Social-emotional factors underlying internalizing problems and peer relations in deaf or hard of hearing youth

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Chapter 7

Best friends of children and adolescents who are deaf or hard of hearing

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Abstract

Although the importance of friends has been widely acknowledged, little is known about friendships of children who are deaf or hard of hearing (DHH). In this study, friendship quality and stability were examined in DHH (n = 127; M_{age} = 11;11) and hearing children (n = 121; M_{age} = 11;08). Also longitudinal regression analyzes with clustered bootstrap were run, to examine whether changes in social behaviors (i.e., empathy and aggression) caused changes in friendship quality. DHH children reported lower friendship quality, but equal friendship stability as compared to hearing children. Additionally, changes in social behaviors caused changes in friendship quality in both groups. In DHH and normal hearing children their friendship quality could be enhanced by increasing their social abilities.

Children and adolescents who are deaf or hard of hearing (DHH) have been reported to experience social difficulties (e.g., Fellinger, Holzinger, Beitel, Laucht, & Goldberg, 2009; Remine & Brown, 2010), but this study is the first to longitudinally explore their best friendships. The importance of examining friendships is underscored by the fact that these peer relationships are found to serve a protective factor against psychopathology and victimization in (hearing) children (La Greca & Harrison, 2005; Vitaro, Boivin, & Bukowski, 2009). Besides comparing mean levels of friendship quality and stability between DHH and hearing children, we aim to contribute to the understanding of mechanisms that cause changes in friendship quality over time.

In DHH children, their language and communication difficulties have often been found as great drawbacks in forming and maintaining social relationships (e.g., Dammeyer, 2010). However, over and above language, one's social behaviors are of particular salience regarding friendships (Durkin & Conti-Ramsden, 2007). This was found in hearing children and a clinical sample that is as well known for their language difficulties, i.e., children with specific language impairments. In the current study, we aim to investigate the associations between social behaviors and friendship quality over time in DHH youth. We further examine if changes in social behaviors cause changes in friendship quality. This knowledge would support intervention and prevention programs directed at enhancing DHH children's social functioning.

Forming and maintaining friendships

Forming friendships can be more challenging for DHH children and adolescents than for their hearing counterparts. DHH children in mainstream classrooms are often reported to be less accepted, and more neglected than their hearing peers (Kluwin, Stinson, & Colarossi, 2002; Nunes, Pretzlik, & Olsson, 2001; Wolters, Knoors, Cillessen, & Verhoeven, 2011). Most studies have also shown that they have fewer friends than hearing children (Kluwin et al., 2002; Nunes et al., 2001). In fact, it has been proposed that hearing peers prefer to have hearing friends, whilst DHH children prefer to be friends with other DHH children (Kluwin, et al., 2002; Most, Ingber, & Heled-Ariam, 2011; Nunes et al., 2001). Nevertheless, although DHH youth in special education may be more alike, they experience even more difficulties forming friendships than their DHH peers

attending mainstream education (Keilman, Limberger, & Mann, 2007). When DHH children do form friendships, these appear to be shorter in duration than friendships between two hearing children (Lederberg, Rosenblatt, Vandell, & Chapin, 1987).

Friendship quality

By definition, a dyadic friendship involves a strong and affective bond between two individuals (Hartup & Stevens, 1997). Friends are generally thought to share feelings, secrets, companionship and other positive features. Yet, negative features can also arise within a friendship, such as high levels of conflict, rivalry and jealousy (Berndt, 2002; Kouwenberg, Rieffe, & Banerjee, 2012). Although the negative features seem unavoidable in close relationships, and are adaptive to a certain extent, too much can be harmful to one's well-being. For example, conflicts between friends are adaptive in that they provide the possibility to improve social (cognitive) skills (Laursen & Hafen, 2010). However, repeated conflicts within a friendship are less likely to provide such constructive opportunities.

This balance in friendship quality has not yet been examined in DHH children. Though, it is known from related constructs that DHH children report lower satisfaction concerning their friends (e.g., friends treat me well and are nice to me), and lower self-esteem in the friends' domain (e.g., sharing secrets and personal thoughts) than hearing children (Gilman, Eastbrooks, & Frey, 2004; Van Gent, Goedhart, Knoors, Westenberg, & Treffers, 2012). These findings indicate a lower friendship quality in DHH children as compared to hearing age-mates.

Social behaviors related to friendship quality

A social behavior that has a strong positive association with friendship quality in hearing children is empathy (Berndt, 2002; Bukowski, Newcomb, & Hartup, 1996; Smith & Rose, 2011). Empathy involves three inter-related facets: contagion (i.e., feeling what another person in distress feels), understanding of another's emotion, and prosocial behavior aimed at releasing distress in the other person (Eisenberg & Strayer, 1987). Contagion as such has not been studied in DHH children and young adolescents, but it is known that DHH youth show impairments or delays in understanding others' emotions, i.e., Theory of Mind (Peterson & Wellman, 2009). Findings regarding their prosocial behaviors are mixed. While some studies report fewer prosocial behaviors in DHH children (Wauters & Knoors, 2008; Wolters et al., 2011), other studies did not find a

difference between DHH and hearing children (Antia, Jones, Luckner, Kreimeyer, & Reed, 2011; Moog, Gustus, Geers, & Brenner, 2010). This discrepancy could have to do with different DHH samples explored, or with different methodology. For example, DHH in mainstream schools score higher on prosocial behaviors than DHH in special schools (Wolters et al., 2011). Observers or other informants may misinterpret DHH children's need for more linguistic and physical signals to react (Corina & Singleteon, 2009) as a lack of social ability.

A social behavior that can threaten high friendship quality in hearing children is aggression. Particular forms of aggression, such as relational aggression (i.e., nonphysical behavior intended to hurt) towards a third person, could strengthen a dyadic friendship (Banny, Heilbron, Ames, & Prinstein, 2011). Overt aggressive behavior (e.g., hitting and kicking) is related to poorer friendship quality (Cillessen, Jiang, West, & Laszkowski, 2005). Past results regarding aggressive behaviors displayed by DHH children are still not clear. Some studies showed that DHH children display higher levels of aggressive behavior than hearing children (Van Eldik, 2005; Wolters et al., 2011), while others failed to find a difference (Van Gent, Goedhart, Hindley, & Treffers, 2007; Remine & Brown, 2010). These differences also appear to be associated with different study samples. Considering education type, children attending mainstream schools report lower levels of aggressive behaviors than DHH attending special education (Van Eldik, 2005; Wolters et al., 2011).

Moreover, DHH children may value the significance of these social behaviors for friendships differently than their hearing peers. Previous research has found that DHH children expressed their anger bluntly in a conflict situation, and expected few empathic responses from a friend who caused them harm (Rieffe & Meerum Terwogt, 2006). Despite these behaviors that would negatively impact a hearing pair of friends, DHH still expect friendships to continue. In other words, this could indicate that the associations between empathy or aggression and friendship quality are weaker in DHH children as compared to hearing children.

Purpose of study

This study is the first to examine DHH children and young adolescent's close friendships in great detail, longitudinally, and from different angles (i.e., friendship quality, friendship stability, and relations between friendship quality

and social behaviors) with five aims. First, mean levels of perceived friendship quality in DHH and hearing children will be explored. Second, within the DHH sample the influence of factors that are characteristic for the DHH group will be examined. Various DHH-related characteristics have been assumed to influence children's functioning, but empirical findings are thus far inconclusive (e.g., Polat, 2003; Antia et al., 2011, Van Gent et al., 2012). We will examine the influence of education type (special or regular), language mode (signed or spoken), degree of hearing loss (from moderate to profound), age at detection of hearing loss, and hearing device (cochlear implant or regular hearing device) on friendship quality. Children profit considerably from cochlear implant(s) (CI) in terms of their speech and language development, though they appear to function socially as DHH children without CI (Punch & Hyde, 2011). In this respect, two additional DHH-related characteristics worth exploration are age at implantation, and duration of CI use.

The third aim is to examine friendship quality in different dyads of friends (i.e., hearing dyad, DHH dyad, or mixed dyad with one DHH and one hearing child). Fourth, friendship stability over three data collections will be studied. Fifth, we will examine whether individual differences in changes in empathy and aggressive behavior over time can explain individual differences in changes in friendship quality in DHH children compared to hearing children.

The complete sample of DHH children is expected to have lower friendship quality and less stable friendships than hearing children. We predict that while the type of hearing device might not affect friendship quality, DHH children attending special education may experience lower friendship quality than DHH attending mainstream schools. The influences of language mode, degree of hearing loss, age at detection of hearing loss, age at implantation, duration of CI use, and hearing status of the dyad on friendship quality were explorative. Finally, the theory that fewer empathic and more aggressive behaviors are associated with a lower level of friendship quality should apply to both groups. Alternatively, we speculate that the association between empathy, aggression, and friendship quality is weaker in DHH children than in hearing children, because DHH children have less understanding of the significance of social behaviors in friendships. Finally, gender will be taken into account, since gender differences may be present in the study variables of interest (Crick & Grotpeter, 1995; Smith & Rose, 2011; Underwood & Buhrmester, 2007).

Method

Participants

In total, 248 children and adolescents (n = 127 DHH and n = 121 hearing) from the Netherlands and the Dutch-speaking part of Belgium were included at the first measurement of this study. Inclusion criteria for the DHH children were 1) to have at least 40 dB hearing loss in the best hearing ear (calculated by averaging unaided hearing thresholds at 500, 1000, and 2000 Hertz), 2) detection of hearing loss pre- or perilingually (before the age of 5), and 3) no medical or developmental disabilities (e.g., learning disabilities or autism spectrum disorder). All but one DHH children were having hearing parents. A group of hearing children was matched with the DHH group for age, gender, socioeconomic status (SES; based on parents' education and occupation) and nonverbal IQ. No differences between the groups were found on language comprehension (i.e., story- and sentence comprehension), but DHH children did score significant lower than hearing children on (parent-reported) pragmatic language skills ($t(170) = -7.63$, $p < .001$). Inclusion criterion for the hearing group was to have no diagnosed disabilities. See Tables 1 and 2 for specific information of DDH and hearing children, which were obtained from parent questionnaires and medical records.

At Time 2, nine months later, 184 children were tested (n = 79 DHH and n = 105 hearing). All excluded DHH children (n = 48) were part of a cross-sectional sample and therefore tested once. At Time 3, again nine months later, 146 children participated (n = 65 DHH and n = 81 hearing). Parents of excluded participants at Time 3 were found to have a slightly higher SES than parents of included participants ($t(182.9) = 2.46$, $p < .05$, $M = 11.1$, $SD = 4.7$ versus $M = 9.7$, $SD = 3.7$, respectively). However, there was still no significant difference between DHH and hearing participants on SES at Time 3. Moreover, there were no differences on distribution of gender, or on mean age, nonverbal IQ, language comprehension, friendship quality, aggression, and empathy scores between included and excluded participants at Time 2 and Time 3.

Table 1 *Characteristics of participants*

	DHH	Hearing
Number of children - *n*	127	121
Mean Age in years (*SD*)	11;11 (1;09)	11;08 (1;04)
Age range in years	8;03 - 14;08	8;03 - 16;05
Gender - *n* (%)		
Male	64 (50%)	55 (45%)
Female	63 (50%)	66 (55%)
Socioeconomic status mean (*SD*) [a]	10.0 (4.2)	10.5 (4.1)
Ethnicity - *n (%)*		
Both parents Dutch	83 (65%)	79 (65%)
One or both parents other ethnicity	12 (10%)	13 (11%)
Missing data	32 (25%)	29 (24%)
Nonverbal Intelligence		
Norm score Picture arrangement (*SD*)	10.1 (3.6)	10.6 (3.4)
Norm score Block design (*SD*)	10.5 (3.1)	10.6 (3.0)
Spoken Language scores[b]		
CCC-2 Pragmatic Composite score (*SD*)	46.3 (8.7)	36.0 (9.0)
CELF Semantic relations (*SD*)	10.4 (3.9)	10.2 (2.9)
CELF Story comprehension (*SD*)	10.1 (3.8)	10.0 (3.0)

[a] Socioeconomic status score was measured by parental education and occupation. [b] CCC-2, Children's Communication Checklist-2. A higher score indicates more pragmatic language problems. CELF, Clinical Evaluation of Language Fundamentals

Table 2 *Characteristics specific of DHH participants*

	DHH
Sign Language scores[a]	
ASLN Semantic relations (*SD*) (max = 5)	3.4 (1.4)
ASLN Story Comprehension (*SD*) (max = 5)	3.1 (1.6)
Mean age at onset of deafness, in years (*SD*)	1;09 (1;05)
Degree of hearing loss[b] - *n* (%)	
Moderate (40-60 dB)	29 (23%)
Severe (61-90 dB)	26 (20%)
Profound (>90 dB)	62 (49%)
Missing data	10 (8%)
Preferred mode of communication - *n* (%)	
Oral language only	96 (76%)
Sign or sign supported language	31 (24%)
Type of education - *n* (%)	
Regular education	83 (65%)
Special education	44 (35%)
Hearing Device	
Regular Hearing aid	73 (57.5%)
Cochlear Implant[c]	54 (42.5%)

[a] ASLN, Assessment of Sign Language of the Netherlands. [b] Hearing losses of the DHH children were calculated by averaging unaided hearing thresholds at 500, 1000, and 2000 Hertz. [c] Mean age of implantation is 3;09 years (*SD* = 2;08; Range = 0;11 - 10;08 years); Mean duration of CI use is 8;02 years (*SD* = 2;08; Range = 2;02 - 13 years).

Materials

Friendship quality was assessed with a Best Friend Index (BFI; Kouwenberg, Rieffe, & Banerjee, 2012). The BFI consists of a positive friendship features scale (e.g., "I turn to my best friend for support with personal problems") and a negative friendship features scale (e.g., "My friend and I bug each other"). The 20 items could be answered on a 3-point scale ranging from 1 = *(almost) never* to 3 = *often*. Before rating the items, participants were asked whether they had a friend. Seven hearing and twelve DHH children reported to have no best friend at Time 1. These children did not differ from children with best friends regarding gender, age, nonverbal IQ, story- and sentence comprehension, and reports of aggressive or empathic behaviors. The children who agreed to have a best friend were asked to write down the name of this best friend. This was done to discourage children from rating the items based on an internal representation of an idealized friendship. Additionally, this enabled us to examine friendship stability.

The *Empathy Questionnaire* consisted of 21 items and was designed to measure: a) Contagion, b) Personal Distress, c) Understanding, and d) Prosocial Behavior. An example item from the Understanding-scale is "When a peer cries, I often understand why". Children were asked to rate items on a 3-point scale (from 1 = *not true* to 3 = *true*). In the current study, a mean empathy score was calculated consisting of the scales Contagion, Understanding, and Prosocial Behavior. Personal distress was not included in this mean score because the scale has an opposite direction of association with other variables.

Aggressive behavior was assessed with a self-report version of the Instrument for Reactive and Proactive Aggression (IRPA; Polman, Orobio de Castro, Koops, Van Boxtel, & Merk, 2007; Rieffe, Faber, Güroğlu, Tsutsui, & Kouwenberg, *submitted*). Children were asked to rate six possible motives (e.g., "because I was angry") for five forms of aggressive behavior (e.g., "kicking, hitting and pushing") on a 3-point scale (from 1 = *never* to 3 = *always*). Consequently, the total score of aggressive behavior consisted of 5 x 6 items = 30 items. A mean score over these 30 items was calculated, indicating children's tendency to engage in overt aggressive behaviors.

All questionnaires had internal consistencies ranging from sufficient to good (Table 3). Within the DHH sample, results indicated sufficient to good internal consistency values for the spoken and sign language versions separately (ranging from α =.63 to α = .91).

Table 3 *Psychometric properties of the questionnaires*

	Range	Means (*SD*)		Cronbach's Alpha	
		DHH	H	DHH	H
Friendship quality					
PFF***	1-3	2.51 (.28)	2.70 (.21)	.74	.63
NFF***	1-3	1.31 (.24)	1.18 (.16)	.69	.62
Social behaviors					
Empathy***	1-3	2.21 (.32)	2.38 (.30)	.79	.80
Aggressive behavior	1-3	1.28 (.29)	1.25 (.23)	.92	.89

Abbreviations. DHH, deaf or hard of hearing; H, hearing children; PFF, Positive Friendship Features; NFF, Negative Friendship Features

*** $p < .001$

Additionally, indices for children's *nonverbal intelligence* were measured with two subtests of the Wechsler Intelligence Scale for Children – Third Edition (WISC-III): Block Design (copying small geometric designs with cubes), and Picture Arrangement (arranging pictures to make logical stories) (Kort et al., 2002; Wechsler, 1991). Children's raw scores were transformed to age equivalent norm scores. In a random sample of 23 DHH children, we found high associations between the present two intelligence subtest scores and previously assessed complete nonverbal intelligence scores (i.e., $r = .79$, $p < .001$). These tests were either (a version of) the WISC or the Snijders-Oomen Nonverbal Intelligence Test (Tellegen & Laros, 1993). We did not obtain IQ scores for 6 DHH and 15 hearing children.

To ensure that children have sufficient language knowledge to understand the psychosocial questionnaires, they received story- and sentence comprehension tasks. Using spoken language, hearing and DHH children received the two subtests from the Dutch version (Kort, Schittekatte, & Compaan, 2008) of the *Clinical Evaluation of Language Fundamentals® - Fourth Edition (CELF®-4*; Semel, Wiig, & Secord, 1987). DDH children who use sign or sign supported language received the subtests from the *Assessment instrument for Sign Language of the Netherlands (ASLN*; Hermans, Knoors, & Verhoeven, 2010). Children's language scores were converted into age-equivalent norm scores. The story-comprehension task was not administered to 6 DHH and 15 controls, and the sentence-comprehension was not administered to 13 DHH and 15 controls.

Children's *pragmatic language comprehension* was assessed to receive an indication of their linguistic abilities in real-world environments. Parents were presented with the Children's Communication Checklist-2 (CCC-2; Bishop, 1998). This

checklist contains 70 items divided over eight scales: a. speech, b. syntax, c. semantics, d. coherence, e. inappropriate initiation, f. stereotyped language, g. use of context, and h. non-verbal communication. Each item can be scored from 0 = *less than once a week (or never)* to 3 = *several times (more than 2) a day (or always)*. The pragmatic composite score is computed by summing scales e to h. A higher pragmatic composite score indicates more pragmatic language problems. We did not obtain pragmatic composite scores for 41 DHH and 35 hearing children.

Procedure

The Medical Ethics Committee of the Leiden University Medical Center granted permission for the study. DHH children were recruited from schools for the deaf and hard of hearing (both primary and secondary), ambulatory care organizations, hospitals, and by means of (social) media. The group of hearing children was recruited from primary and secondary mainstream schools. We ensured that these schools were an accurate reflection of the Dutch educational system. Written parental consent was obtained for all children prior to data collection.

Participants were individually assessed either at home or at school. Before actual data collection began, they were told their answers would be processed anonymously. Furthermore, they were made familiar with the testing procedure by an introduction and example items. All participants viewed the items one at a time in written Dutch on a laptop, with response buttons beneath on which the participants could click with a computer mouse. DHH participants who relied on sign or sign supported language viewed a video clip of the signed item in addition to the written Dutch version. A qualified sign language interpreter did translation from Dutch into sign language. Back translation showed convergence between translated and original items. Throughout data collection, a researcher was present who communicated with the DHH participants in their preferred mode of communication (i.e., spoken, sign supported or sign language). Participants could request clarification on any item from this researcher.

Statistical analyzes

Data were analyzed using the programs *Statistical Packages for the Social Sciences* version 19 and R (R development core team, 2007). In all analyzes, Friendship quality is divided in Positive Friendship Features (PFF) and Negative Friendship Features (NFF). Multivariate Analysis of Variance (MANOVA) or *t*-tests were

conducted to compare the mean levels of Friendship quality, Empathy, and Aggression between the DHH and hearing group. A three-way MANOVA was used to examine influences of (*categorical*) DHH-related characteristics (i.e., Education type, Hearing device and Communication mode) on Friendship quality. In addition to these three main effects, a possible interaction effect between Hearing device and Education type was examined.

Correlational analyzes were conducted to see which (*continuous*) DHH-related characteristics (i.e., Age at detection of hearing loss, Degree of hearing loss, Age at cochlear implantation, and Duration of CI use) were associated with Friendship quality.

We furthermore correlated Degree of Hearing loss with Friendship quality when CI children were excluded. This was done because our CI sample consists of only profoundly hearing impaired children and past research has found that CI children have more positive outcomes than profoundly hearing impaired children with a hearing aid (e.g., Theunissen, Rieffe, Kouwenberg, De Raeve, Soede, Briaire, & Frijns, 2012). Comparison of friendship quality between different friendship dyads based on hearing status was conducted with a MANOVA.

Subsequently, correlational analyzes were run to examine relations between Empathy, Aggression, and Friendship quality. Because the DHH and hearing samples differed on pragmatic language scores, and pragmatic language is important in relationships (Ninio & Snow, 1996), correlational analyzes were also carried out between pragmatic composite scores and Friendship quality, Aggression, and Empathy.

Finally, longitudinal regression analyzes with clustered bootstrap were conducted to examine whether changes in Empathy or Aggression cause changes in Friendship quality over the three measurements (Harden, 2011; Sherman & Le Cessie, 1997). The regression weights are estimated as in standard regression analysis, but the standard errors are measured by bootstrapping. This means that 10.000 samples of the same size as the total data set were drawn randomly with replacement. To deal with the dependency between measurements of the same participant, the bootstrap was clustered, i.e., individuals were sampled rather than cases so that if the individual was assessed all three times, the three measurements were included in the sample (De Rooij, 2012). In the regression models, Empathy and Aggression were split into a mean level and a change component over three measurements (Hedeker & Gibbons, 2006). The mean level is a measure of the between-participants (i.e., cross-sectional) effect of

Empathy (or Aggression) and the change component is a measure of the within-participant (i.e., longitudinal) effect of Empathy (or Aggression). The main effects of Age, Hearing status, Gender, mean Empathy score, mean Aggression score, change in Empathy, and change in Aggression on Friendship quality were tested. Interaction effects between Hearing status and Empathy (or Aggression) were included to examine whether the effect of Empathy (or Aggression) were different for DHH and hearing children. Additionally, we looked for an interaction effect between Hearing status and Age.

Results

Comparison between DHH and Hearing on Friendship quality, Empathy, and Aggression

Results of the comparison between DHH and hearing participants on PFF and NFF showed a significant multivariate effect for Group ($F(2,226) = 22.50$, $p < .001$, partial $\eta^2 = .17$). Univariate tests revealed that DHH score significantly lower on PFF ($F(1,227) = 30.02$, $p < .001$, partial $\eta^2 = .12$), and higher on NFF ($F(1,227) = 20.77$, $p < .001$, partial $\eta^2 = .08$).

Furthermore, DHH children scored significantly lower on Empathy than hearing children ($t(239) = 3.97$, $p < .001$). The two groups did not differ from each other on display of Aggressive behavior ($t(214.9)$, $p = .33$). For all mean scores see Table 3.

Influence of DHH characteristics on Friendship quality

The three-way MANOVA showed a significant multivariate effect for Education type ($F(2,109) = 5.36$, $p < .01$, partial $\eta^2 = .09$). Univariate tests revealed the DHH children in Special education scored lower on PFF than DHH in Mainstream education ($F(1,110) = 7.02$, $p < .01$, partial $\eta^2 = .06$; $M = 2.41$, $SD = .28$ versus $M = 2.57$, $SD = .27$, respectively). In contrast, DHH in Special education scored higher on NFF than DHH in Mainstream ($F(1,109) = 4.95$, $p < .05$, partial $\eta^2 = .05$; $M = 1.42$, $SD = .26$ versus $M = 1.24$, $SD = .21$, respectively). No significant interaction effect between Hearing device and Education type was found ($p > .05$)

None of the continuous DHH-related variables were correlated to Friendship quality (Table 4). When children with CI were removed from the analysis, a higher Degree of hearing loss was related to more NFF.

Table 4 *Correlations between Friendship Quality and DHH-related variables*

	PFF	NFF
Age at onset of hearing loss	.09	.06
Degree of hearing loss	-.10	.07
Degree of hearing loss without CI sample	-.11	.39**
CI characteristics:		
Age at Cochlear implantation	-.06	-.02
Duration of CI use	.13	.02

** $p < .01$

Effect of Hearing status of friendship dyads on Friendship quality

Subsequently, we examined friendship quality in different dyads: a) both children DHH (DHH-DHH), b) participant DHH and friend hearing (DHH-H), c) both children hearing (H-H). A multivariate effect for dyad was found ($F(4,362) = 5.63$, $p < .001$; partial $\eta^2 = .06$). Univariate tests with Bonferroni correction revealed that the DHH-H and DHH-DHH dyads scored lower on PFF than H-H dyads. The DHH-H and DHH-DHH did not differ from each other on PFF. On the NFF, DHH-DHH dyads scored higher than H-H dyads, while DHH-H dyads do not differ from both DHH-DHH and H-H dyads (Table 5).

Table 5 *Mean Friendship quality scores of different friendship dyads*

	Range	Means (*SD*)		
		DHH-DHH *n* = 18	DHH-H *n* = 70	H-H *n* = 97
PFF	1-3	2.51 (.24)[a]	2.58 (.28)[a]	2.71 (.22)[b]
NFF	1-3	1.36 (.26)[a]	1.24 (.20)[ab]	1.21 (.22)[b]

Notes. Means differ when they do not share superscripts at the same row. DHH-DHH represents DHH dyad, DHH-H represents a DHH child and a hearing friend, H-H represents hearing dyad.

Friendship Stability over time

Children indicated their best friend by name for each wave, which enabled us to exploratively study friendship stability. Friendship stability could be explored for 79 DHH and 103 hearing participants over the first two data collections and for 64 DHH and 80 hearing participants over all three waves. Results showed that 42% ($n = 33$) of the DHH sample and 50% ($n = 52$) of the hearing sample had the same best friend the first two consecutive waves. In both DHH and hearing

children, about one fourth ($n = 15$; 23%, and $n = 21$; 26%, respectively) had the same best friend over three waves.

Correlational analyzes

PFF were positively related to Empathy, whereas PFF were negatively related to Aggression (Table 6). The relations of NFF with Empathy and Aggression were in the opposite direction as for the PFF. Pragmatic composite scores (in which a higher score represents more problems) were negatively related to PFF and Empathy in both groups (Table 6). Because, first, there were no relationships between Pragmatic composite scores and Aggression and NFF, and second, partialling out for Pragmatic language scores did not alter the relation between Empathy and PFF ($r = .44$, $p < .001$); the pragmatic scores were not included in the regression analyzes.

Table 6 *Correlational analyzes at Time 1*

	PFF	NFF	CCC-2 pragmatic score
Empathy	.43***	-.20**	-.17*
Aggression	-.22**	.35***	.08
CCC-2 pragmatic score	-.27**	.11	-

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 7 *Longitudinal regression analyzes between Empathy, Aggression and Friendship quality*

	PFF			NFF		
	R^2	*B*	[95% CI][a]	R^2	*B*	[95% CI]
	29.4%			14.5%		
Hearing status[b]		-.10*	[-.16 - -.05]		.07*	[.02 - .11]
Gender[c]		.08*	[.02 - .13]		.02	[-.02 - .07]
Age[d]		.002*	[.001 - .003]		-.001	[-.002 - .000]
Mean Empathy		.30*	[.20 - .40]		-.01	[-.10 - .007]
Mean Aggression		-.08	[-.21 - .04]		.34*	[.22 - .45]
Change in Empathy		.17*	[.08 - .26]		-.02	[-.10 - .06]
Change in Aggression		-.07	[-.20 - .06]		.14*	[.002 - .28]

[a] CI = Confidence Interval. Significance is reached when the 95% CI does not include zero. [b] 0 = hearing, 1 = DHH. [c] 0 = boys, 1 = girls. [d] Raw scores are used in these analyzes. Age is in months, meaning that by every month children grow older; their PFF value increases with .002.

Longitudinal regression analyzes

For PFF, results showed significant effects of Hearing status, Gender, Age, mean Empathy score, and change in Empathy (Table 7). For NFF, results revealed

significant contributions of Hearing status, mean Aggression score, and change in Aggression. We also explored a just significant interaction effect between Hearing status and Age for NFF (*B* = -.002, 95% CI [-.004 - .000], which indicated that the difference on NFF between hearing and DHH decreases with age.

Discussion

The current study revealed that DHH children reported lower friendship quality than hearing children. This means that DHH children reported more negative friendship features (e.g., conflicts) and less positive features (e.g., companionship) than hearing children. Fortunately, we found that the difference regarding negative friendship features between DHH and hearing children became smaller with increasing age. Furthermore, for DHH children, it did not matter whether they had a DHH or hearing friend; the main variable that caused variability in friendship quality within the DHH sample was the type of education children attend. DHH in special schools had lower friendship quality than DHH in mainstream schools. Finally, friendship stability was equal in DHH and hearing children, as were the (longitudinal) associations between friendship quality and social behaviors. In both groups, a change in empathic behavior caused a change in positive friendship features and a change in aggressive behavior caused a change in negative friendship features. In this respect, for both DHH and hearing children, increasing their emphatic skills and decreasing their aggressive behavior can improve their friendship quality.

The low friendship scores DHH children in special education reported, might reflect the more general problems these children experience, i.e., problems that placed them into special education in the first place (Fellinger, Holzinger, & Pollard, 2012; Van Gent et al., 2007). This was underscored by our observations that these DHH children in special education experienced more pragmatic language ability problems, showed fewer empathic-, but more aggressive behavior than DHH in mainstream education. This pattern remained regardless of the type of hearing device DHH children have.

In the ever present discussion whether the use of sign (supported) language hinders DHH children in their development, the current results support the assumption that it would not (for friendship quality at least). We explored the main effect of education type when correcting for communication mode, and vice

versa. So, although children using sign (supported) language may score lower on the negative friendship features than children using spoken language, the effect is absent when education type is taken into account. This result emphasizes exploration of these effects simultaneously, because separate analyzes may not isolate the actual main effect.

Furthermore, a higher degree of hearing loss was associated with more negative features within a friendship. An increased hearing loss may be associated with more misunderstandings by DHH children, and in turn, frustration within the friendship may increase (Leigh, Maxwell-McCaw, Bat-Chava, & Christiansen, 2008). Yet, this was only found when CI children were excluded from the analysis. Our complete CI sample was profoundly hearing impaired, because cochlear implantation used to be performed only on individuals with a profound hearing loss. An implant generally provides more access to sound (e.g., speech perception) than is accessible to most profoundly hearing impaired children with conventional hearing devices (e.g., Meyer, Svirsky, Kirk, & Myamoto, 1998). In future studies, the effect of the functional limitations of hearing loss of the total group of DHH children (both children wearing CI as those wearing a conventional hearing device) could be explored.

The fact that age at implantation and duration of CI use were not related to friendship quality is possibly attributable to the relatively high mean scores and wide ranges of both of these aspects. McConkey Robbins, Burton-Koch, Osberger, Zimmerman-Philips, and Kishon-Rabin (2004) found that when age at implantation increased; it became harder to predict outcomes after the implantation. Because the majority of CI children nowadays receive their implant at an early age, the range will automatically become smaller. The influence of the CI characteristics can be explored in future studies.

Both DHH and hearing children had relatively unstable friendships within a timeframe of 1.5 years. Only 23% of the DHH and 26% of the hearing children were having the same friend over three waves. This also means that the changes in friendship quality over time were often not within the same friendship. However, how children experience their friendship could be viewed as a characteristic of the child and relatively stable across friendships. This is supported by past results of consistency in friends' behavior across friendships (Güroğlu, Cillessen, Haselager, & Van Lieshout, 2012). Friendship instability during late childhood and early adolescence is not uncommon. One-third to one-half of friendships is unstable (Bowker, 2004; Chan & Poulin, 2007). At first, the similarity in

friendship stability between DHH and hearing children contradicts Lederberg and colleagues (1987), who reported DHH children to have less stable friendships than hearing children. Yet, these prior results were based on observations of interactions between preschoolers and therefore, both on developmental and methodological levels, different from the current study. This makes our study the first to examine friendship stability in DHH individuals during late childhood and early adolescence.

No difference was found between DHH and hearing individuals on language abilities (i.e., sentence and story comprehension), which opposed findings of DHH children to experience language problems (see Musselman, 2000, for review; Traxler, 2000). The good results on the current language comprehension tasks are likely caused by the fact that two different assessment tools were used. DHH children who used sign language were not tested with the CELF®-4, while particularly this group of signing children is expected to experience (spoken) language problems. The methodology of using two different assessment tools supported our goal of examining children's comprehension of the language in which they received the psychosocial questionnaires. However, the language tests may not reflect children's language abilities to interact with the (overall hearing) surrounding. In fact, DHH children were found to score lower on the ability to use language effectively in interpersonal situations (i.e., pragmatic language use). Lower pragmatic language skills were related to less empathy and less positive friendship features. The pragmatic language skills did not alter the relationship between empathy and positive friendship features, but future studies could examine this skill more closely in DHH children's social interactions.

Future research

In the present study, the subjective and one-sided (as opposed to reciprocal) experiences of friendship were examined because these components are found to be particularly influential for children's behavior and adjustment (Aloise-Young, Graham, & Hansen, 1994; Poulin & Chan, 2010). Yet, we do not know whether the friendships were reciprocal or the objective quality of the friendships. This can be established by investigating also the friends' perspective and reciprocity of friendships in future research. Furthermore, relationally aggressive behavior (i.e., nonphysical behaviors that damage peer relationships) can be seen as more sophisticated than blunt overt aggressive behavior. This behavior requires

more social understanding and, therefore, may be differently associated with friendship quality in DHH compared to hearing peers. Future research could examine relationally aggressive behavior in DHH children as compared to their hearing age-mates. Finally, our sample of dyads of two DHH friends was small with $n = 18$. A research sample that includes more of these dyads in future research would allow examination of relations between social behaviors and friendship quality in the various dyads.

Conclusion

Particularly a high quality, best friendship has been found significant for individuals' mental health (La Greca & Harrison, 2005). The present results revealed that DHH children reported lower friendship quality than their hearing age-mates. Fortunately, friendship quality can be enhanced by decreasing children's aggressive and increasing their empathic behaviors. This accounts for both DHH and hearing children. So, for children who experience problems in their friendships, prevention and intervention programs can focus on improving these children's social behaviors.