The number of children who have received cochlear implants (CIs) has increased dramatically in the past two decades. In view of potential concerns about their psychosocial adjustment, our aim was to assess the effect of implants on the adolescents’ psychosocial functioning among a group of 57 deaf adolescents with and without CIs, using published and validated measures completed by the adolescents themselves, their parents, and teachers. Adolescents with CI tended to be more hearing acculturated, whereas those without CI tended to be more Deaf acculturated. Despite some differences in background characteristics between the two groups, there were no differences between them on the psychosocial variables assessed in this study, regardless of the reporting sources. Rather than having a direct effect on the psychosocial outcomes assessed in this study, it is through the mediating effect of acculturation and school setting that CI status exerts an influence over many of this study’s outcomes. Recommendations for future research are made in light of our findings.

Adolescence is characterized by rapid physiological, psychological, and social development (e.g., Harter, 2003; Kroger, 1996; Noller, Feeney, & Peterson, 2001). Deaf adolescents undergoing these changes also typically confront the challenges of being deaf in a sound-dominated environment not always attuned to their auditory and visual needs, particularly in the school setting. Some authors believe that the academic and psychosocial adjustment of adolescents with cochlear implants (CIs) could be adversely affected because of efforts to “normalize” their status and deny their visual needs (e.g., Ladd, 2003; Lane, Hoffmeister, & Bahan, 1996; Preisler, 2007). Other authors argue that the CI can serve as a vehicle for positive academic achievement and psychosocial adjustment because of greater access to spoken language (Fagan, Pisoni, Horn, & Dillon, 2007; Geers, 2006; Spencer & Marschark, 2003; Wheeler, Archbold, Gregory, & Skipp, 2007).

The importance of exploring academic and psychosocial adjustment in adolescents with CI is underscored by the dramatic increase in the number of children who have received CI over the past 15 years. According to the three major CI companies, more than 50,000 children worldwide have received a CI to date. Currently, approximately 12.6% of students in data reported to the Annual Survey of Deaf and Hard of Hearing Children and Youth for the 2006–2007 academic year are reported to have CI (Gallaudet Research Institute, 2006). This is likely an underestimation, considering these data represent approximately 60% of all schools and programs enrolling deaf and hard-of-hearing students. In addition, the most recent information available from the Annual Survey shows that among both cochlear-implanted and nonimplanted children in the United States, 26.5% are in “special schools or centers” (primarily residential or day schools for deaf children). Therefore, most deaf students presently attend fully or partially mainstreamed educational settings.
Although increasing numbers of deaf children have the potential to hear and use spoken communication after being implanted, they typically require intensive communication therapy in order to maximize their expressive and receptive spoken communication (e.g., Christiansen & Leigh, 2005; Nicholas & Geers, 2006). There is a small but growing number of studies investigating the linguistic and academic achievement of these children which demonstrate that students with CI generally perform better academically than those without CI (for reviews, see Fagan, et al., 2007; Geers, 2006; Marscharck, Rhoten, & Fabich, 2007). Whether this superior academic achievement persists over time is not yet established.

A growing body of literature also demonstrates the effects of CIs on auditory perception, speech, and oral language development (e.g., Geers, 2004; Waltzman, 2006). These benefits are moderated by several variables, including age of implantation, duration of implant use, and mode of communication. If implantation results in improved auditory perception and more advanced speech and oral language skills in deaf children and adolescents, this may result in better psychosocial adjustment, especially in the areas of academic achievement and peer relationships.

**Psychosocial Adjustment Variables**

**Social Integration of Deaf Adolescents**

A review of research studies of deaf students in mainstream settings indicates that interactions with hearing students can be positive when deaf adolescents are emotionally secure and participate frequently in social activities (Leigh & Stinson, 1991; Stinson, Chase, & Kluwin, 1990; Stinson & Kluwin, 2003). However, deaf students’ peer interactions in the mainstream are not always positive, primarily because of difficulties in communication access or lack of awareness regarding hearing loss among hearing peers (Antia & Stinson, 1999; Bat-Chava & Deignan, 2001; Eriks-Brophy, et al, 2007; Stinson & Kluwin, 2003). Deaf mainstreamed students often report feelings of loneliness, few close friendships, and lack of contact with deaf peers (Foster, 1988; Leigh & Stinson, 1991; Stinson & Lang, 1994; Stinson & Whitmire, 1992; Stinson, Whitmire, & Kluwin, 1996). Within public schools, although deaf adolescents typically experience more comfort and emotional security in relationships with deaf peers than with hearing peers (Stinson, et al., 1990; Stinson & Whitmire, 1992), some do report comfort with hearing peers, depending on social and communication competence (Bat-Chava & Deignan, 2001; Musselman, Mootilal, & MacKay, 1996; Stinson & Antia, 1999).

Parents of deaf children with CIs generally expect that the CI will facilitate communication and psychosocial adjustment within the family, school, and neighborhood settings. Several studies have used parent perceptions to explore the psychosocial effects of pediatric cochlear implantation (Bat-Chava & Deignan, 2001; Bat-Chava, Martin, & Kosciw, 2005; Chmiel, Sutton, & Jenkins, 2000; Christiansen & Leigh, 2005; Kluwin & Stewart, 2000; Nicholas & Geers, 2003). In general, these studies indicate that parents see evidence of improved quality of life, greater self-esteem, confidence, and outgoing behavior in their implanted children in comparison to the pre-implant stage. Difficulties in social relationships with hearing peers remain, however, because of residual lags in oral communication skills, limited access to communication within group situations, and the attitudes of hearing peers. Parents whose children were either adolescents at implantation or who were implanted against their wishes reported more problems (Christiansen & Leigh, 2005). In summary, recent studies based on parent perceptions indicate that for deaf students, CIs can help children function better socially, but they do not guarantee age-appropriate socialization experiences with hearing peers.

One observational study involving a small sample of children and adolescents with CIs noted that their interaction with hearing peers tended to be unsuccessful (Boyd, Knutson, & Dahlstrom, 2000). Acceptance by hearing peers is more likely when deaf children exhibit good spoken communication skills, whether they have implants or not (Bat-Chava & Deignan, 2001, Leigh & Stinson, 1991; Stinson & Kluwin, 2003). Results of qualitative interviews conducted with deaf children with CIs demonstrate ongoing communication limitations (Preisler, Tvingstedt, & Ahlstrom, 2005). From information obtained through interviews of young people with CIs, Wheeler, Archbold,
Gregory, and Skipp (2007) suggest how intelligible speech may facilitate comfort in situations where sign language is not used. Considering that deaf children are typically placed in mainstream settings, parents, educators, and psychologists continue to be concerned about the social adjustment of deaf children and adolescents, both with and without implants. However, implanted children and adolescents are expected to have better communication skills and more positive psychosocial adjustment compared to their unimplanted peers. It is the goal of this study to assess whether this expectation is warranted.

Behavioral Characteristics of Deaf Adolescents

A review of the literature indicates that the prevalence of negative behaviors in deaf students varies from 4.8% to 50.3% depending on the sample studied and type of behavior (Schirmer, 2001). Greenberg and Kusche (1989) note that deaf children exhibit greater impulsivity and inadequate emotional regulation compared to hearing children. They believe that this is primarily because of limited exposure to language and social experiences. More recently, Khan, Edwards, and Langdon (2005) found no difference between age-matched groups of hearing children, children with CI, and children with hearing aids on the Child Behavior Checklist. However, sustained attention as measured by the Attention Sustained subscale of the Leiter International Performance Scale-Revised was lower for children with hearing aids in comparison to hearing children and those with implants. Given that direct communication plays an even more important role in the life of adolescents compared to younger children (Preisler et al., 2005), there is a need to compare the behavior of deaf adolescents with and without implants.

Self-perceptions and Identity of Deaf Adolescents

The self-perceptions of deaf mainstreamed students appear to be generally positive even when they are not accepted by hearing peers (for a review, see Stinson & Kluwin, 2003). Nicholas and Geers (2003) used a picture assessment of self-image in a sample of 181 8- to 9-year-old children who had been implanted four or more years. Results indicated that self-perceptions were positive in most aspects of daily life, thus counteracting earlier concerns about psychosocial problems in implanted children. Whether positive self-perceptions among deaf students continues into adolescence is yet unknown. It is also important to assess how social identity relates to self-perceptions and psychological well-being in adolescents, given that social identity reflects a conscious affiliation with a shared social group, thereby providing stability and continuity in self-perceptions (Erikson, 1968, 1980).

According to Corker (1996), deaf identity is not necessarily a core identity for deaf children who grow up within hearing families. Instead, incorporating a deaf identity into one’s self-image is a developmental task that is influenced by family and school variables. For example, growing up in a family that emphasizes one’s deafness as different from hearing family members or peers can strengthen the salience of a deaf identity, whereas growing up in an environment that minimizes such differences may diminish the emphasis on deafness as a core part of one’s social identity. In a meta-analytic review of the literature examining factors that influenced self-esteem in deaf adolescents and adults, Bat-Chava (1993) found five studies that assessed the relationship between cultural deaf identity and self-esteem. Having a stronger deaf identity contributed positively to self-esteem in deaf adolescents and adults.

Christiansen and Leigh (2005) were among the earlier explorers of the relationship between CI usage and deaf identity development, having conducted a small interview study of implanted older adolescents and young adults, some of whom had stopped using the CI. Almost all those interviewed desired ongoing contact with the deaf community in addition to socializing with hearing peers. Wheeler, Archbold, Gregory, and Skipp (2007) later administered a semi-structured questionnaire to 29 young adolescents aged 13–16 with CI in mainstreamed and specialized educational settings. They found that most participants were flexible in terms of communication mode and endorsed a perception of deaf identity that was neither culturally Deaf nor strongly hearing. There was no clear relationship between the educational setting students attended and their identity status. Whether this flexibility
continues into later years remains to be seen, as the participants were in the younger phase of adolescence. Borrowing from racial identity development theories (e.g., Helms, 1990), Glickman (1996) proposed that deaf people evolve through four stages of identity development, from first internalizing the need to be like hearing people (hearing identity), to confusion about where one belongs (marginality), to an immersion stage (characterized by denigrating hearing values), and ultimately to a bicultural identity (integrating both hearing and deaf ways of being). Glickman acknowledges that the process is not necessarily linear. In a study of eight adolescents with CI and 37 adolescents without CI that used Glickman’s (1996) Deaf Identity Development Scale, mean item scores indicated that hearing identity was more frequently endorsed by participants with a CI compared to participants without a CI (Wald & Knutsen, 2000). The groups were more similar than different in the bicultural, immersion, and marginal categories, with the bicultural identity receiving the strongest endorsement.

Maxwell and Zea (1998) proposed that many deaf people negotiate their involvement in both deaf and hearing cultures. Borrowing from acculturation research (e.g., Birman, 1994; Landrine & Klonoff, 1994; Zea et al., 2003), Maxwell and Zea investigated how the various domains of acculturation (e.g., psychological identification, cultural/linguistic competence, cultural behaviors/involvement) are expressed among deaf individuals. In a subsequent study involving over 3,000 deaf and hard-of-hearing adults, Maxwell-McCaw (2001) found that those who were deaf acculturated or bicultural had a more positive sense of overall well-being than those who were hearing acculturated, suggesting that some degree of affiliation with the Deaf community facilitated psychological well-being. Marginalized individuals had the lowest levels of psychological well-being. These findings were supported by a follow-up study in Germany, with bicultural respondents being most advantaged psychosocially (Hintermair, 2008). Neither Maxwell-McCaw nor Hintermair specifically examined whether cochlear implantation had a mediating effect on these results. The current study attempts to build on previous research and examine the effect of cochlear implantation on the relationship between group identity and psychosocial well-being.

**Purpose of the Study**

The purpose of this investigation was threefold. First, we wanted to expand the knowledge base on the psychosocial effects of CI by focusing on a group that has received little attention in the literature: deaf adolescents. To do so, we compared the experience of adolescents with implants to those without implants. Second, we wanted to go beyond the previous research focus on parents’ perspectives. Specifically, we collected self-report data from adolescents themselves, as well as data from parents and teachers with the goal of using multiple sources of data to assess the effect of implants on the psychosocial functioning of deaf children. Finally, because there has been relatively little research on this topic, our goal was to explore the associations among multiple variables in a small sample to inform future research. Because of the dearth of research on the psychosocial adjustment of deaf adolescents with CI (Marschark, 2007; Wheeler, et al., 2007), we have cast a wide net in an effort to narrow down the factors that are likely to be important indicators of academic and social functioning.

**Method**

**Participants**

Fifty-seven deaf high school students, ranging in age from 13 to 18 (\(M = 15.79\), standard deviation \([SD] = 1.35\)), participated in this study. Twenty-eight (49%) were CI users, and 29 (51%) had never used an implant. Sixty percent of the participants were female \((N = 34)\). Of the 55 adolescents who reported race/ethnicity, the vast majority was white \(n = 46, 84\%\). Of the parents who reported their own level of education, the majority was highly educated: 24 (45%) had either 2- or 4-year college education and 22 (42%) had a postgraduate degree. For CI users, the average age of implantation was 7 years \((M = 7.33, SD = 3.61)\) and the average length of use was 8 years \((M = 8.37, SD = 3.34)\). There were no significant differences between implant users and nonusers in terms of age, ethnicity, gender, age at...
diagnosis of hearing loss, and parental level of educa-
tion. Participants also did not differ in reading ability
(7.3 grade equivalent for the CI users and 6.5 for the
nonCI users). One parent (4%) of a participant with
a CI was hard of hearing; the remaining 27 sets
of parents were hearing. In the nonimplant group,
9 out of 29 (31%) participants had deaf parents. The
two groups differed significantly in educational plac-
ements: 26 (93%) of implant users attended main-
stream settings (either full or partial), and 15 (52%)
of nonusers attended mainstream settings, $\chi^2 (N = 57;
degrees of freedom [df] = 1) = 11.94, p = .001.$

In addition, despite attempts to recruit adolescents
with comparable levels of hearing loss (before the
implant), the two groups differed on this variable.
Of the adolescents with CI whose parents reported
this information, 25 (96%) had a profound hearing
loss and 1 (4%) had a severe hearing loss. Of those
without implants, 16 (67%) had a profound hearing
loss, 7 (29%) had a severe hearing loss, and 1 (4%) had
a moderate hearing loss, $\chi^2 (N = 50; df = 2) = 7.41,
p = .025.$ The two groups also differed in preferred
mode of communication. The majority of implant
users (77%) preferred to use oral communication ex-
clusively, whereas only 15% of non-users preferred
oral communication. Nonusers reported preference
for American Sign Language (ASL) only (26%), Total
Communication/Signing Exact English (26%), and
code-switching (26%), $\chi^2 (N = 53; df = 5) = 21.53,$
p = .001.

Instruments

Adolescents. Acculturation was assessed using a
30-item version of the Deaf Acculturation Scale
(DAS; Maxwell-McCaw, 2001). This version consists
of two acculturation scales, one measuring accultura-
tion to Deaf culture and the other measuring accul-
turation to Hearing culture. Each scale measures
acculturation across five dimensions: (1) psychological
identification (e.g., “I feel that I am part of the Deaf
community”), (2) cultural involvement (e.g., “How
much do you enjoy socializing with hearing people?”),
(3) cultural preferences (e.g., “I would prefer my best
friend(s) to be deaf”), (4) cultural knowledge (e.g.,
“How well do you know important events in
American/World history?”), and (5) language
competence (e.g., “How well do you sign using Ameri-
can Sign Language (ASL)?”). Items are scored on a 5-
point Likert scale from 1 (e.g., “strongly disagree” or
“not at all”) to 5 (e.g., “strongly agree” or “excellent/
like a native”). Subscale scores were averaged, culmi-
nating in one score for Deaf acculturation (DASd)
and one for hearing acculturation (DASH). Cronbach
alphas for the DASd subscales ranged from .83 to .96
and for the DASH subscales ranged from .68 to .87.

Self-esteem was assessed using the Self-Perception
Profile for Adolescents (Harter, 1988). Respondents
identify which of two statements apply to them (e.g.,
“Some teenagers find it hard to make friends” or
“Other teenagers find it’s pretty easy”) and then rate
the statement as “Really true for me” or “Sort of true
for me.” There are nine scales of five items each,
culminating in 45 items, scored on a scale from 1 to
4, with higher scores representing more positive self-
perception. We report on three subscales that address
self-perception in academic and social functioning as
well as global self-perception because these reflect the
factors most relevant to the purpose of this
study. Cronbach’s alphas ranged from .67 (global
self-esteem) to .77 (scholastic competence and close
friendships).

Satisfaction with Life was assessed using the brief
Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985). This scale consists of five
items measuring global life satisfaction, such as
“I am satisfied with my life.” Items are scored on
a 7-point scale from 1 (strongly disagree) to 7 (strongly
agree). Cronbach’s alpha was .80.

Loneliness was assessed using the four-item version
of the Revised UCLA Loneliness Scale (Russell,
Peplau, & Ferguson, 1978; Russell, Peplau, &
Cutrona, 1980), a summed rating scale consisting of
two positively worded and two negatively worded
items (e.g., “No one really knows me well”). Re-
sponses are given on a 4-point scale from 1 (“never”) to
4 (“often”). In this study, Cronbach’s alpha was .59.
At least one other study found a modest internal re-
liability (.63) for this scale (Hays & DiMatteo, 1985).

Student demographic form was used to collect de-

gographic information as well as deafness-related var-
iables (e.g., age at which hearing loss was detected,
educational setting), and psychological variables not
otherwise measured (e.g., teacher support as perceived by the student, satisfaction with communication at school, with family members, and with peers).

Adolescents with implants were also asked about their perceived acceptance by deaf and hearing peers (from 1 “always” to 4 “almost never”) and their patterns of socializing with deaf and hearing peers (from 1 “all the time” to 4 “very little/never”). Acceptance and socializing were very highly correlated ($r_{\text{hearing}} = .59, p = .001; r_{\text{deaf}} = .41, p = .039$) and were combined into acceptance/socialization by calculating the mean of the two items. Items measuring perceived acceptance and socialization were inadvertently left off the questionnaires for nonusers.

Reading comprehension was assessed by the Reading Comprehension Subtest of the Peabody Individual Achievement Test-Revised (Markwardt, 1998). For each two-page item, the student reads a sentence silently and on the next page selects one of four pictures that best illustrates the sentence.

Parents. Adolescents’ psychosocial functioning was assessed with the Achenbach System of Empirically Based Assessment (ASEBA; formerly called the Child Behavior Checklist, CBCL), Parent Form (Achenbach & Rescorla, 2001). Parents report on their child’s (ages 6–18) problem behavior and adaptive functioning (competence), identifying the extent to which “in the past 6 months” each item is “not true,” “somewhat or sometimes true,” or “very true or often true.” The ASEBA has previously been used effectively with children and adolescents who are deaf and hard of hearing (e.g., Wallander, Varni, Babani, Banis, & Wilcoz, 1988). In this study, we used five subscales from the problem behavior section and two competence subscales, selected for their relevance to academic functioning (e.g., attention problems) or social functioning (e.g., rule-breaking behavior, social competence). Cronbach’s alphas for the problem-behavior scales ranged from .76 (rule-breaking behaviors) to .86 (Attention problems). Alphas for the competence scales were .56 (social competence) and .58 (school competence).

Parent demographic form. Parents were asked some of the same questions as the adolescents in order to both corroborate the information provided by the student as well as to assess major areas of differences between child and parent. Parents were also asked for demographic information that their adolescents may not have known, such as degree of hearing loss, etiology, and age at diagnosis. Other items assessed parents’ education and occupation, ethnic/racial information, and household composition.

Teachers. Teacher perceptions. Adolescents’ psychosocial functioning was assessed by the adolescents’ teachers using the ASEBA (formerly called the CBCL), Teacher Form (Achenbach & Rescorla, 2001). This measure covers functioning in two areas, academic achievement and social functioning. Scales are identical to those on the Parent Form. We used the same five subscales from the problem behavior section as used on the Parent form. Cronbach’s alphas ranged from .61 (rule-breaking behaviors) to .91 (Attention problems).

Procedure

Participants were recruited through organizations serving deaf individuals and their families, online discussion groups for parents of deaf children and word of mouth. Interested parents and adolescents contacted one of the researchers to set up interviews. Two of the researchers traveled throughout the United States for data collection. Informed consent was obtained from parents and adolescents at the beginning of the scheduled appointment. Researchers communicated with the adolescents in their preferred mode of communication (spoken English, signed English, or ASL). Measures were presented in the same order. The typical length of time required for administration of all adolescent measures was about an hour. The ASEBA Teacher Form was mailed or given to teachers selected by the adolescents.

In addition, two schools for the deaf sent information about the study and parent consent forms to parents of high school students. Following receipt of completed consent forms mailed by the parents, adolescents were contacted on site to give their own consent to participate in the study, fill out measures, and provide teacher names for the Teacher Form, which was then delivered to the teachers to be filled out and
mailed to the researchers. The parents of these adolescents were mailed the parent forms to be filled out and mailed back. All parents returned their forms. Participating adolescents were paid $10 and their parents were paid $5.

Results
Comparing Adolescents’ and Parents’ Responses
Responses to demographic and deaf-related variables that were reported by both adolescents and their parents are presented in Table 1, along with descriptive data (means and SDs for continuous variables or number of responses for categorical variables), the level of agreement between the two sources, and the specific source’s information ultimately selected for use in the study. Agreement was calculated either as a percent agreement (when data were categorical) or as a correlation coefficient (when data were continuous). For most variables, concordance rates were high. In cases where the information pertained to an adolescent’s subjective experience (e.g., acceptance by peers, perceived teacher report), the adolescent’s report was selected for subsequent analyses. When the information was factual, the source selected was the one who seemed more reliable (e.g., fewer missing data).

Differences Between Adolescents With and Without CI
Despite our efforts to recruit adolescents with similar characteristics into the two groups, there were significant differences between the groups in type of schools attended and degree of hearing loss (see Methods). To adjust for these differences, we compared the two groups on all outcome variables using a series of one-way analysis of variance with school setting and degree of hearing loss as covariates. Although school setting is not a continuous variable, it was coded to represent an ordinal variable from most integrated with hearing students (i.e., full mainstream = 1) to least integrated (i.e., deaf school = 3). Table 2 presents the results of these tests on all outcome variables. After adjusting for the two covariates, the two groups differed from each other significantly on one variable: adolescents with CI scored significantly higher on hearing acculturation relative to those without CI. Approximately 40% of both groups scored as

### Table 1 Concordance between adolescents’ and parents’ reports

<table>
<thead>
<tr>
<th></th>
<th>Child, M (SD)</th>
<th>Parent, M (SD)</th>
<th>Concordance</th>
<th>Source used in study and reasons for selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at CI</td>
<td>7.33 (3.61)</td>
<td>7.16 (3.58)</td>
<td>r = .974</td>
<td>Parent (information more reliable)</td>
</tr>
<tr>
<td>Child’s age</td>
<td>15.93 (1.37)</td>
<td>15.79 (1.35)</td>
<td>100%</td>
<td>Parent</td>
</tr>
<tr>
<td>Age hearing loss detected</td>
<td>.98 (1.90)</td>
<td>1.24 (1.56)</td>
<td>r = .868</td>
<td>Parent (fewer missing; information more reliable)</td>
</tr>
<tr>
<td>Level of hearing loss a</td>
<td>3.67 (.76)</td>
<td>3.80 (.45)</td>
<td>90%</td>
<td>Parent (many fewer missing; information more reliable)</td>
</tr>
<tr>
<td>Educational setting b</td>
<td>N</td>
<td>N</td>
<td>85%</td>
<td>Child information more reliable based on comparison with objective data. Child information used unless missing, in which case parent information used.</td>
</tr>
<tr>
<td>Socialize with deaf peers c</td>
<td>2.68 (1.33)</td>
<td>3.22 (1.01)</td>
<td>r = .704</td>
<td>Child (subjective experience)</td>
</tr>
<tr>
<td>Acceptance by deaf peers</td>
<td>1.69 (.79)</td>
<td>1.52 (.73)</td>
<td>r = -.13</td>
<td>Child (subjective experience)</td>
</tr>
<tr>
<td>Socialize with hearing peers</td>
<td>1.50 (.84)</td>
<td>1.78 (1.05)</td>
<td>r = .641</td>
<td>Child (subjective experience)</td>
</tr>
<tr>
<td>Acceptance by hearing peers</td>
<td>1.61 (.79)</td>
<td>1.41 (.57)</td>
<td>r = .45</td>
<td>Child (subjective experience)</td>
</tr>
<tr>
<td>Perceived teacher support</td>
<td>1.36 (.56)</td>
<td>3.63 (.69)</td>
<td>r = -.578</td>
<td>Child (subjective experience)</td>
</tr>
</tbody>
</table>

### Notes:

**a**Coded: 1 = 10–39 decibels; 2 = 40–69 decibels; 3 = 70–89 decibels; 4 = 90 decibels or greater.

**b**Agenda—FM: full mainstreaming; PM: partial mainstreaming; Res: residential school, live-in; RD: residential school, day student; Day: day deaf school.

**c**The last five variables are coded: 1 = always; 2 = most of the time; 3 = sometimes; 4 = almost never.
Therefore, our results indicate that in this sample, aside from the hearing–Deaf acculturation difference, adolescents with and without implants were quite similar on the variables assessed in this study.

The covariate of school setting seems to play a larger role in psychosocial adjustment than CI status. Compared to those adolescents attending deaf schools, adolescents attending mainstream educational settings had significantly lower scores in deaf acculturation, higher hearing acculturation, and marginally higher levels of scholastic self-esteem, friendship self-esteem, and global self-esteem. They also had significantly higher parent-reported social competence (see Table 2).

The associations between the covariate “Level of hearing loss” and the outcomes were assessed using an $F$ statistic in an analysis of covariance model. Degree of hearing loss was significantly associated with hearing acculturation and with attention problems reported by both parents and teachers and had a weaker (and nonsignificant) association with acculturation to Deaf culture and parent-reported rule breaking behavior (see Table 2).

### Table 2: Analysis of covariance comparing students with and without CIs

<table>
<thead>
<tr>
<th>CI</th>
<th>No CI</th>
<th>$N$</th>
<th>$M$</th>
<th>$SD$</th>
<th>$F$ (CI status) ($df$)</th>
<th>$F$ (school) ($df$)</th>
<th>$F$ (hearing) ($df$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deaf acculturation</td>
<td>27</td>
<td>2.90</td>
<td>0.96</td>
<td></td>
<td>3.55$^1$ (1,43)</td>
<td>19.69*** (1,43)</td>
<td>3.27$^1$ (1,43)</td>
</tr>
<tr>
<td>Hearing acculturation</td>
<td>28</td>
<td>4.14</td>
<td>0.68</td>
<td></td>
<td>11.60** (1,44)</td>
<td>12.39** (1,44)</td>
<td>4.11* (1,44)</td>
</tr>
<tr>
<td>School self-esteem</td>
<td>27</td>
<td>3.10</td>
<td>0.68</td>
<td></td>
<td>.93 (1,45)</td>
<td>3.81$^1$ (1,45)</td>
<td>.21 (1,45)</td>
</tr>
<tr>
<td>Social self-esteem</td>
<td>28</td>
<td>3.01</td>
<td>0.66</td>
<td></td>
<td>.69 (1,46)</td>
<td>.45 (1,46)</td>
<td>.15 (1,46)</td>
</tr>
<tr>
<td>Friends self-esteem</td>
<td>27</td>
<td>3.41</td>
<td>0.57</td>
<td></td>
<td>.12 (1,45)</td>
<td>3.25$^1$ (1,45)</td>
<td>.08 (1,45)</td>
</tr>
<tr>
<td>Global self-esteem</td>
<td>28</td>
<td>3.21</td>
<td>0.51</td>
<td></td>
<td>.58 (1,45)</td>
<td>3.40$^1$ (1,45)</td>
<td>.01 (1,45)</td>
</tr>
<tr>
<td>Satisfaction with life</td>
<td>28</td>
<td>5.63</td>
<td>1.03</td>
<td></td>
<td>.74 (1,46)</td>
<td>2.54 (1,46)</td>
<td>2.48 (1,46)</td>
</tr>
<tr>
<td>Loneliness</td>
<td>27</td>
<td>7.86</td>
<td>2.05</td>
<td></td>
<td>.47 (1,46)</td>
<td>.04 (1,46)</td>
<td>.19 (1,46)</td>
</tr>
<tr>
<td>Anxiety/depression (parent)</td>
<td>27</td>
<td>2.00</td>
<td>2.22</td>
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<tr>
<td>Social problems (parent)</td>
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<td>1.83</td>
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<td>1.93 (1,43)</td>
<td>.16 (1,43)</td>
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<tr>
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<td>Attention problems (parent)</td>
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<td>2.76</td>
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<td>2.05</td>
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<td>.20 (1,43)</td>
<td>2.90$^1$ (1,43)</td>
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<tr>
<td>Rule breaking (teacher)</td>
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<td>.78</td>
<td>1.63</td>
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<td>.02 (1,35)</td>
<td>.00 (1,35)</td>
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<td>Aggression (parent)</td>
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<td>Aggression (teacher)</td>
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<td>1.28</td>
<td>2.05</td>
<td></td>
<td>.15 (1,35)</td>
<td>1.49 (1,35)</td>
<td>1.43 (1,35)</td>
</tr>
<tr>
<td>Social competence</td>
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<td>10.02</td>
<td>2.49</td>
<td></td>
<td>.14 (1,41)</td>
<td>.39 (1,41)</td>
<td>.83 (1,41)</td>
</tr>
<tr>
<td>School competence</td>
<td>26</td>
<td>4.77</td>
<td>.89</td>
<td></td>
<td>.00 (1,44)</td>
<td>7.01* (1,44)</td>
<td>.73 (1,44)</td>
</tr>
</tbody>
</table>

$^1p < .10, ^*p < .05, **p < .01, ***p < .001.$

bicultural $\chi^2 (3, N = 54) = 9.58, p < .05$. Therefore, our results indicate that in this sample, aside from the hearing–Deaf acculturation difference, adolescents with and without implants were quite similar on the variables assessed in this study.

The covariate of school setting seems to play a larger role in psychosocial adjustment than CI status. Compared to those adolescents attending deaf schools, adolescents attending mainstream educational settings had significantly lower scores in deaf acculturation, higher hearing acculturation, and marginally higher levels of scholastic self-esteem, friendship self-esteem, and global self-esteem. They also had significantly higher parent-reported social competence (see Table 2).

The associations between the covariate “Level of hearing loss” and the outcomes were assessed using an $F$ statistic in an analysis of covariance model. Degree of hearing loss was significantly associated with hearing acculturation and with attention problems reported by both parents and teachers and had a weaker (and nonsignificant) association with acculturation to Deaf culture and parent-reported rule breaking behavior (see Table 2).

### Associations between deaf-related variables and psychosocial functioning

Table 3 presents the bivariate correlations of deaf-related variables with psychosocial functioning, reported for the full sample by child, parent, and teacher. An overall view reveals that some deaf-related constructs are related to both child- and parent-reported psychosocial functioning. Teacher-reported functioning is related to a lesser extent to deaf-related variables and often simply reflects parent-reported functioning. The following presentation of the analyses is based on psychosocial functioning outcome variables, both those reported by adolescents themselves and those included in the
ASEBA syndrome profile of problems and competence sections reported by parents and teachers.

**Psychosocial indicators reported by adolescents.** *Deaf acculturation and hearing acculturation.* As seen in Table 3, deaf acculturation and hearing acculturation were associated with several of the measured variables and always in the direction opposite of each other. Notably, satisfaction with home communication was positively related to hearing acculturation. Conversely, number of deaf friends was positively associated with deaf acculturation and negatively associated with hearing acculturation. Grade was also related to acculturation such that adolescents in higher grades had higher deaf acculturation scores and lower hearing acculturation scores than those in lower grades.

**Self-perceptions.** Several self-esteem subscales were associated with the antecedent variables. As indicated in Table 3, self-reported scholastic competence was negatively associated with age when hearing loss was detected, such that those whose hearing loss was detected earlier had higher scholastic self-esteem. Students who were more satisfied with home communication had higher levels of scholastic self-esteem and social competence self-esteem.

**Satisfaction with life.** Table 3 demonstrates that satisfaction with life was positively related to satisfaction with home communication.

**Psychosocial indicators reported by parents/teachers.** *Negative functioning.* Attention problems (reported by both parents and teachers) were positively associated with age at which hearing loss was detected (later age was related to greater problems), rule-breaking was positively associated with age at detection of hearing loss according to both parent and teacher report, and parent-reported aggression was

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Bivariate correlations for the full sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reporter</td>
</tr>
<tr>
<td>Deaf acculturation</td>
<td>C</td>
</tr>
<tr>
<td>Hearing acculturation</td>
<td>C</td>
</tr>
<tr>
<td>School self-esteem</td>
<td>C</td>
</tr>
<tr>
<td>Social self-esteem</td>
<td>C</td>
</tr>
<tr>
<td>Friends self-esteem</td>
<td>C</td>
</tr>
<tr>
<td>Global self-esteem</td>
<td>C</td>
</tr>
<tr>
<td>Satisfaction with life</td>
<td>C</td>
</tr>
<tr>
<td>Loneliness</td>
<td>C</td>
</tr>
<tr>
<td>Anxious/depressed</td>
<td>P</td>
</tr>
<tr>
<td>Withdrown</td>
<td>P</td>
</tr>
<tr>
<td>Social problems</td>
<td>P</td>
</tr>
<tr>
<td>Attention problems</td>
<td>P</td>
</tr>
<tr>
<td>Rule breaking</td>
<td>P</td>
</tr>
<tr>
<td>Aggression</td>
<td>P</td>
</tr>
<tr>
<td>Social competence</td>
<td>P</td>
</tr>
<tr>
<td>School competence</td>
<td>P</td>
</tr>
</tbody>
</table>

*Note.* “Reporter” is coded, C = child, P = parent, or T = teacher.

\(^{1}p < .10, ^{*}p < .05, ^{**}p < .01, ^{***}p < .001.\)
positively related to age at which hearing loss was detected (Table 3).

**Positive functioning.** As Table 3 shows, parent-rated social competence was positively related to satisfaction with home communication, whereas satisfaction with communication at school was not associated with any of the indicators of psychosocial functioning. Parent-rated scholastic competence was negatively associated with age at which hearing loss was detected, age, and grade.

**Partial correlations adjusting for implant status.** To assess the possible role of CI use on the relationship among the variables, partial correlations or analysis of covariance were calculated among all variables, adjusting for CI status. These associations were generally the same as the bivariate associations reported earlier, indicating that beyond its direct relation with outcomes, CI status did not have a moderating effect on the relations among variables.

### Table 4  Bivariate correlations for adolescents with CI

<table>
<thead>
<tr>
<th>Reporter</th>
<th>Perceived teacher support</th>
<th>Socialization/Acceptance by hearing peers</th>
<th>Socialization/acceptance by deaf peers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deaf acculturation</td>
<td>C</td>
<td>-.11</td>
<td>-.57**</td>
</tr>
<tr>
<td>Hearing acculturation</td>
<td>C</td>
<td>.29</td>
<td>.69***</td>
</tr>
<tr>
<td>School self-esteem</td>
<td>C</td>
<td>.22</td>
<td>.35†</td>
</tr>
<tr>
<td>Social self-esteem</td>
<td>C</td>
<td>.20</td>
<td>.31</td>
</tr>
<tr>
<td>Friends self-esteem</td>
<td>C</td>
<td>-.01</td>
<td>.34†</td>
</tr>
<tr>
<td>Global self-esteem</td>
<td>C</td>
<td>-.25</td>
<td>.34†</td>
</tr>
<tr>
<td>Satisfaction with life</td>
<td>C</td>
<td>-.45*</td>
<td>.10</td>
</tr>
<tr>
<td>Loneliness</td>
<td>C</td>
<td>.31</td>
<td>-.14</td>
</tr>
<tr>
<td>Anxious/depressed</td>
<td>P</td>
<td>-.03</td>
<td>.08</td>
</tr>
<tr>
<td>T</td>
<td>-.16</td>
<td>.01</td>
<td>.06</td>
</tr>
<tr>
<td>Withdrawn</td>
<td>P</td>
<td>-.15</td>
<td>-.28</td>
</tr>
<tr>
<td>T</td>
<td>-.64**</td>
<td>-.53*</td>
<td>-.00</td>
</tr>
<tr>
<td>Social problems</td>
<td>P</td>
<td>-.31</td>
<td>-.19</td>
</tr>
<tr>
<td>T</td>
<td>.21</td>
<td>-.00</td>
<td>.25</td>
</tr>
<tr>
<td>Attention problems</td>
<td>P</td>
<td>.09</td>
<td>-.14</td>
</tr>
<tr>
<td>T</td>
<td>-.10</td>
<td>-.16</td>
<td>-.02</td>
</tr>
<tr>
<td>Rule breaking</td>
<td>P</td>
<td>-.06</td>
<td>-.18</td>
</tr>
<tr>
<td>T</td>
<td>-.05</td>
<td>-.27</td>
<td>.12</td>
</tr>
<tr>
<td>Aggression</td>
<td>P</td>
<td>-.08</td>
<td>-.07</td>
</tr>
<tr>
<td>T</td>
<td>-.08</td>
<td>-.15</td>
<td>.26</td>
</tr>
<tr>
<td>Social competence</td>
<td>P</td>
<td>-.28</td>
<td>.10</td>
</tr>
<tr>
<td>School competence</td>
<td>P</td>
<td>.20</td>
<td>.50**</td>
</tr>
</tbody>
</table>

**Note.** “Reporter” is coded, C = child, P = parent, or T = teacher.

*p < .10, *p < .05, **p < .01, ***p < .001.
with and acceptance by deaf peers. Scholastic self-esteem was negatively related to socialization with and acceptance by deaf peers. Satisfaction with life was negatively associated with perceived teacher support. Finally, loneliness was positively associated with socialization with and acceptance by hearing peers.

Psychosocial indicators reported by parents and teachers. None of the parent-reported variables on negative functioning was associated with any of the social variables assessed for adolescents with implants. Teacher-reported withdrawn behavior was negatively associated with perceived teacher support and with socialization with/acceptance by hearing peers. Parent-reported scholastic competence was positively related to socialization with and acceptance by hearing peers (see Table 4), taking into account the modest reliability of the social and scholastic competence scales on the ASEBA.

Discussion

From a psychosocial perspective, deaf adolescents with a CI and those without the device in our sample are far more similar to each other than might have been anticipated, given the expectations that the CI might make a significant difference in adolescents' social development, even while adjusting for educational settings and degree of hearing loss. Although there are many more similarities than differences between the two groups, our research reveals the presence of some interesting differences and associations. One purpose of this study was to examine the associations among multiple variables investigated in this study in order to inform future research. These differences and future research suggestions are discussed below.

Acculturation

The one notable difference between the two groups is that those with CI are more likely to be acculturated to hearing society than those who do not use the device, whereas non-CI adolescents are more Deaf acculturated than those with CI. It is no surprise that the CI group generally is more hearing acculturated, given that many parents and educators are encouraged to maximize auditory training post-implantation. It is also possible that this group, even considering their greater degree of hearing loss prior to implantation, had higher hearing orientation due to hearing aid use and auditory training prior to implantation. In addition, more of the adolescents without CI were in specialized deaf settings where, despite their relatively lower levels of hearing loss, auditory training perhaps was less emphasized and deaf identities were more likely to be reinforced. All these factors could contribute to the difference in the findings on hearing–Deaf acculturation. However, it is important to emphasize that implant users can be primarily acculturated either to deaf or hearing worlds, or to both (as indicated by the similar number of participants with bicultural identities in both groups), though this CI sample was predominately hearing acculturated. Rather than having a direct effect on the psychosocial outcomes assessed in this study, it seems that CI status exerts an influence over many of this study’s outcomes through the mediating effect of acculturation and school setting. Although it appears that hearing acculturation is associated with CI use, this does not necessarily mean that the CI is key. Other mediating variables, such as spoken language competency, also need to be examined. Because this study did not compare differences between hearing-aid users and CI users, future studies that specifically address this variable may shed more light on this issue.

Despite the differences in acculturation, the two groups nonetheless do not significantly differ in the other psychosocial outcomes. This suggests that the differing acculturative experiences between these two groups—alignment with either the majority hearing society or with Deaf culture—do not have a differential effect on the psychosocial outcomes of self-esteem, satisfaction with life and loneliness when reported by adolescents themselves, as well as psychosocial characteristics reported by parents and teachers.

Scholastic Self-esteem, Socialization, and Satisfaction With Life

The negative relationship between scholastic self-esteem and socialization with and acceptance by deaf peers for CI users might be due to subtle parent and school messages that focus on the value of hearing peer
socialization and mainstream education rather than deaf peer socialization or specialized deaf settings. The negative association between satisfaction with life and perceived teacher support could be interpreted to mean that those CI users who were satisfied with life required less teacher support than those with lower satisfaction scores.

Loneliness Among Deaf Adolescents

In our study, levels of loneliness were similar for both groups, considering that the CI users were mostly in mainstream settings and adolescents without CI were in mostly specialized settings. Although the reliability of the Loneliness Scale was modest in this study, our findings appear to be consistent with the existing literature. Most (2007) found similar levels of loneliness among young deaf adolescents in inclusion settings and those in specialized classes within a mainstream setting. This finding supports our own findings regarding the similarity of loneliness levels for students in mainstream and specialized schools. In addition, Most (2007) reports a negative correlation between speech intelligibility and loneliness only for the inclusion sample. She suggests that students in the specialized setting may have felt set apart from the mainstream, whereas students in the inclusion setting may have been subject to ongoing communication difficulties and feelings of rejection.

Overall, Most’s participants had higher levels of loneliness than a normative hearing sample. However, in a study of the effects of CI experience on loneliness in middle and late childhood, Schorr (2006) found that loneliness levels among her participants were similar to levels noted in hearing peers. In our sample, loneliness levels did not significantly differ from those in the normative sample reported for the Revised UCLA Loneliness Scale (D. Russell, personal communication, December 9, 2007). In alignment with Schorr’s (2006) findings, our findings imply that deaf adolescents are not more lonely compared to hearing peers. The positive relationship between loneliness and socialization with and acceptance by hearing peers found for CI users in this study might be explained by the possibility that socialization with hearing peers averts loneliness mainly in one-on-one interactions but not in group situations where loneliness might easily arise. It would be helpful to further examine the factors that might be related to loneliness for adolescents with CI, such as receptive speech comprehension, functional communication skills (particularly in noisy situations), types of social skills, and the availability of deaf peers in mainstream settings. Future studies should use the full Revised UCLA Loneliness Scale and assess its reliability with deaf adolescent populations.

Peer Acceptance

Researchers have noted that parents do not consistently evaluate social situations the same way their children do (e.g., Gregory, Bishop, & Sheldon, 1995). The low correlation between parent and adolescent CI user ratings of acceptance by deaf peers (−.13) suggests the possibility that adolescents may view their acceptance by deaf peers differently than parents do. The moderate correlation for acceptance by hearing peers (.45) could possibly be due to a greater focus by parents on acceptance by hearing peers, which might also influence the desire of adolescents to view themselves as being accepted by hearing peers. These correlations reinforce the importance of asking children as well as parents about their perceptions of peer relationships and loneliness.

The Effect of School Setting on Psychosocial Outcomes

Students attending mainstream settings report higher self-esteem within the domains measured in this study, including scholastic self-esteem. It is impossible to conclude from these data whether adolescents with higher perceived scholastic self-esteem tend to go to mainstream schools or if attending mainstream schools contributes to such positive self-perception.

Our results also indicate that adolescents educated in mainstream settings are more likely to be hearing acculturated compared to those attending deaf schools. Additionally, similar percentages of adolescents with and without CI endorsed a bicultural identity. This appears to support the idea that even in view of the stronger orientation toward hearing acculturation on the part of CI users, it is possible for CI users to have
bicultural orientation. Considering the Maxwell-McCaw (2001) and Hintermair (2008) findings of an association between bicultural identity and well-being, the implication is that of a psychosocially healthy process.

The Effects of Age and Grade on Psychosocial Outcomes

Students in higher grades are more Deaf acculturated, and students in lower grades are more hearing acculturated. It is possible that students in higher grades increasingly experience communication difficulties with hearing peers and in the classroom and, as a result, desire a stronger connection with deaf peers or academic environments with critical masses of deaf students. Alternatively, this result could lend support for Glickman’s (1993) supposition that as deaf individuals explore their identity more fully, they move toward the immersion stage in order to explore their interest in and comfort within the deaf community. Given that this sample is composed entirely of adolescents and that, according to Erikson (1968, 1980), adolescence is focused on explorations of identity, our finding that adolescents in different grades have different levels of hearing and Deaf acculturation is not surprising. Longitudinal studies following adolescents’ identity development through several grades as well as the influence of deaf peer presence in mainstream settings may clarify the extent to which development and exposure to deaf peers influence acculturation choices over time.

The Effect of Hearing Loss levels on Psychosocial Outcomes

Early detection of hearing loss was related to feelings of academic and social competency. Another interesting finding is the association of hearing loss levels with attention problems and rule-breaking behavior. Based on parent and teacher reports, lower levels of hearing loss were associated with greater disruptive behavior. It is possible that when children have greater hearing loss, family members to report more disruption (Harvey, 2003; Laszlo, 1994; Pipp-Siegel, Sedey, & Yoshinaga-Itano, 2002). When cues are misunderstood, frustration may increase. It is further possible that those with a more severe hearing loss may have received intervention sooner and more extensively than those with less severe hearing loss (Kochkin, Luxford, Northern, Mason, & Tharpe, 2007).

The Effect of Home Communication on Psychosocial Outcomes

Based on an analysis of the psychosocial functioning of the entire sample of adolescents with and without CI, the importance of communication at home is demonstrated by findings that satisfaction with home communication was positively related with hearing acculturation, scholastic self-esteem, social competence self-esteem, and satisfaction with life. Considering that early detection of hearing loss was also related to feelings of academic and social competency, this implies that when parents are hearing, earlier intervention leads to greater ease of communication at home, which in turn leads to greater comfort in social and academic environments. Based on a data set of 213 parents in Germany, Hintermair (2006) noted that when the child is communicatively competent, the child’s socioemotional development is facilitated and parents experience less stress.

Conclusion

The purpose of this preliminary study was to assess differences between adolescents with and without implants in several areas of psychosocial functioning according to reports by adolescents themselves, their parents and teachers in order to inform future research. In addition, deafness-related antecedents of psychosocial functioning were examined for all adolescents, both those with and without implants. This study is unique in that it examines adolescents with CI, a group not previously studied, and includes data from multiple sources: adolescent themselves, parents, and teachers. Our most notable finding is that deaf adolescents’ functioning—as measured in this study—is not directly affected by implant status. CI status exerts an indirect influence on several of the
psychosocial outcomes in our study through its effect on acculturation and school setting. Because our small, nonrandom and self-selected sample may have introduced some biases, our findings should be replicated with larger and more representative samples, including samples of children implanted at younger ages than was typically the case in this study. Other types of data, such as objective observations of children and adolescents with implants in naturalistic settings may shed more light on the possible difference relative to those without CI. In addition, a longitudinal design to ascertain cause and effect might be appropriate for answering questions such as the following: Are students who are hearing acculturated choosing to attend mainstream schools, or does attendance in mainstream schools contribute to hearing acculturation? Our observations of the minor differences between parent and teacher reports lead us to suggest that future research could consider omitting teacher reports, which are more difficult to collect. Future research may want to consider measuring other psychosocial as well as academic constructs, which may yield greater differences between adolescent CI users and those who do not have a CI.

Overall, it is apparent from this study that the CI is an assistive tool and not a factor that significantly impacts psychosocial functioning as measured in this study, contrary to what was believed a decade ago. It appears that, considering the entire sample of participants in this study, how parents and the educational system meet the psychosocial needs of these deaf adolescents is of more importance than whether or not the adolescent has a CI.

Funding
Priority Grant from the Gallaudet Research Institute.

Notes
2. Additional schools declined to participate as staff time to extract parent addresses and mail flyers were not available.

References


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