

Children With Cochlear Implants in Australia: Educational Settings, Supports, and Outcomes

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This Australian study examined the communication, academic, and social outcomes of pediatric cochlear implantation from the perspectives of teachers working with children with cochlear implants. The children were aged from 1 to 18 years and attended a range of educational settings in early intervention, primary, and secondary schooling. One hundred and fifty-one teachers completed a survey on one child with a cochlear implant and 15 of these teachers were interviewed. Teachers reported their perceptions of children's functional outcomes in a range of communication, academic, social, independence, and identity areas. Reported achievements in literacy, numeracy, and social development were below class levels. Implications for educational authorities and professionals working with children with cochlear implants are discussed.

Although the rates of cochlear implantation in young children diagnosed with severe and profound hearing loss have increased rapidly in recent years in Australia and most other developing countries (Hyde & Power, 2006; Valencia, Rimell, Friedman, Oblander, & Helmbrecht, 2008) and the reported success rates for spoken language acquisition continue to improve, questions remain about the longer term benefits of these devices in education and other areas of the children's personal and social development. The reported variability in outcomes among children with cochlear implants (e.g., Pisoni, Conway, Kronenberger, Horn, & Henning, 2008; Thoutenhoofd et al., 2005) adds to the importance of examining how implanted children fare over time in their schooling and personal lives.

In Australia, public education is under the jurisdiction of the governments of each of the country's six

federated states and two territories. Although there is some variation between the different states' and territories' models of educating deaf students, the main program now provided for the great majority—an estimated 83%—of deaf and hard-of-hearing students across Australia is in a regular class with support from an itinerant teacher of the deaf. These students generally use an oral–aural communication mode, although a small number receive some signing support from an interpreter. Most of the remainder are placed in “units” or “facilities” for deaf students within regular schools, where a form of manual communication (either Australian Sign Language [Auslan] or Australasian Signed English) may be used, and attend the schools' regular classes to varying degrees (Hyde & Power, 2003; Power, 2009). A very small number attend special schools for deaf children, with some schools offering bilingual–bicultural programs involving instruction in Auslan, with English taught as a second language (Hyde, Ohna, & Hjulstadt, 2005/2006; Komesaroff & McLean, 2006). In each state, there is at least one such bilingual program that provides Auslan, typically in the capital cities.

In most Australian states, decisions about the most appropriate educational placement for individual students are made within a formal system of ascertainment or appraisal operated by the state schools authorities. Teachers of the deaf, representatives of the educational settings under consideration, parents, and specialist advisors as required (e.g., speech pathologist, psychologist, audiologist) form an ascertainment committee to determine the recommended placement and levels of support (Power & Hyde, 2002). The final

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decision regarding placements, however, lies with the parents. Usually the decision is based on the individual needs of the child and particularly their capacity to learn in a spoken language environment and is not determined by the level of hearing loss *per se* or the presence or absence of cochlear implants.

The increasing number of profoundly and severely deaf children receiving cochlear implants and the expectation of educational placement in regular school programs that often accompanies implantation mean that regular schools are faced with a growing population of children with cochlear implants. However, although it may be a common expectation among parents and educators that cochlear implantation would result in deaf children developing spoken language abilities and attending regular classroom settings, this does not happen for all children, and even when children develop high levels of spoken communication, it appears that a range of educational settings and supports are necessary. For example, a large study conducted by the Gallaudet Research Institute obtained survey responses from 439 parents of children with cochlear implants. These data found that the children were in a variety of educational settings: 58% of the children were fully or partially mainstreamed in regular classes, 13% were in self-contained classes for deaf or hard-of-hearing children, 15% attended special schools for deaf and hard-of-hearing children, and 14% were in other settings, including reverse mainstreaming and playgroups (Christiansen & Leigh, 2002). Another survey study found that 64% of a group of 135 randomly selected children with cochlear implants across the United States attended mainstream schools, with a further 27% in schools with focused services for children with hearing loss and 8% in schools for deaf or hard-of-hearing children (Sorkin & Zwolan, 2004). In the United Kingdom, children with cochlear implants were found to have the same educational placement profile as same-age severely deaf children with hearing aids, with 38% of the implanted children in mainstream schools, 57% in special classes or units within mainstream schools, and 5% in schools for the deaf (Archbold, Nikolopoulos, Lutman, & O'Donoghue, 2002).

The literature reports significant academic gains for children with cochlear implants compared to

profoundly deaf children without implants but generally suggests that implanted children continue to fall behind their hearing peers (Marschark, Rhoten, & Fabich, 2007). For instance, Thoutenhoofd (2006) found a performance gap in academic attainment between students with cochlear implants and all Scottish schoolchildren, based on the Scottish National Test data; however, the gap was smaller than the gap for profoundly deaf children without implants. In mathematics, the cochlear implanted children were comparable to students with a moderate hearing loss, whereas in reading and writing they were comparable to children with a moderate to severe loss. In their follow-up study of U.S. students who had received a cochlear implant between the ages of 2 and 5 years, Geers and her colleagues found that the majority of students did not have age-appropriate reading levels when aged 15–18 years, although most surpassed the levels commonly reported for deaf teenagers (Geers, Tobey, Moog, & Brenner, 2008). Certain factors, in particular younger age at implantation, are generally associated with higher literacy and academic levels (Archbold, Harris, O'Donoghue, Nikolopoulos, White, & Richmond, 2008; Connor & Zwolan, 2004).

There is a concern that even those deaf or hard-of-hearing children who, with the help of a cochlear implant or hearing aids, successfully acquire spoken language and are able to conduct conversations in optimal conditions may be at a major disadvantage in situations that are difficult for them to hear or lipread; this has been termed “social deafness” (Vonen, 2007). Social deafness is likely to affect not only children's social interactions, such as play and conversations with peers, but also classroom learning, particularly with current teaching practices that incorporate inquiry-based learning involving cooperative learning situations and high levels of student–student dialogue in which there is a division of tasks within a group of students. These situations are also a social exercise and require students to use interpersonal skills such as negotiating a position, taking a leadership role, and responding to and demonstrating respect for the ideas and views of others.

A study of elementary school students in Canada illustrates this type of social deafness at school. Caissie and Wilson (1995) reported that mainstreamed deaf

and hard-of-hearing students aged 9–12 years working in cooperative learning groups with normally hearing classmates experienced communication breakdowns, largely consisting of failure to understand a message, and lacked the skills to effectively manage these breakdowns. Another Canadian study found that class teachers and hearing peers of mainstreamed adolescent deaf or hard-of-hearing students underestimated the effects of hearing loss for these students and perceived them to experience significantly less communication difficulty than was reported by the students themselves (Zheng, Caissie, & Comeau, 2001). In the case of hard-of-hearing students, where no signed communication or interpreters are used, general class teachers often do not realize the extent of communication difficulty the students experience, particularly in challenging listening conditions (Antia, Jones, Reed, & Kreimeyer, 2009). If deaf children with cochlear implants are functioning or presenting more like hard-of-hearing children, then it is possible that similar communication difficulties and breakdowns may occur and that general education teachers are not fully aware of, or equipped to manage, these difficulties.

Recent studies from several European countries and the United States have investigated the social inclusion and social functioning of children with cochlear implants (e.g., Bat-Chava & Deignan, 2001; Bat-Chava, Martin, & Kosciw, 2005; Nicholas & Geers, 2003; Percy-Smith, Caye-Tomasen, Gudman, Jensen, & Thomsen, 2008; Preisler, Tvingstedt, & Ahlstrom, 2002; Schorr, 2006). Overall, the research indicates that cochlear implantation of deaf children does not eradicate issues of social inclusion and participation in regular educational settings and raises the question of the role of sign language for these children. Some research has considered implanted adolescents' sense of identity with Deaf or hearing cultures in association with social and communication aspects. In Britain, Wheeler, Archbold, Gregory, and Skipp (2007) found that adolescents in a range of educational settings had a flexible attitude toward communication modes and cultural identity. A recent U.S. study found that adolescents with cochlear implants were more hearing acculturated than those without cochlear implants, who were more Deaf acculturated, although 40% of both groups indi-

cated a bicultural identity (Leigh, Maxwell-McCaw, Bat-Chava, & Christiansen, 2009).

The findings from teachers reported here are part of a larger study that also involved parents and children; findings from the parent and child data are reported elsewhere (Hyde, Punch, & Komesaroff, 2010, *in press*; Hyde, Punch, & Grimbeek, *in press*). The study included a relatively large sample of children implanted at several implant clinics and attending a variety of early intervention and educational settings across a range of locations in eastern Australia. The study utilized a mixed-methods approach that allowed quantitative survey findings to be extended and elaborated by qualitative findings from in-depth interviews and open-ended written responses. It included children with varying lengths of time since implantation, enabling insights to be gained into the lived experience and functional outcomes for implanted children over time.

The research questions related to the findings reported here were:

- What educational settings, supports, and communication modes are being used by Australian students with cochlear implants?
- How does implantation affect educational inclusion and what outcomes in communication, social, and academic development are observed by teachers?
- What challenges remain in educational programs for children with implants?

Methods

A mixed-methods approach to data collection and analysis was used to enable the research questions to be addressed more fully than the adoption of a single approach permits. A combination of quantitative and qualitative approaches was adopted in a sequential approach in which one method is used to further explore and expand the findings of another (Creswell, 2003). Teachers' experiences of children's communication, educational, and social outcomes in relation to those of similar-aged hearing students were assessed using a quantitative survey instrument. A subsample of 10% of the teachers then participated in semi-structured interviews in order to provide elaboration of and further depth to the data generated from the survey.

Participants

The participants were teachers who taught or supported children with cochlear implants in the Australian states of Queensland, New South Wales, and Victoria and included itinerant teachers of the deaf who visit students and collaborate with class teachers in regular school settings, teachers attached to units or facilities for deaf students in regular schools, and those working in more specialized settings such as bilingual programs or early intervention centers. It was considered that all these professionals would have a good knowledge of individual children's outcomes and experiences. For instance, as well as the time they spend with individual students, itinerant teachers of the deaf are in regular collaboration with the various class teachers and generally have a comprehensive understanding of the child's academic and social standing and progress within the class and school. In addition, regular class teachers could complete a survey on a child if appropriate, for example, if the child did not receive any support from teachers of the deaf.

Each teacher and early intervention specialist was asked to complete a survey based on one child with a cochlear implant whom they supported. Some itinerant teachers visit very few children with a cochlear implant, and other teachers, particularly in schools with specific facilities for deaf students, support many. Therefore, in order to obtain a profile of implanted children within educational settings, respondents were asked to generate an alphabetical list of students with cochlear implants whom they supported, pick the second child on that list, and complete the questionnaire with responses based on that child. We asked the respondents to report on only one student to reduce the task demands on teachers and to ensure as high a response rate as possible. The same approach was used effectively in a large Australian study of students supported by itinerant teachers of the deaf in regular schools (Hyde & Power, 2003, 2004; Power & Hyde, 2002, 2003).

Teachers returned 151 completed surveys. Teachers reported their professional role: 40.4% were itinerant, or visiting, teachers of the deaf, 39.7% were teachers of the deaf based in a support class or deaf facility in a regular school, 11.9% were early intervention special-

ists, 6.0% were class teachers, and 3% reported themselves as "other."

Survey

We constructed a survey based, in part, on others used with teachers of the deaf and parents of children with cochlear implants. The survey consisted of three sections.

Background information. Section 1 collected data on the role of the teacher (e.g., itinerant support teacher, early intervention specialist, support class teacher, regular class teacher) and details about the child, including gender, age, age of implantation, occurrence of bilateral implantation, hearing aid use, type of educational setting, and the communication approach or program used with the child in that setting.

Teachers' perceptions of children's outcomes with the cochlear implant. The second section incorporated four subscales: Communication Abilities, Social Skills and Participation, Academic Achievement, and Future Life. The items were similar to those on this study's parent survey that was adapted from the questionnaire of Zaidman-Zait and Most (2005) used with mothers of children with cochlear implants. Modification was made to some of the items to more closely reflect the Australian context and the educational environment, and a small number of further items were included. The items on the Communication Abilities subscale largely reflected abilities in spoken language in functional, everyday situations such as "the child is able to follow a spoken conversation with a group of people." The Social Skills and Participation items were concerned with children's experiences making friends and being accepted by hearing peers and actively participating in play with children in general. The Academic Achievement subscale included children's ability to participate in a regular class, as well as items concerning levels of achievement in mathematics, reading and writing, and general age-related levels. The Future Life subscale was concerned with perceptions of children's general functioning and independence and their identity as deaf or hearing persons. Items on the subscales can be seen in Tables 1 to 4.

Table 1 Teachers' reports of Communication Abilities (by percentage) ($N = 151$)

Subscale item	Disagree	Neither agree nor disagree	Agree
The child is able to use the telephone	35.4	14.2	50.5
The child is able to easily detect even very quiet sounds (e.g., a whisper)	37.4	11.6	51.0
The child is able to understand speech without needing to rely on lipreading	42.1	11.0	46.9
The child's speech is intelligible to teachers and school friends	18.3	7.7	73.9
The child's speech is intelligible even to people who are unfamiliar with him/her	27.8	10.4	61.8
The child is able to follow a spoken conversation with a group of people	47.6	14.7	37.8
The child does not need to look at the speaker's face	60.5	10.2	29.2
The child does not need to use sign language at all	30.1	11.8	58.1
The child can communicate easily with his/her family	18.3	11.3	70.4
I am able to communicate as easily with this deaf child as I do with a hearing child	57.5	8.9	30.6
The child is able to express his/her wants, needs and feelings	20.5	8.9	70.5

Zaidman-Zait and Most (2005) reported Cronbach alpha coefficients for internal consistency for the subscales as follows: .86 for Communication abilities, .76 for Social Skills, .63 for Academic Achievement, and .72 for Future life. For the current study, alpha coefficients were .89 for Communication Abilities, .90 for Social Skills and Participation, .86 for Academic Achievements, and .74 for Future Life.

Respondents were asked to rate their level of agreement with each item on a 5-point scale with responses *strongly disagree*, *disagree*, *neither agree nor disagree*, *agree*, and *strongly agree*.

Levels of participation. The third section of the survey examined the level of participation of children in their school and classroom activities, based on a system devised by Mirenda (1998) for use with students with

communication disorders, with slight modifications to reflect the educational supports used by deaf and hard-of-hearing students. This model has been used effectively before in Australian studies of teachers' perspectives of deaf and hard-of-hearing students (Hyde & Power, 2003, 2004; Power & Hyde, 2002, 2003). The framework covers four aspects of participation in regular classrooms and provides an explanation of each level for respondents. The first aspect, Integration, is physical presence in the regular classroom, with three levels being *full*, *selective*, or *none*. Second, Academic Participation is rated at four levels: *competitive*, where academic standards are similar to and are evaluated in the same way, as those of other students in the regular school, *active*, *involved*, and *none* (where no academic standards are expected and no evaluation is undertaken). The third question

Table 2 Teachers' reports of Social Skills and Participation (by percentage) ($N = 151$)

Subscale item	Disagree	Neither agree nor disagree	Agree
The child easily makes friends with hearing children	34.0	17.7	48.2
The child actively participates in play and games with other children	20.9	15.1	64.0
The child is accepted by his/her classroom hearing peers	10.1	12.3	77.5
The child also socializes with deaf peers	24.0	18.4	57.6
The child's social skills are appropriate for his/her age	34.5	12.4	53.1
The child is able to initiate social interaction and play	21.4	13.8	64.8
The child's behavior is appropriate for his/her age	27.9	10.9	61.2

Table 3 Teachers' reports of Academic Achievements (by percentage) ($N = 151$)

Subscale item	Disagree	Neither agree nor disagree	Agree
The child is able to participate easily in a regular class	53.7	9.0	37.3
The child's academic progress has improved tremendously	52.3	6.8	41.0
The child has achieved high standards in reading and writing	58.1	14.5	27.4
The child has achieved high standards in mathematics	53.2	18.5	28.2
The child has achieved at least the expected level for his/her age	52.5	8.6	38.8

assesses Independence at three levels: *complete*—the student is able to participate without assistance; *independent with support*—the student is independent once set up with considerations of position, amplification, and the acoustic conditions; and *assisted*—the student is able to be involved in an activity with structured support in communication, such as a communication aide, interpreter, or co-teacher. The fourth question assesses Social Participation at four levels: *competitive*, when children are actively involved in the social dynamics of the group and exert influence within the group; *active*, when students are actively involved but do not exert influence on the group; *involved*, when students are more passive and limited in their participation in group activities; and *none*.

The survey was pilot tested with teachers of the deaf and reviewed by other major stakeholders during ethics approval protocols.

The quantitative findings reported here are descriptive. An extensive analysis using multiple regression was conducted to investigate factors predictive of the children's outcomes according to teacher report. The findings from that analysis will be reported elsewhere.

Procedure. Approval for the project was gained from the Human Research Ethics Committees of the uni-

versities involved in the study and of Departments of Education and early intervention centers in Queensland, New South Wales, and Victoria. In each state, Education Department personnel disseminated information about the study and invitations to participate to the relevant school principals, itinerant support teachers of the deaf, and teachers of the deaf based in special educational settings. Private schools and early intervention centers were also recruited to pass surveys and information on to the appropriate teachers. Responding schools and teachers were sent questionnaires along with information letters, consent forms, and reply-paid envelopes addressed to the researchers. Teachers were informed of the option of completing and submitting the survey online. All data were collected in 2008.

Interviews. We aimed to conduct follow-up interviews with approximately 10% of the teachers who returned surveys. Almost 78% of the survey respondents agreed to be contacted for an interview, and so we needed to make a selection of teachers to contact and invite to be interviewed. We sought to include a range of teachers in terms of educational setting and the educational level of the child, so that there would be structured representation across the range of children with cochlear implants.

Table 4 Teachers' reports of Future Life (by percentage) ($N = 151$)

Subscale item	Disagree	Neither agree nor disagree	Agree
The child functions like a child with normal hearing	56.8	12.3	30.8
The child is as independent as other children his/her age	39.6	12.5	47.9
The child has developed an identity as a hearing person	33.3	23.9	42.7
The child has developed an identity as a deaf person	38.0	32.1	29.9
The child comfortably shares both deaf and hearing identities	30.4	32.6	37.0
The child has a positive attitude toward the use of the cochlear implant	5.6	4.9	89.5
The child has a positive attitude toward the use of sign language	22.7	23.6	52.7

Fifteen teachers were interviewed. Six were from New South Wales, five were from Queensland, and four were from Victoria. Seven of the teachers worked as itinerant teachers of the deaf, five were based in support classes or deaf facilities within regular schools, and three were early childhood teachers/early intervention specialists. Nine teachers reported on primary school children, three on high school students, and three on students in early childhood settings.

The interviews incorporated an initial list of questions serving as a guideline only, allowing unanticipated information to emerge. The use of a semi-structured interview schedule does not pre-empt the open-ended nature of the qualitative interview, as within each question the opportunity for unstructured responses remains. Rather, the schedule ensures that previously identified areas of interest will be explored even if they do not emerge spontaneously during the course of the interview (McCracken, 1988). The interview questions fell into two categories: first, questions that related to the specific child about whom the teacher had completed the survey, and second, questions relating more generally to the teacher's experience of working with children with cochlear implants. Teachers were asked about their experiences of the outcomes of cochlear implantation in terms of the child's development in language and communication, educational achievement, social participation, and identity. More specific questions enquired about the child's functioning in classrooms situations, including group learning tasks. In addition, teachers were asked "What do you believe are the major challenges that remain for children with cochlear implants in educational programs?"

Interviews were conducted over the telephone and ranged from 30 to 45 minutes. All were audiotaped, with the teachers' prior consent, and transcribed in full for analysis. The interview data were analyzed according to the constant comparative method (Glaser & Strauss, 1967; Lincoln & Guba, 1985). Analysis involved the coding of data in order to generate categories, with the constant comparison of units of data in order to discover similarities, differences, patterns, and consistencies of meaning that identified themes. The interview data analysis was facilitated by the use of the NVivo 8 computer software.

Quantitative Results

Characteristics of the children. The majority of the children on whom the teachers reported were girls (55.6%). The mean age of the children was 10.37 years, with a range of 1.33–18.67 years. The mean age of the children's cochlear implant surgery was 4.11 years, with a range of 0.67–16.58 years. The majority of children (56.2%) had been implanted before the age of 3 years.

Teachers reported that 92.1% of the children's families were normally hearing, 4.6% were deaf or hard of hearing communicating orally, and 2.6% were Deaf. Teachers also reported that 7.9% of families were from non-English-speaking backgrounds and 5.3% were indigenous Australian.

The largest group of teachers and children was in New South Wales (40.4%), with a further 35.1% in Victoria and 24.5% in Queensland. The children on whom the teachers were reporting were attending early childhood settings, primary school, or high school. Some of the children (10.4%) were younger than school age and were reported to be attending daycare, kindergarten, or "at home"; a further 9.7% attended preschool, 45.1% were in school years 1–6, and 34.7% in Years 7–12. (These year levels correspond, in New South Wales and Victoria, to primary and secondary/high school, but in Queensland, secondary schooling currently begins in Year 8).

The large majority of children on whom the teachers reported in the survey used their cochlear implants all the time (95.4%) or most of the time (1.3%) while at school, early intervention center, or kindergarten. Five teachers (3.3%) reported that the children on whom they were reporting used their cochlear implant for none of the time at school. Many of the children used a hearing aid in the nonimplanted ear: 33.1% used a hearing aid all the time at school and 10.5% used a hearing aid for some of the time at school; 14.6% of the children had a sequential bilateral implant.

Over one quarter (27.2%) of the children had additional difficulties or disabilities. The teachers specified a wide range of disabilities or difficulties, including intellectual disability, cerebral palsy, learning difficulties, language delays, and wearing reading glasses.

Educational settings. The majority (52%) of the children attended mainstream settings in which they spent most or all of their time in the regular classroom, usually receiving itinerant teacher of the deaf or co-teacher support. A further 44.7% attended specialized settings including early intervention centers for deaf children (6.7%) and “units” or “facilities” in regular schools (32.1%) or special schools (5.9%). Teachers indicated that 3.3% of children were in “other” settings, usually described as being daycare or at home.

Teachers reported on any learning support provided in addition to themselves or the child’s regular teachers. Over half (51%) of the children received additional learning support, the majority from teachers’ aides, with a small number of children receiving note-taking support or speech therapy at school.

Teachers were asked to what extent, in their opinion, the child’s educational setting and support met the child’s current needs. The majority indicated that the child’s needs were relatively well met: 55.0% indicated that the child’s needs were met *a great deal*, 25.5% *quite a lot*, 12.1% *a fair amount*, 6.7% *a small amount*, and 0.7% *very little*.

Teachers reported that academic performance fell below the median of their class for 69.2% of the children and above the class median for 30.8% of the children.

Communication approach. Teachers reported the communication approach or program used with the children in their educational settings. The majority of the children (58.3%) received an auditory–oral approach, 13.9% received an Auditory–Verbal approach, and a sizeable proportion received an approach involving sign: Simultaneous Communication for 19.2% and bilingual (Auslan/English) for 9.3%. Most of the 7.9% of respondents who chose the option *other* reported varying combinations, such as “Auslan in English word order,” and “spoken English supported by Auslan.” (percentages add up to more than 100 as a small number of respondents chose more than one response.)

In all, 20.5% of the children received interpreter support. Most of this interpreting was for Auslan, or both Auslan and Signed English, and three children were reported to have oral interpreters. The number of hours of interpreting per week ranged from 1.5 to

all contact hours at school, with over half of these children receiving more than 15 hr per week.

Teachers’ experiences of children’s outcomes. Tables 1–4 report the percentages of responses to items about teachers’ perceptions of the children’s outcomes across the four domains, Communication Abilities, Social Skills and Participation, Academic Achievement, and Future Life. The *agree* and *strongly agree* responses have been summed to indicate agreement and *disagree* and *strongly disagree* responses summed to indicate disagreement.

Overall, teachers perceived the children to be doing quite well but lagging behind hearing peers in some areas. Responses to the items detailing oral communication abilities in everyday situations indicated that teachers considered the majority of the children to be functioning well in many situations, such as communicating with their families and producing intelligible speech, and just over 50% were able to use the telephone and to detect sounds as quiet as a whisper. However, less than 40% reported that the child was able to follow a spoken conversation within a group. Socially, 77.5% of the children were reported to be accepted by their hearing peers, and 48.2% were reported to easily make friends with hearing children. Just over half of the children were considered to be at their age level for social skills. In the area of academic achievement, only 37.3% of the children were reported to participate easily in a regular class (even though 52% of the children were spending all or most of their time in regular classrooms). The teachers reported that 38.8% of the children were achieving at the expected level for their age. Almost a third of the children were considered to function like a child with normal hearing but slightly less than half were reported to be as independent as other children their age.

Participation in school life. Teachers reported their perceptions of the child’s participation as described in the four categories in Mirenda’s (1998) framework. As Table 5 shows, teachers indicated a high level of integration, with 41.5% of the children present in an age-appropriate classroom for the entire school day, 43% for some of the day but also receiving educational

Table 5 Teachers' reports of levels of Participation (by percentage) ($N = 151$)

Integration	Full 41.5	Selective 43.0	None 15.5	
Independence	Complete 15.4	With support 42.7	Assisted 42.0	
Participation	Competitive	Active	Involved	None
Academic	54.2	25.4	16.2	4.2
Social	30.5	29.1	36.2	4.3

services in other settings, and 15.5% not in a regular classroom. (As well as students in special schools or full time in special education units, this 15.5% would include those very young children attending early intervention centers for deaf children.)

Few of the children were reported to have *complete* independence, that is, participating without assistance; however, over 40% were deemed independent *with support*, once considerations of position, amplification, and acoustic conditions were in place, and a slightly smaller percentage were *assisted*, that is, able to participate with structured communication support such as a communication aide, notetaker, interpreter, or co-teacher.

Just over half of the children were reported to be *competitive* academically with their peers in that no allowances needed to be made for them as far as curriculum and assessment were concerned. A quarter was *active* (following the regular curriculum but with possible reductions and modifications to their workload) and a further 16.2% were *involved* with the regular curriculum but with minimal academic standards. Approximately 4% were said to have no academic participation.

The level of reported social participation of the children was somewhat lower than the level of academic participation, with less than a third of children at the *competitive* level and the *active* level, respectively, and slightly more than another third reported as *involved* only, that is, more passive and limited in the group. About 4% were reported to have no involvement in social activities or interactions with regular peers.

Qualitative Results

In the interviews, teachers talked about a variety of outcomes among implanted children with whom they

worked. Based on their experiences with and observations of students with cochlear implants, most teachers expected children to have good speech and to function quite well in the regular school environment provided they had been implanted early, received good language acquisition opportunities from parents, early intervention, and ongoing educational settings and had no additional disabilities. Teachers spoke positively about their experiences of children's outcomes in general, as in this statement:

Access to sound and therefore language, and if those children have all those auditory pathways that work right from the start, they just become wonderful listeners, and every aspect of their life is just so much easier for them. Having been a teacher of the deaf back in the late 1970s, to actually hear was so difficult for so many of these children, and to see children that are profoundly deaf, who really struggled hearing anything, and then seeing the implant, and seeing the way the child develops as a result of the implant is just awesome.

However, there were several particular areas of concern for the teachers. These included ongoing support for the children in school, assumptions made by regular teachers and school authorities about children with cochlear implants, children's and adolescents' social issues, and educators' ongoing communication with, and support from, implant programs. Many of the teachers saw social issues as the biggest challenge remaining for children and their educators. Because this area of social outcomes was such a major part of the interview data, it will be more extensively reported in a separate paper.

Concerns about levels of support for students. A major theme in the interview data, and cited as a major challenge by many of the interviewees, was a lack of understanding on the part of school authorities in general and regular class teachers in particular that children with cochlear implants were still children with a hearing loss and needed ongoing supports as such. As this support teacher said, in response to the question about the biggest challenge remaining in the education of children with implants:

Realistic expectations that they are still a deaf child with an expensive hearing aid, rather than they are now a hearing child; that seems to be the biggest thing within the school, that expectation.

Several teachers spoke about funding issues, in the context of the need for more support for the child through specialist teacher, teacher aide or interpreter hours, or the lack of funding for regular class teachers to receive professional development and training. In describing the struggle for adequate funding for a student, this teacher said:

I suspect that people think that if they've got the implant, now they're a hearing child, there's no need for a lot of support. That seems to be the attitude that comes through. Ah, but they've got an implant, they're fine now! That it's the fix-all; they have no concept of how much it still isolates them and how little language comes through that for a very long time.

The teacher went on to explain this primary student's educational needs:

At the moment we have funding for 8 hours teacher's aide. Unfortunately we don't have a signing teacher's aide, we're in a small rural setting, and we just don't have that. And with the signs he steps up a mark, he does a lot better if he can get some signed input. But the rest of the time he is really struggling. We are pushing for extra funding so that he's covered pretty well full-time, but that's highly unlikely I know that his funding is one of the ones on the axe list They think he's getting too much money. And yet he is a child who does not cope in the classroom, he's not accessing the curriculum; he's not able to do any of that without very directed instruction.

Teachers reported positive instances of regular class teachers' support for and understanding of children with cochlear implants, as this example indicates:

Some teachers just have a real insight, and they're very interested and they immediately understand and are perceptive of what the needs of the child are. They'll immediately be sensitized to the fact that, you know, you have to reduce the noise, you

have to make the other children aware of the child's needs.

However, the teachers interviewed felt that it was difficult for many teachers without specialist deaf education training to understand that, even though implanted children's speech might be extremely good, they were likely to have language delays and difficulty accessing spoken language in many situations. As this teacher explained:

She speaks very, very well, she's speaking as well as a child with a mild to moderate hearing loss. But she ... has a lot more difficulty understanding language than a child who has a mild to moderate hearing loss. And that's what the teachers don't understand. They equate quality of speech and being able to detect sound with "okay, you're the same as somebody else."

Both teachers based in support units in regular schools and itinerant teachers supporting students in regular classes described their efforts to inform and educate regular class teachers; in the words of one teacher, "other than that there's really no support available for staff development. There's no time and there's no funding."

Some teachers spoke particularly of the needs of implanted children who did not do well with their implants:

Not all of these children are going to be stars, they're not all going to come to full language, they're all not going to integrate fully, you know. Where are the support systems for those kids that have other difficulties or, you know, his language doesn't progress because there is a neuropathy element, and all that kind of stuff?

Group situations. Teachers described children's communication difficulties in groups of peers, in both classroom and play situations. Of a 12-year-old boy who had been implanted at the age of 6 years, this teacher said:

He's reluctant to speak up because if he hasn't heard it properly, I think he's frightened of getting laughed at or, you know, teased, and often he

doesn't hear well in a group situation because there is some noise and he has trouble tracking where the conversation is coming from And he won't ask for help because he doesn't like people to think he can't do it.

An itinerant teacher reporting on a girl aged 8 years, implanted at the age of 12 months, explained:

She doesn't follow the group discussions that well. She relies a lot on lipreading. And because of the problems with the directional hearing, she has that delay in processing it, so by the time someone's asked her something and she's picked it up, she's processing it, and there's that little bit of delay before she can contribute. In a play setting or sports, in group settings, she fits in okay; there isn't a problem with that, although you always feel that she's following rather than actually on the same speed as everybody else

These descriptions elucidate the quantitative findings indicating that two thirds of the children were not *competitive* in social participation but rather were involved but not exerting influence within the group or were passive and limited in group activities.

Contact between schools and cochlear implant clinics or early intervention centers. In some cases, teachers reported that regular and valuable contact between themselves or their schools and cochlear implant clinics or early intervention centers occurred, in the form of meetings with or visits to the school by therapists from the centers involved in the children's implantation and therapy. However for many, particularly when the schools were not in major cities, contact was more sporadic. Most teachers said that they could approach the centers by phone or e-mail and have helpful communication if there were problems; however, several teachers expressed a wish for more support in keeping up-to-date with implant technology, as this teacher explained:

Trouble-shooting cochlear implants, we did a bit of that, with [the early intervention center], but I would love to do more of that because when something goes wrong, it might just be something simple and it doesn't have to be sent away.

It seemed that parents (usually mothers) were often the link between the implant center or early intervention center and the school:

[Communication between the cochlear implant center and the school] is usually through the mum, and you know, I talk to mum a lot about what's going on, and she keeps me informed, like for instance with this, the new implant, I said to mum, do you want to talk to the staff and tell them what's going on or do you want me to go to a staff meeting and say what's happening? And she said, you can do it, I'd be happy with that. But mum has come to the school, when we tried an FM, which didn't work, mum came to the school and she talked to the staff about the FM.

Teachers outside of major urban centers talked of the ways in which living in a rural or regional location placed difficulties on schools and stresses on parents and made it more difficult for children to achieve optimal outcomes with their cochlear implants. When parents needed to make long trips to the city for appointments with implant clinics, it was tiring for both parents and child, expensive for parents, and often meant the child missing several days of school.

And just that isolation—I know it's the same whether you're in western Queensland or rural New South Wales or rural Victoria, and I think those are really big issues that need to be addressed. You know, if you're really remote you probably think, well it's not much use being able to sign, so a cochlear implant's probably the way to go, but you're so remote when the thing breaks down, or you're having to get all the mapping or you're having to get that support.

Many of the teachers emphasized the demands on families and teachers of managing and maintaining the cochlear implant equipment, which could be complex, especially in conjunction with FM systems, as this teacher explained:

And you're dealing with [name of audiology provider] for the FM, and [name of early intervention center] or whoever for the implant, for the speech processor and that sort of thing, and that's another

difficult thing too is when you're not sure if the problem is the implant or the FM, and you're trying to negotiate with everybody to try and work out which FM you want, or what's actually happening And I think that's difficult for parents as well, that you're not just dealing with one place that can give you all your gear.

Issues in secondary schooling. Several of the teachers spoke about particular difficulties for children in secondary schooling. They described issues in learning, social, and identity areas and it was clear that these areas were often intertwined. Adolescents were reluctant to be singled out or appear "different" from other students. In an open-ended response on the questionnaire, this teacher wrote:

FM usage with CI's is an important issue in high schools. Students with a CI who have used an FM in primary school are often very reluctant to use them in high school—resulting in a less than adequate auditory input in regular classes.

Another teacher mentioned difficulties with the increasing complexity of language used in the high school curriculum, along with issues of identity:

They get up to secondary level where the language gets more complex, etcetera, they can have issues. And by the time of high school, identity can become an issue. They're not just hearing children with a cochlear implant in, you know, some of them want to acknowledge the deaf side of their being and some of them want to relate to other deaf children, and then they might want to start looking at sign language, just to try and identify with some of those kids. The one little girl I first supported, she's now in high school and she's learning Auslan because she wants to be in the Deaf sports and mix with some of those other children and so forth. So, both the hearing world and the deaf world.

Some teachers worked with students who were implanted during their high school years and felt that these adolescents had particular needs that were not always met. This teacher perceived a lack of ongoing

support and follow-up after implantation for these students:

If they're implanted quite early they have the follow-up that we don't get in the secondary school ... because if they're implanted early enough they're going to, hopefully, acquire language pretty much on a par with hearing children, if the work's put in, and at an early intervention centre the parents would have instruction. Well, these parents of the secondary kids, they haven't had any instruction, or any assistance.

Discussion

The children in this study were a heterogeneous group in terms of age, age at implantation, location, and presence or absence of additional disabilities, and they attended a variety of educational settings and received a range of educational supports. However, slightly over half of them were educated in regular, age-appropriate classrooms for most or all the time and received support from itinerant teachers of the deaf. As well, just over 50% received additional learning support, usually from teachers' aides. Almost 30% were using signed communication in their educational setting, and approximately a fifth were receiving interpreter support, the majority in Auslan. Thus, a proportion of these implanted children continue to rely on signed communication to access their education and social development opportunities in schools. How this support may be best delivered is not clear from our data, but important questions are raised. For example, to what extent does the practice in some Australian states of providing Auslan or signed English "interpreters" in primary school classrooms provide appropriate communicative and curricular access and to what extent, if any, is it able to be considered to be a bilingual environment?

Most teachers thought that the child's setting met his or her needs. Approximately 42% of the children were reported to have "full" integration and be present in the regular classroom for the entire school day; however, only 37% of teachers reported that the children were able to participate easily in a regular class. In levels of independence, the largest proportion (43%) of the children were reported as independent once set up with considerations of position,

amplification, and acoustic conditions, suggesting that these students were functioning in regular classrooms when these basic accommodations were in place. Almost 40% were reported as needing structured support in communication, such as a communication aide, interpreter, or co-teacher, in order to be involved in activities. Over 15% were considered to be completely independent, suggesting that their teachers considered that these students needed no specific accommodations in the classroom.

In terms of communication abilities, teachers rated the children quite highly in some areas, with, for example, almost 74% having speech intelligible to teachers and friends and 62% having speech intelligible to unfamiliar people. However, slightly less than 38% agreed that the child could follow a spoken conversation with a group of people, and this was reflected in the qualitative findings, where most of the teachers interviewed described children's difficulties in group situations. This has important implications both for teaching situations and for social interaction and participation and reflects the issues reported in the literature for deaf and hard-of-hearing students in teaching and social environments (Antia, Sabers, & Stinson, 2007; Caissie & Wilson, 1995), as well as for children with cochlear implants (Preisler, Tvingstedt, & Ahlstrom, 2005).

On average, the students' academic performance was reported to be below that of their hearing peers. Almost 70% of the children fell below the class median in academic performance. Teachers also reported that approximately 39% were achieving at or above the expected level for their age, 27% were achieving high standards in reading and writing, and 28% were achieving high standards in mathematics. In terms of academic participation according to the Mirenda framework, 54% of students were considered to be *competitive*. This compares unfavorably with the two thirds of students considered to be at the competitive level in the study of Power and Hyde (2003) of students supported by itinerant teachers of the deaf in four Australian states.

In their ratings of children's social participation according to the Mirenda (1998) categories, teachers indicated that a little under one third each rated *competitive* and *active* and a little more than one third

rated *involved*. This closely reflects the findings of Power and Hyde (2003) about the social participation of deaf and hard-of-hearing students in regular classes. It is interesting that the children with cochlear implants in the present study, spread across a range of educational settings with varying levels of integration in regular classes, had levels of social participation very similar to the earlier sample of students in regular classes supported by itinerant teachers.

In their responses to the items on the Social Skills and Participation subscale, teachers reported that nearly half of the children easily made friends with hearing children and that approximately 78% were accepted by their hearing classroom peers. In addition, almost 58% of the children also socialized with deaf peers. However, it is concerning that a third of the children did not easily make friends with hearing children and did not have age-appropriate social skills and that a tenth were not accepted by their hearing peers. These findings, along with those from the qualitative data, indicate less than optimal social outcomes and suggest that even children with good outcomes in spoken language development and communication experience the phenomenon of "social deafness."

Although the teachers interviewed were frequently positive about the outcomes and educational experiences of students with cochlear implants, they identified a number of problems and challenges about which they expressed their concerns strongly and clearly. One such concern was that some students were at risk of missing out on learning in certain environments such as group discussion activities and that students could be reluctant to admit to difficulty and seek help in those situations. This can be a challenge for educators, particularly in secondary schooling, as children who have done well in primary school may need more specialist support in high school to access a more challenging curriculum (Archbold et al., 2002). However, this is often the very time, during their adolescence, that deaf young people do not want to be seen as different and may resist what they see as the stigma of being singled out for assistance by itinerant teachers or other support services. Certainly, in our qualitative findings teachers reported high school students' reluctance to use FM systems and other supports in school.

For the independence item on the Future Life subscale, almost half of the children were reported to be as independent as others their age. Nearly 90% of the children had a positive attitude toward their cochlear implant, and a little over half had a positive attitude toward the use of sign language. In terms of identity, teachers reported that approximately 43% of the children had developed an identity as a hearing person, 30% as a deaf person, and 37% comfortably shared deaf and hearing identities. Although these (obviously overlapping) figures represent teachers' opinions, they are consistent with findings of implanted adolescents' self-reported sense of identity, where young people indicated positive feelings toward their implants and a flexible attitude toward cultural identity (Wheeler et al., 2007), and 40% of implanted adolescents indicated a bicultural identity (Leigh et al., 2009). The qualitative findings in the current study indicated a perception by teachers of a move toward more of a deaf or a bicultural identity by some students during their adolescence.

It appeared from the qualitative findings that some regular class teachers did not have a good understanding of the communication and academic needs of children with cochlear implants, assuming that the implant "fixed" the deafness and, particularly when children have high levels of spoken language and clear speech, not understanding that their ability to hear in imperfect listening environments was likely to be compromised. This was consistent with studies that have reported a lack of understanding on the part of general class teachers and students of the extent of communication difficulty experienced by students with hearing loss in general classes (Antia et al., 2009; Zheng et al., 2001). The perception by the teachers in the current study that regular class teachers needed training about the needs of students with implants, in tandem with teachers' perceptions of underfunding of needed educational supports for the students, makes a strong case for funding for staff professional development and training and appropriate learning support for children with cochlear implants to be a priority if these children are to achieve their educational potential. Other studies have also pointed to the need for adequate ongoing professional development and training in the area of cochlear implants for teachers of the deaf

and regular class teachers (Archbold & O'Donoghue, 2007; Ben-Itzhak, Most, & Weisel, 2005).

Some of the teachers interviewed in this article reported a lack of liaison with cochlear implant clinics and of professional development about cochlear implants for themselves as well as for regular class teachers and wished for more. Teachers pointed out the complexity of the technology involved, especially when cochlear implants are used with FM systems and hearing aids, and the challenges presented for teachers and parents attempting to identify and rectify problems in the equipment. Clearly, the maintenance of the device equipment necessitates strong communication links among teachers, parents, and implant professionals, and researchers have pointed out the importance of close liaison between implant centers and local educational services in order to ensure the best management and continuing use of the cochlear implant technology (Archbold & O'Donoghue, 2007; Archbold, Sach, O'Neill, Lutman, & Gregory, 2008). As Archbold and her colleagues pointed out in relation to the U.K. context, these links are especially important at times of changes to individual children's technology and device problems, as well as changes of the child's school or class teacher (Archbold, Lutman, Gregory, O'Neill, & Nikolopoulos, 2002). Another major benefit may be realized through better liaison with schools as implant programs and intervention centers receive feedback from class teachers about the kinds of issues and concerns identified in this article.

Teachers spoke of the difficulties for schools and families in regional and remote areas and seemed particularly aware of the additional demands and stresses on families in these areas. These findings reflect those from our surveys and interviews with parent, which strongly show the difficulties regional and rural families experienced. Although agencies such as implant clinics, audiology services, and early intervention centers make ongoing efforts to improve prompt access to ongoing services for families in regional and remote parts of Australia, it is clearly essential that these efforts are continued and expanded.

The study did not include a comparison group of profoundly deaf students who do not use cochlear implants. The logistics of identifying such a group in the present context of very high rates of

implantation of severely and profoundly deaf children would be considerable. However, it was clear from the interview findings that teachers believed that cochlear implants provided many children with better outcomes in spoken language communication and academic and social outcomes than were likely for profoundly deaf children without implants. It was also clear from the qualitative findings that teachers were concerned that the needs of some students with cochlear implants were not being adequately met in mainstream settings. Overall, it is apparent from the study's findings that, from the perspective of their functional communication, children with cochlear implants need to be supported by teachers and school authorities as if they were hard of hearing; that is, the children are likely to need supports similar to those provided to children with moderate or severe levels of hearing loss. Even when their spoken language proficiency is high, children with implants are likely to have listening difficulties in particular contexts and will not have full access to the curriculum or to social inclusion. The teachers' reports reflected limitations in relation to core elements of academic development, particularly the acquisition of literacy, and delays or problems in aspects of social development and participation. These two elements alone perhaps constitute the major challenge for teachers, schools, education authorities, and parents.

A possible limitation in this study is that the data derive from teacher opinion rather than scores on validated measures directly testing the children's outcomes. However, a major purpose of the study was to increase knowledge of children's functioning in everyday situations in real-world environments, particularly in schools. Teachers are in an ideal position to be able to interpret the child's performance in comparison with other children in their class and in the broader context of national achievement data currently available in all schools. Nevertheless, student outcomes need to be carefully monitored in both national and school-based achievement testing and it would seem appropriate for national tracking studies for deaf children to be established in Australia as they have been in some other countries (Hendar, 2009; Thoutenhoofd, 2006).

The children in the study varied in age, time since implantation, and age at implantation, with a mean implantation age of 4.11 years and a majority implanted before 3 years of age. Clearly, the age at which implantation surgery is commonly performed has fallen and continues to fall (Dettman, Pinder, Briggs, Dowell, & Leigh, 2007; Holt & Svirsky, 2008), and it could be suggested that the most recent implantees may have a better prognosis in terms of their spoken language acquisition and subsequent school and social achievement outcomes. However, more long-term studies are necessary before this claim can be substantiated and, notwithstanding, children with cochlear implants will continue to be a heterogeneous group, with many factors other than age at implantation affecting their progress—for example, the presence of other disabilities (Nikolopoulos, Archbold, Wever, & Lloyd, 2008; Vernon & Rhodes, 2009) and varying levels of parental involvement (DesJardin & Eisenberg, 2007; Kirkham et al., 2009). Further, the group of students reported on in this study is significantly large and many will be in the school system for some years to come. Their reported levels of educational and social achievement and the concerns expressed by teachers in the qualitative data suggest the need for appropriate, ongoing support, and adjustment of their education programs. Further research should examine the role that signed communication support and sign language may have in reducing current difficulties and how itinerant teachers and class teachers may be better engaged before and after implantation.

In summary, this study reports data trends that are in concurrence with those reported by previous studies (e.g., Bat-Chava et al., 2005; Geers et al., 2008; Thoutenhoofd, 2006) indicating that children with cochlear implants continue to lag behind their hearing peers in academic and social domains. These ongoing concerns about the educational and social outcomes of childhood implantation should lead to a reconsideration of any assumptions held by teachers, families, educational authorities, and medical professionals. It is essential that the limitations, as well as the benefits, of cochlear implantation are understood if children with implants are to receive the support they need in order to reach their full potential personally, educationally, and socially.

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Conflict of Interest

No conflicts of interest were reported.

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