as well as parents reported on empathic behaviors displayed by the children. Additionally, parents were asked to report the extent to which the children were able to acknowledge, i.e., correctly interpret, emotions displayed by their parents, and the extent to which children were socially competent. This study aimed to 1) compare young, early-implanted children with CI with a matched group of NH children on social competence and empathic behaviors, 2) examine whether the different instruments for measuring empathic behaviors contribute to the prediction of social competence to the same extent in both groups of children, and 3) assess whether language aspects were related to empathic behaviors or social competence in children with CI.

Method

Participants

A total of 150 children from the Netherlands and the Dutch speaking part of Belgium participated in this study. All children were born to hearing parents and had no apparent (additional) disabilities. Age, gender and socioeconomic status did not differ between the groups. Characteristics of the samples are reported in Table 1. All children with CI were prelingually, profoundly deaf and had been implanted before the age of three years. Sixty-eight % had been using their CI for 12 months or more. Parents indicated that practically all children were wearing their CI full-time, only two children were wearing the device

often but not always. Approximately half the group was bilaterally implanted (simultaneously or sequentially), the other half was unilaterally implanted (either with or without a conventional hearing aid in the other ear). All children with CI entered a tailored rehabilitation program after implantation, which includes specialized playgroups, technical support for the device and speech therapy.

Table 1 Demographic and Medical Profile of Participants

	CI (*n* = 61)	NH (*n* = 89)
Age, mean (SD), mo	39 (15.1)	39 (16.7)
Age, range, mo	14 – 77	14 – 76
Male, No. (%)	37 (58%)	52 (61%)
Socioeconomic status		
Maternal education, mean (SD)[a]	3.45 (0.82)	3.60 (0.58)
Net household income, mean (SD)[b]	3.61 (1.18)	3.66 (0.84)
Age at implantation, mean (SD), mo	16 (7.3)	
Age at implantation, range, mo	6 – 35	
Time with (first) CI, mean (SD), mo	21 (13.1)	
Time with (first) CI, range, mo	1 – 44	
Preferred mode of communication, No. (%)		
Oral language only	23 (38%)	
Sign-supported Dutch	28 (46%)	
Sign Language of the Netherlands	3 (5%)	
Combination of communication modes	7 (11%)	
Reynell Developmental Language Scales		
Language Comprehension Quotient, mean (SD)	0.86 (0.18)	
Schlichting Expressive Language Test		
Sentence Quotient, mean (SD)	0.84 (0.14)	
Word Quotient, mean (SD)	0.89 (0.19)	

[a] (1 = *no / primary education*, 2 = *lower general secondary education*, 3 = *higher general secondary education*, 4 = *college / university*).
[b] (1 = *less than €15,000*, 2 = *€15,000 – €30,000*, 3 = *€30,000 – €45,000*, 4 = *€45,000 – €60,000*, 5 = *More than €60,000*).

Materials

The Empathy Questionnaire for infants and toddlers (19 items; Rieffe et al., 2010) measures empathic behavior displayed in daily situations (Table 2). Parents rated the degree to which each item represented their child's behavior over the past two months (0 = *never*, 1 = *sometimes*, 2 = *often*). The questionnaire shows good internal consistency (Table 3).

The Empathy Observation (Rieffe et al., 2010) examines children's empathic responses to three emotions that are acted out nonverbally by the

experimenter: happiness when clicking with a pen, anger with a pen that fails to write, and pain/sadness upon hurting one's finger. Children's responses were scored on a 20-item checklist (0 = *not at all*, 1 = *a little*, 2 = *a lot*) for the three events combined (Table 2). The internal consistency is good (Table 3).

Children's ability to acknowledge emotions in their parents was measured by the scale Others' Emotion Recognition (6 items) of the Emotion Expression Questionnaire (Rieffe et al., 2010) (Table 2). Parents rated on a five-point scale to what extent each item was true for their children (1 = *(almost) never*, 2 = *rarely*, 3 = *sometimes*, 4 = *often*, 5 = *(almost) always)*. The internal consistency of the scale is good (Table 3).

Social Competence (9 items) was assessed with the Dutch version of the Strengths and Difficulties Questionnaire (Goodman, 1997; Muris, Meesters, & van den Berg, 2003). The scale Social Competence comprised the two original scales Prosocial (5 items) and Peer Problems (5 items). Three items of the Peer Problems scale were reversed so that higher scores reflected lack of peer problems. One item of the Prosocial scale ("Helpful if someone is hurt, upset or feeling ill") was removed because of conceptual overlap with items of the Empathy Questionnaire. Parents rated each item on a three-point scale (0 = *not true*, 1 = *somewhat true*, 2 = *certainly true*). The internal consistency of the compound scale is acceptable (Table 3).

Oral language comprehension and word and sentence production of children with CI were measured using the Dutch version of the Reynell Developmental Language Scales (RDLS) and the Schlichting Expressive Language Test (SELT) respectively (Van Eldik, 1998). An extensive study with 288 children with CI reported an average score of 0.78 (*SD* = 0.18) for children implanted before the age of two and an average of 0.66 (*SD* = 0.20) for children implanted before the age of five (Boons et al., 2012a).

Table 2 Items of the Empathy Measures

	Empathy Questionnaire
1	When another child cries, my child gets upset too
2	When I make clear that I want some peace and quiet, my child tries not to bother me
3	When my child sees other children laughing, he/she starts laughing too
4	My child also needs to be comforted when another child is in pain
5	When another child starts to cry, my child tries to comfort him/her
6	When an adult gets angry with another child, my child watches attentively
7	When another child takes a bad fall, shortly after my child pretends to fall too
8	When another child gets upset, my child tries to cheer him/her up
9	My child looks up when another child laughs
10	When another child is upset, my child needs to be comforted too
11	When I make clear that I want to something by myself (e.g., read), my child leaves me alone for a while
12	When adults laugh, my child tries to get near them
13	When another child gets frightened, my child freezes or starts to cry
14	When two children are quarrelling, my child tries to stop them
15	My child looks up when another child cries
16	When other children argue, my child gets upset
17	When another child gets frightened, my child tries to help him/her
18	When another child is angry, my child stops his own play to watch
19	When other children quarrel, my child wants to see what is going on
	Emotion Acknowledgment
1	Can your child adequately assess other people's emotions?
2	Does your child know when you are angry?
3	Does your child know when you are happy?
4	Does your child know when you are afraid?
5	Does your child know when you are sad?
6	Does your child know when you are having fun?
	Empathy Observation [a]
1	Child responds to experimenter's emotion
2	Child stops playing and looks at adult
3	Child tries to follow what is happening
4	Child physically approaches experimenter
5	Child mimics experimenter's facial expression
6	Child re-enacts/imitates event
7	Child tries to comfort experimenter [b]
8	Child tries to help experimenter [c]

[a]Items were scored during each of the emotion-evoking events (happiness, anger, pain/sadness), except for item 7 and 8

[b]Assessed during pain/sadness event only

[c]Assessed during anger event only

Table 3 Internal Consistencies, Means, and SDs for Measures of Emotional and Social Functioning

					CI (n = 61)	NH (n = 89)
	No. of items	Min-Max	Cronbach's Alpha	Inter-item correlation	*M (SD)*	*M (SD)*
			Parent questionnaires			
Empathy Questionnaire	19	0-2	.78	.16	0.84 (0.29)	0.85 (0.25)
Emotion Acknowledgment	6	1-5	.74	.35	3.73 (0.60)	3.75 (0.57)
Social Competence	9	0-2	.60	.13	1.42 (0.34)	1.42 (0.32)
			Experimenter observation			
Empathy Observation*	20	0-2	.85	.23	1.04 (0.29)	0.81 (0.37)

*$p \leq .001$.

Procedure

Children with CI were recruited through hospitals and family counseling services all over the Netherlands and Dutch-speaking part of Belgium. NH children were recruited through day-care centers and elementary schools in the Netherlands. All children were tested individually in a quiet room at home, school or hospital. Three empathy-evoking events were alternated with other tasks (not presented in this manuscript) during a videotaped test session. Parents filled in questionnaires. Additional information, such as household income and age at implantation, was obtained from parents and/or medical records. Informed consent was obtained for all children and the study was approved by the university's medical ethics committee.

The tasks were administered to children in the CI group by one of two hearing experimenters who were fluent in sign language. Although in both groups the empathy tasks were administered nonverbally and did not require a verbal response, children with CI were addressed in their preferred mode of communication during the test session.

Statistical Analyses

The first research question was addressed by carrying out independent sample *t*-tests in order to compare children with CI and NH children on their empathic behavior and social competence. In order to answer the second research question, relations between the different measures of empathic behavior and social competence were examined by means of Pearson's correlations. Additionally, a stepwise regression analysis was carried out to examine the effect of measures of empathic behavior on social competence, and to examine

whether these effects differed for children with CI or NH. For that reason, group status was included as a dummy variable (NH = 0; CI = 1) and the independent variables were centered. Repeating the regression analysis excluding children who had less than one year experience with their CI did not produce different outcomes. Furthermore, the analysis was also carried out including age as an independent variable, but age did not contribute to the regression model. For reasons of clarity, the outcomes of these analyses are not reported. The third research question was addressed through Pearson's correlations in order to examine the relation of language-comprehension and production skills with measures of empathic behavior and social competence in children with CI.

Results

Group Differences

Mean scores in Table 3 reveal that parents of children with CI scored their children just as high as parents of NH children on Social Competence ($t(148) = -0.08$, $p = .933$, $\eta^2 = .00$), Emotion Acknowledgment ($t(148) = 0.20$, $p = .843$, $\eta^2 = .00$), and the Empathy Questionnaire ($t(148) = 0.10$, $p = .925$, $\eta^2 = .00$). Surprisingly, children with CI were rated higher than their NH peers on empathic behaviors as observed by experimenters ($t(145.57) = -4.29$, $p \leq .001$, $\eta^2 = .11$). Post-hoc *t*-tests with Bonferroni correction on the individual items of the Empathy Observation demonstrated that the difference was largely attributable to children with CI receiving higher scores than NH children on items that involved looking at the event or the experimenter.

Relations between Empathy Measures and Social Competence

A marginally significant correlation between the Empathy Questionnaire and the Empathy Observation was found for the whole group ($r = .16$, $p = .047$), but not for each group separately (CI: $r = .22$, $p = .086$; NH: $r = .15$, $p = .159$), which indicates that these instruments measure different aspects of empathic behavior. Table 4 shows Pearson's correlations of Age, Empathy Questionnaire, Empathy Observation, and Emotion Acknowledgment with Social Competence for both groups separately. Age did not correlate with Social Competence in either group (CI: $r = .02$, $p = .874$; NH: $r = .20$, $p = .061$). The Empathy Questionnaire as well as the Empathy Observation correlated with Social Competence in both

groups. A marginally stronger correlation was found in the CI group for the Empathy Questionnaire with Social Competence than in the NH group ($Z = 1.93$, $p = .054$), no difference in strength of the correlation was found for the Empathy Observation. Emotion Acknowledgment was only significantly associated with Social Competence in the CI group, the correlation was significantly stronger in the CI than in the NH group ($Z = 2.19$, $p = .029$).

Table 4 Pearson's Correlations and Hierarchical Regression Analysis for Measures of Empathy on Social Competence (N = 150)

	CI ($n = 61$)	NH ($n = 89$)			
	r	*r*	R^2_{adj}	β	*p*
Step 1			.24**		
Group				-.09	.234
Empathy Questionnaire	.51**	.23*		.25	.001
Empathy Observation	.32*	.41**		.32	≤ .001
Emotion Acknowledgment	.48**	.15		.19	.014
Step 2			.26**		
Group				-.09	.268
Empathy Questionnaire				.16	.118
Empathy Observation				.36	≤ .001
Emotion Acknowledgment				.05	.596
Group x Empathy Questionnaire				.13	.223
Group x Empathy Observation				-.05	.619
Group x Emotion Acknowledgment				.21	.034

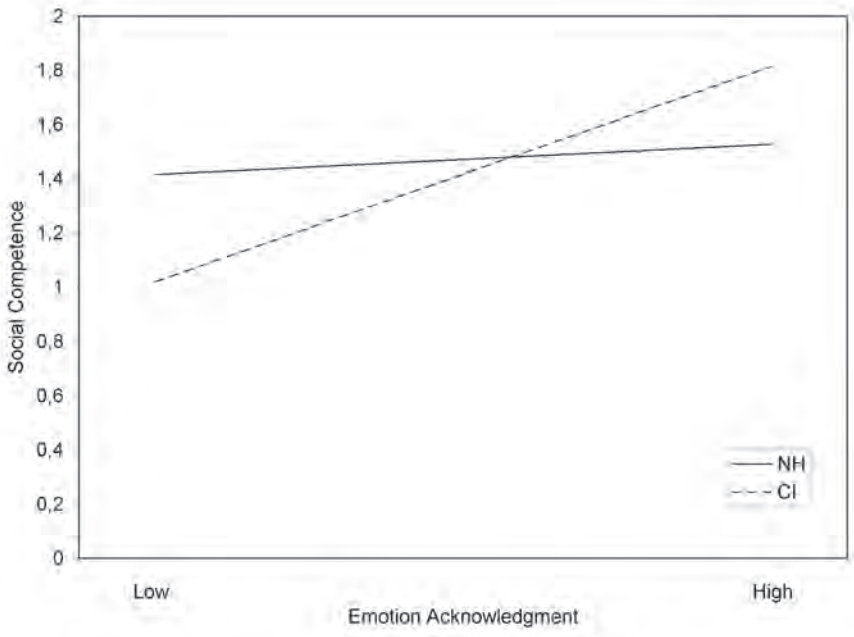
Note. $\Delta R^2 = .04$ for Step 2 ($p = .050$).

*$p < .05$. **$p \leq .001$.

In order to examine whether the different measures of empathic behavior contributed to the prediction of social competence, and to assess whether these contributions differed between the groups, a hierarchical regression analysis with Group, Empathy Questionnaire, Empathy Observation, Emotion Acknowledgment (Step 1), and the interaction terms Group x Empathy Questionnaire, Group x Empathy Observation, and Group x Emotion Acknowledgment (Step 2) as predictor variables and Social Competence as dependent variable was carried out. Because of the low correlation between the Empathy Questionnaire and the Empathy Observation, both were included in the analysis in order to examine whether they uniquely contributed to the prediction of Social Competence. Results of the analysis in Table 4 show that all three measures of empathic behavior uniquely contributed to the

prediction of Social Competence. Adding the interactions with Group in Step 2 resulted in an increase in model fit. Group only interacted with Emotion Acknowledgment, which implies that Group status moderates the effect of Emotion Acknowledgment on Social Competence. As shown in Figure 1 correlations in Table 4 are confirmed, demonstrating a stronger association in children with CI than in children with NH between Emotion Acknowledgment and Social Competence when controlled for the other two measures of empathic behavior.

Figure 1. Group status moderates the effect of Emotion Acknowledgment on Social Competence.



Role of Language Skills in Children with CI

Mean language scores in Table 1 show that the CI group in this study exceeded the average language score of children implanted by the age of two as reported in the study by Boons and colleagues (2012a). No significant correlations between the language indices and any of the measures for empathic behavior and social competence were found (Table 5).

Table 5 *Pearson's Correlations of Language Skills with Empathy and Social Competence Measures for Children with CI*

	Empathy Questionnaire	Empathy Observation	Emotion Acknowledgment	Social Competence
RDLS	-.01	-.09	.24	-.11
SELT-W	.15	.17	.11	-.02
SELT-S	.02	.10	.13	.01

Note. RDLS = Reynell Developmental Language Scales, SELT-W = Schlichting Expressive Language Test – Word Development, SELT-S = Schlichting Expressive Language Test – Sentence Development

Discussion

This study aimed to assess the level of social competence in children with a CI as compared to NH children, and to examine whether empathic behavior contributed to the development of social competence to the same extent in both groups. Our results show equal levels of social competence in children with CI and NH children, which is in contrast with a study by Wiefferink, Rieffe, Ketelaar, and Frijns (2012a) that did note a difference on the same measure of social competence in favor of NH children. The sample of NH children included in the Wiefferink study was slightly older than in the current study, which could explain this different outcome as NH children become increasingly socially skilled with age (Rubin, Bukowski, & Parker, 1998).

Contrary to our expectations, the empathic behavior of children with CI was not impaired. In fact, experimenters judged children with CI to show more empathic behavior than their NH peers, although it is unclear whether the frequent eye contact by children with CI that caused this difference actually implies more attention to the emotional impact of the situation, or whether it simply reflects a greater reliance on visual cues conveyed by their communication partner. This finding should be examined further in follow-up studies. Yet, our study indicates that in both groups alike empathic behavior is an important factor regarding social competence. The ability to acknowledge emotions, however, was related to better social competence only in the CI group. This may denote a more other-focused orientation in these children, which is an important quality for gaining an understanding of the causes of others' emotions (Denham, 1998).

The finding that the empathic behaviors of children with CI were on a par with those of NH children seems to contradict findings from other

studies showing an impaired understanding of other people's mental states and subsequent emotions in children with CI (Ketelaar, Rieffe, Wiefferink, & Frijns, 2012a; Peterson, 2004), even when this was measured nonverbally (Wiefferink et al., 2013). Yet, empathy consists of two complementary aspects: affective and cognitive empathy (Baron-Cohen & Wheelwright, 2004). Affective empathy comes first in development, and refers to the supposedly innate ability to attend to others' emotions and become aroused as if feeling the same emotion, which does not have to be learned through language. This was the main aspect measured in our study, and it appears to be intact in children with CI. The presumed independence between affective empathy and language was indeed confirmed in this study by the fact that no correlations between the empathy indices and language skills were found.

The other aspect, cognitive empathy, develops during the preschool years and beyond, and refers to the ability to understand the cause of others' distress. This requires insight into others' mental states, which is dependent upon language (Astington & Jenkins, 1999; Ketelaar et al., 2012a; Peterson, 2004). Because this insight appears to be impaired in children with CI, cognitive empathy, which was not measured in our study, could be expected to be less well-developed in this particular group. Future studies should address this.

Although this study was restricted to the relation between affective empathy and children's social competence, these outcomes show that all indices for empathic behavior make a valuable contribution to the prediction of social competence, which also implies that these measures are complementary. Given the fact that the questionnaire is an instrument measuring children's empathic displays toward peers or familiar adults as judged by parents, whereas the observation instrument measures children's empathic responses toward an unfamiliar adult as judged by a trained observer, it is not surprising that these instruments produced different results and in fact measured different manifestations of empathic behavior.

Our study paints a positive picture of the social skills of children with CI, demonstrating that young, early-implanted children with CI do not show delays in social competence or of an important factor associated with social competence: empathic behavior. Early implantation combined with counseling appears to prevent the development of impairments in social functioning that are common in hearing-impaired children without CI (Ita & Friedman, 1999). This study has also indicated that the factors contributing to social functioning

in children with CI are not necessarily the same as for NH children. In order to optimize the rehabilitation process it is therefore important to identify which factors contribute to the development of which skills in these children.