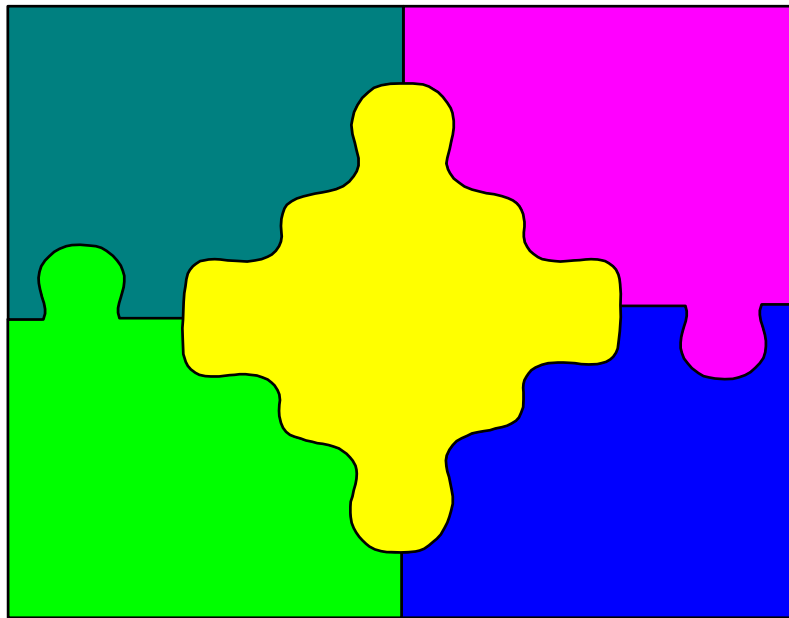


A research program of the
Child Development Lab

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Research Report to Parents on
Social and Emotional Functioning of Children
with Cochlear Implants

Social and Emotional Functioning of Children with Cochlear Implants

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ABSTRACT

Children with cochlear implants have demonstrated significant and steady gains in audition, speech and language areas in the years since cochlear implants have been available to children. Children with cochlear implants are hearing better than ever before and research has shown that their speech and language skills are steadily improving. However, the investigation of the social and emotional functioning of children with cochlear implants has only recently begun. We need to know how children with cochlear implants are doing in their social and emotional lives. Understanding more about how children with cochlear implants carry on with the work of growing up despite their hearing difficulties is crucial to helping children and parents through this process. Our study assessed social and emotional functioning of children ages 5 to 14 with have cochlear implants. Our research explored whether factors such as age at implantation and duration of use are associated with the development of social and emotional functioning.

CLINICAL APPLICATIONS

The social and emotional well-being of children who receive cochlear implants is of vital interest to cochlear implant teams, educators, mental health professionals, and parents of children with hearing loss. Identification of specific areas of social or emotional difficulty would enable interventions to address these difficulties in children who have cochlear implants and can facilitate the development of preventative intervention that would encourage healthy social and emotional development in children who are cochlear implant candidates. Furthermore, information about the actual social and emotional functioning of children with cochlear implants will allow us to understand the mechanism linking sensory experience with complex social and emotional functioning.

AIMS OF THE RESEARCH

The purpose of this study is to assess the impact of cochlear implants on social and emotional functioning during childhood.

REVIEW OF INFORMATION ON RESEARCH PROGRAM

The current study investigated the social and emotional functioning of cochlear implant recipients in childhood, ages 5 to 14. Children with cochlear implants were compared to an age-matched group of children with normal hearing. Assessments consisted of tasks of auditory-visual sensory perception and emotion identification and discrimination of facial and vocal stimuli. By self-report measure, the children responded to sample statements about their perceived self-competence in academic, athletic, and social domains, as well as behavioral conduct, physical appearance, and global self-worth. The children's perception of social support from parents, siblings, and peers was assessed. Language level and cognitive functioning were assessed for control purposes.

In total, 56 children who have cochlear implants participated in the study. In addition, 37 children with normal hearing, between the ages of 5 and 14 years took part in the study. Each child made a single visit to the Child Development Laboratory in the Department of Human Development or offsite. The laboratory visit took approximately 5 to 6 hours to complete. Each participant came to the laboratory with a parent. Each participant was assigned a unique numeric identifier that will be used throughout the data analyses. All data collected was and remains stored securely in the Child Development Laboratory, with access only made available to project staff. Prior to the laboratory assessment, informed consent was obtained from each child's accompanying parent.

REVIEW OF MAJOR FINDINGS OF THE RESEARCH PROJECT

1. Assessment of Auditory-Visual Sensory Perception

BACKGROUND The integration of auditory and visual information is a type of precursor to emotion understanding. Research on hearing infants has shown that they most easily understand emotional messages when their mother provides facial expression and vocal information to them. How the brain put together visual and auditory information during speech perception is not well understood, we just know that it happens in hearing children and adults. Therefore, we asked whether children with cochlear implants, who had a period when they did not receive auditory information, integrated auditory and visual components of speech.

To investigate this, we used a computer-based activity called the McGurk illusion. In this task, the computer provides the following situations: visual only (you watch the speaker's face move, but hear no sound), auditory only (you hear the speaker's voice but the screen is black), auditory-visual (you both hear the speaker's voice and see her face moving), and the McGurk situation (you see the speaker's face move to say "pa" but you hear her voice say "ka." This is called an illusion because when you ask people what they heard in this situation, they tell you that they heard "ta"!

RESULTS The children with cochlear implants, as a group, performed remarkably well in this test. Table 1 below shows the results for children with cochlear implants on the left bars and children with normal hearing on the right. Children with cochlear implants were able to accurately report the syllable “pa” or “ka” when only visual information was given 56% of the time, just more than children with normal hearing (55%). In the auditory situation, where they only heard the speaker’s voice, they had a more difficult time than children with normal hearing – but still were accurate 65% of the time. In the auditory-visual situation, children with cochlear implants were accurate 90% of the time!

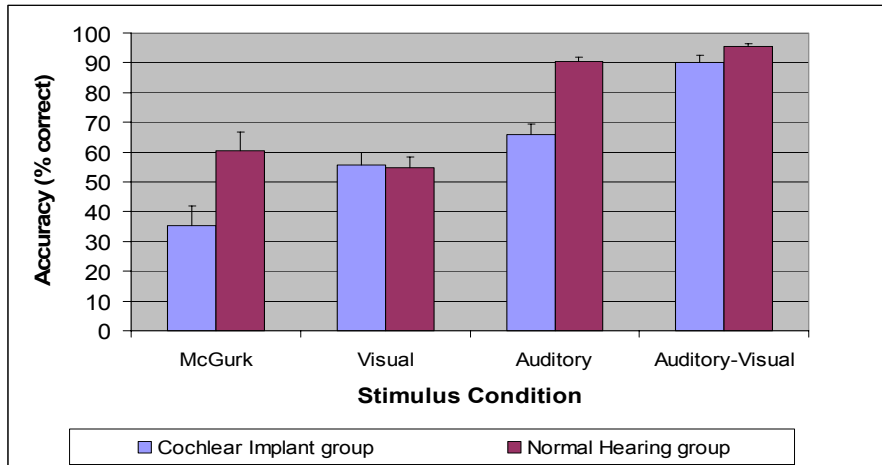
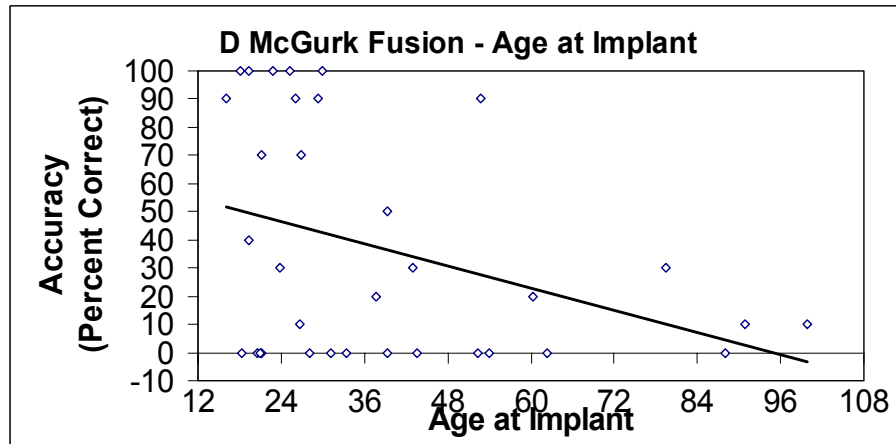


Table 1. Auditory-Visual Perception with McGurk Task

Now, when it came to the McGurk situation, children with cochlear implants had more difficulty than children with normal hearing (35% vs.60%). When we looked closely at these results, we found that there were quite a few children with cochlear implants who were able to integrate the different syllables and report hearing “ta.” These children all received their implant before they were 30 months old. The age at implant made no difference for any of the other situations. The scatterplot below shows you this result with age (in months) that the child had activation of CI at the bottom and percent correct for the McGurk situation on the left side.

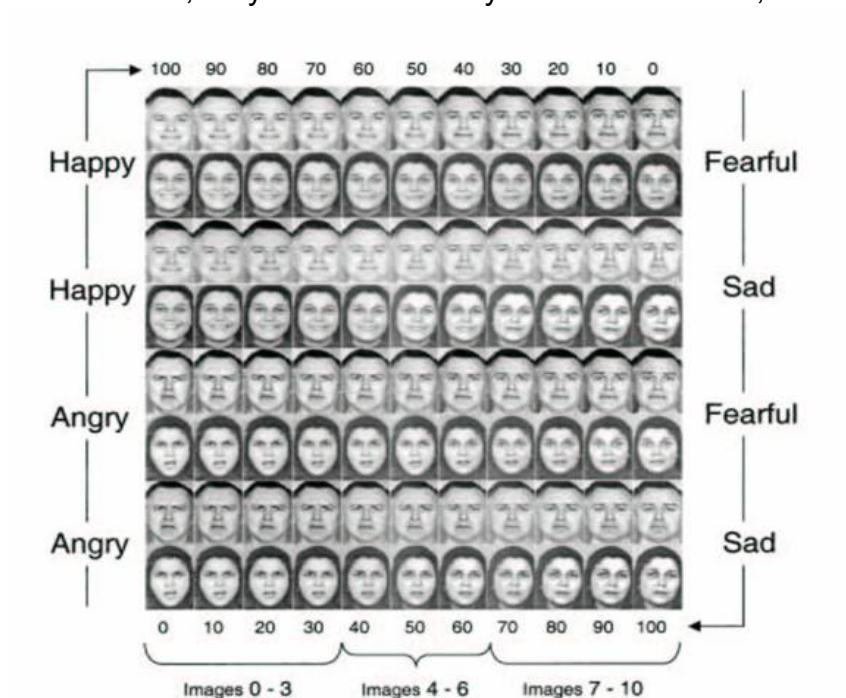


ANALYSIS We thought that this activity showed several important points: 1. Children with cochlear implants are hearing very well with their implants – they hear a syllable, with no sentence or context at all – correctly most of the time. 2. When children with cochlear implants get information on the speech sound from both visual and auditory inputs – they are accurate listeners 90% of the time. That is really amazing testimony to the cochlear implant’s efficacy and the children’s hard work. 3. Children who get implants before they are 2 ½ years old are able to integrate the different sounds that they hear. This raises the issue of the importance of early detection of hearing loss and early intervention with cochlear implants.

2. Assessment of Emotion Identification in Faces

BACKGROUND The ability to identify different facial expressions of emotion is a basic skill that is necessary for appropriate social interactions. Facial expressions give us so much information about what another person is feeling and that makes them really important. Research on hearing children has shown that children who are really good at understanding facial expressions of emotion tend to be more socially competent and successful with peers.

We gave the children a computer based activity that presented a face of either a man or woman in the center of the screen and the choice of two labels for the face. For example: happy and scared. There were four emotions that we looked at: happy, sad, scared, and angry. The children were asked to decide which feeling the person was expressing. These faces were created by taking 100% happy face and 100% scared face and using computer imaging software, morphing the pictures so that each face changed 10% in each picture (see below for the faces, they were created by Pollak and Kistler, used with permission).



RESULTS In the facial identification activity, the children with cochlear implants were incredibly accurate. They were very sure about when a face looked happy, sad, scared, or angry and sensed when the face changed to be the other emotion at the end of the spectrum. Their responses did not differ from those of children with normal hearing.

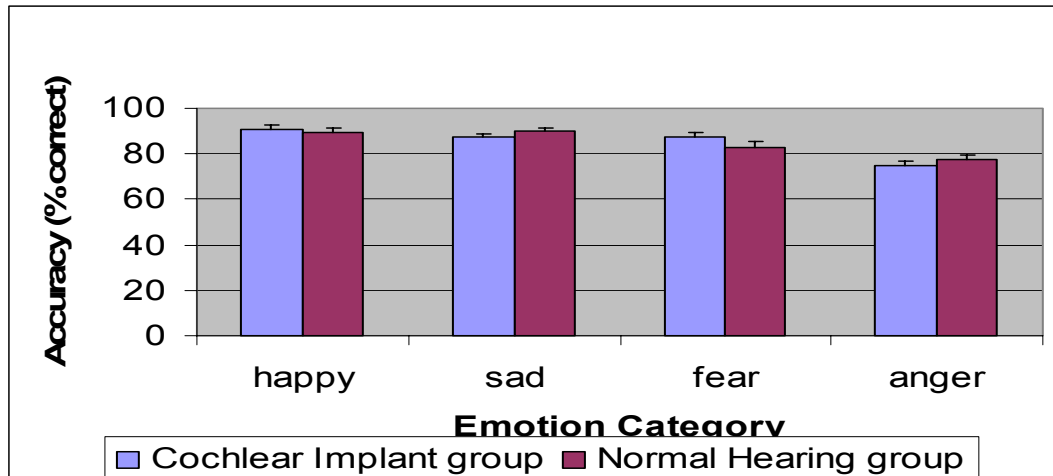


Table 2. Emotion Identification of Faces

In addition, we found that children with cochlear implants and with normal hearing were most accurate when it came to happy and sad faces and more difficulty with scared and angry faces. This was understandable since happy and sad are the earliest to develop and most distinct. It seemed as well, that for both children with cochlear implants and with normal hearing, girls had an edge over boys.

ANALYSIS This task demonstrated several important things: 1. When it comes to basic skills involved in understanding emotion, children with cochlear implants are no different than children with normal hearing. This is really important news. 2. Boys may need more repetition or attention focused on understanding emotions. When emotional situations arise, parents can make a point to talk to boys, and girls, about the situation, how the person might be feeling and why (example of conversation about emotions: “Oh, look at that little girl crying. Why do you think she is crying? Maybe she’s tired, maybe she fell down and got hurt, maybe she is angry. What makes you angry?...”)

3. Assessment of Vocal Emotion Identification

BACKGROUND Another important source for receiving emotional information is sounds. We wanted to know if children with cochlear implants could identify the emotional valence of sounds that they heard. The results of the task with faces told us that children with cochlear implants had no problem understanding emotions, but interpreting sounds requires making decisions on emotions with the weakest type of information for these children: auditory information. A set of

sounds were delivered using sound speakers in a quiet room at approximately 75 dB. The sounds included sounds expressive a positive emotion (like woohoo, ooh, giggle, mmm), sounds expressing no emotion or neutral emotion (hmm, ahh, umm mhm), and sounds expressing a negative emotion (oww, ugh, cry). The sound was played and the children were asked first to report what they heard. Then they were asked to identify whether the emotion is positive, negative, or neutral. Older children were able to just tell us the response and younger were given a smiley, frowning or plain face to point to.

RESULTS The children with cochlear implants were able to accurately identify the emotional category of the sounds that they heard well. They were not as accurate as children with normal hearing. But they were able to identify the emotion conveyed by the sounds that they heard between 57% (for negative sounds) and 73% (positive sounds) of the time. For both cochlear implant and normal hearing groups, girls were more accurate than boys and negative sounds were the most difficult, followed by neutral and then positive sounds. The children with cochlear implants had particular difficulty interpreting the cry sounds; they couldn't tell if they were positive or negative.

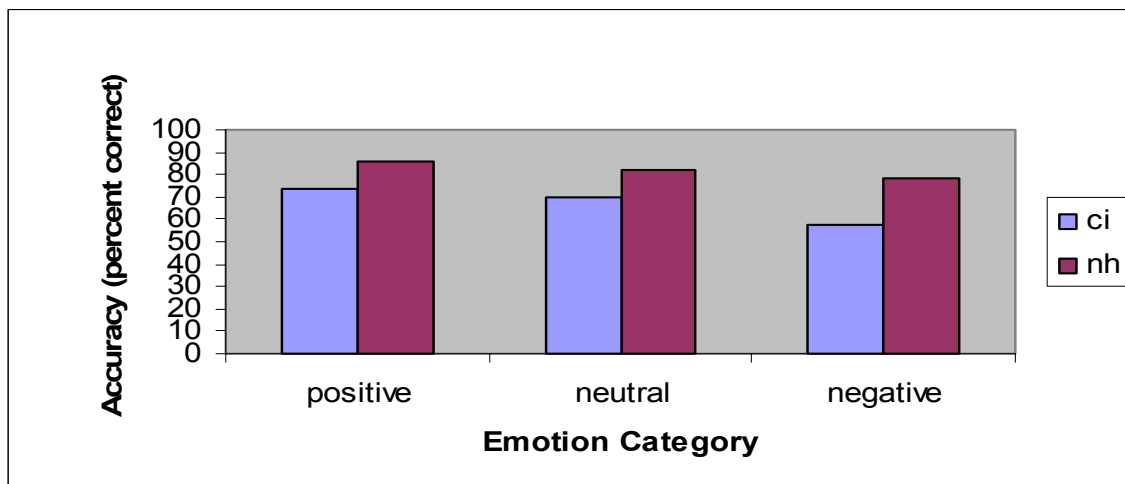


Table 3. Identification of Emotional Sounds

ANALYSIS This task raised some interesting points about understanding emotional sounds: 1. Considering the challenge in understanding sounds with a cochlear implant, the children were surprisingly successful in interpreting the emotion expressed by the sounds they heard. 2. They do have more difficulty than children with normal hearing in this task though, especially interpreting the cries. 3. It is not clear whether children with cochlear implants can get enough information about a situation from the context or speech to compensate for the difficulty in understanding emotional sounds. 4. It is worth investigating whether practice or training can improve this skill.

4. Assessment of Emotional Understanding

BACKGROUND There were three components of this task. The first looks to see whether children can name the six facial expressions of emotion in a photograph. The second asks children to choose which picture from a set of 6 best shows a particular emotion. The six emotions displayed were: happy, sad, fear, surprise, anger, and disgust. In the third, the children were asked decide how the person in the hypothetical situation would feel. They could report verbally which emotion or choose the facial expression represented in one of the photographs.



Sample of faces for Emotion Understanding task.

RESULTS In the first part of this task, the children needed to come up with a name for the emotion expressed by the girl in the picture. Here, the children with cochlear implants were able to give accurate labels for the pictures most of the time (between 4 and 5 pictures). The children with normal hearing were able to identify more pictures (at least 5 pictures). In the second part, where children were asked to choose a face to match an emotion label (example: “where does she look SAD?”), children with cochlear implants were as accurate as children with normal hearing. In the third part, the children read or heard a scenario (example: Rachel was dreaming about a monster in her nightmare) and were asked how Rachel would feel. In this case, children with cochlear implants were as accurate as children with normal hearing.

When we examined responses to the emotional scenarios for each emotion category individually, we saw that children with cochlear implants had more difficulty with the angry and disgust scenarios than the other emotions. We also found that in situations that were meant to evoke anger, children with cochlear implants were more likely to select “sadness” as the emotion felt by Rachel.

ANALYSIS This test showed several things: 1. when children with cochlear implants can respond without needing to name emotions independently, or put another way, where there are minimal expressive vocabulary demands, the

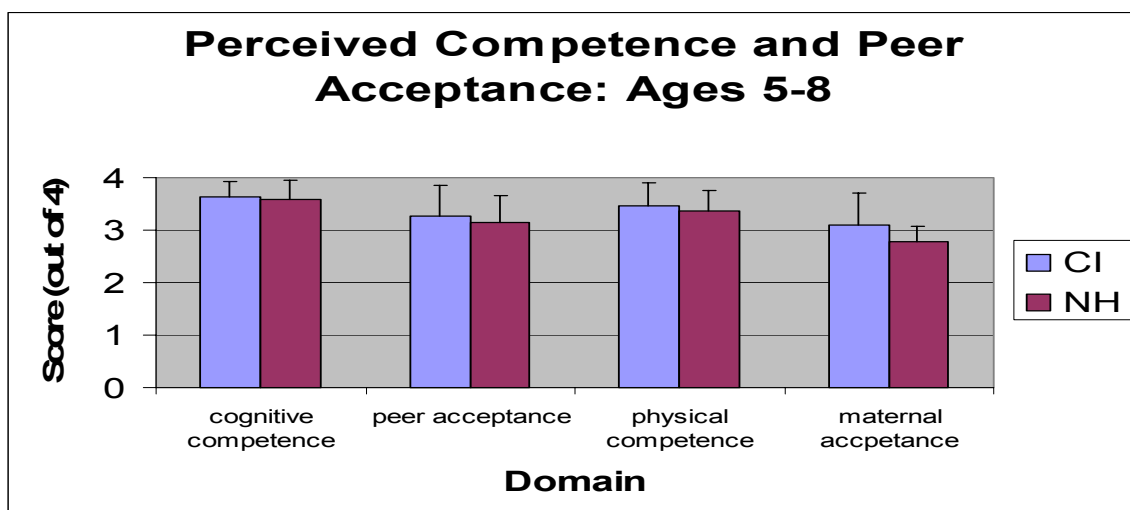
emotion understanding skills of children with cochlear implants are at the same level as children with normal hearing. 2. When children with cochlear implants needed to come up with their own name for an emotion, they had more difficulty. 3. Children with cochlear implants may benefit from extra discussion of negative emotions, like anger and disgust. This might include distinguishing between different negative emotions and specifically what situations make us feel angry.

5. Assessment of Perceived Self-Competence

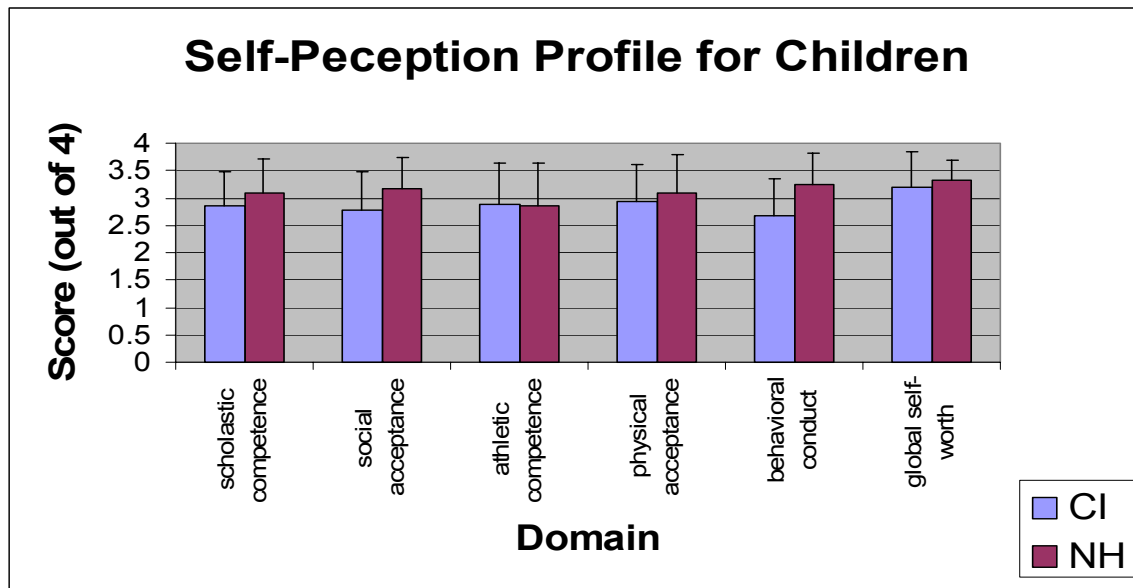
BACKGROUND This test of perceived self-competence or self-esteem, examines how children view themselves. Self-esteem is important because it affects so many other parts of a child’s life. Research has shown that a child’s sense of positive self-esteem is influential in positive behaviors, such as social competence and acceptance by peers and also in negative outcomes like depression. The children aged 5-8 were given a version of the assessment that looked at cognitive competence, physical competence, maternal acceptance, and peer acceptance. This assessment uses pictures of a child writing his name, for example, and asks the child if he is like or unlike the child in the picture.

The older children, aged 9-14 were given a version designed for their age group that focused on scholastic competence, social acceptance, athletic competence, physical appearance, behavioral conduct, and global self-worth. They were given a written copy of the questions and the tester read each of the items aloud to minimize the concern that reading ability might affect the reliability of the assessments.

RESULTS For the younger group of children, aged 5-8, we found that there were no differences in responses of children with cochlear implants and children with normal hearing in their perceived cognitive competence, physical competence, and peer acceptance. In maternal acceptance, we found that children with cochlear implants reported feeling a greater sense of maternal acceptance than children with normal hearing. In general, the children with cochlear implants reported a positive sense of self-esteem – between 3.1 and 3.6 out of 4 on the different aspects.



For the older group, aged 9-14, children with cochlear implant had a positive sense of self-esteem, between 2.7 and 3.2 out of 4. We found that the children with cochlear implants and the children with normal hearing did not differ in scholastic competence, social acceptance, athletic competence, physical appearance and global self-worth. The children with cochlear implants reported lower scores than children with normal hearing in behavioral conduct, indicating that they felt that they did not behave appropriately in some situations.



We also looked at the relationship between the different aspects in the younger and older children. In the younger children, both with cochlear implants and with normal hearing, there was no significant relationship between the 4 different aspects of self-esteem. This shows that the children evaluated themselves in each area independently. However, for the older children with cochlear implants, there was a strong connection between social acceptance, athletic competence, and physical appearance.

ANALYSIS In this assessment we found several important things: 1. Children with cochlear implants have positive self-esteem that is very similar to children with normal hearing. 2. Younger children with cochlear implants feel a particularly positive connection to their mothers, perhaps because their mothers are so involved and “tuned-in” to their children. This may be an up-side to the challenges of deafness and the cochlear implant process: the children feel that their mothers understand and care about them. 3. Older children seem to feel that their social acceptance, athletic competence, and physical appearance were all connected. It may be related to how they feel about their physical disability or how other kids view them. This is worth exploring further to see whether children with cochlear implants are feeling that their cochlear implant affects their social acceptance by peers or athletic abilities.

6. Assessment of Loneliness

BACKGROUND We were interested in getting the children's perspective on their feelings of inclusion or exclusion at school. Almost all of the children with cochlear implants were studying in mainstream schools and we wanted to know if they felt lonely at school. Each child completed a questionnaire that focused on feelings of loneliness and social dissatisfaction in school. The tester read the questions to the younger children and they could indicate their response by pointing to a set of 5 cups, ranging from empty to full. The older children read the questions and then wrote their answers on a page. This questionnaire consisted of 16 questions and scored range from 16 (lowest level of loneliness) to 80 (highest level of loneliness).

RESULTS The children with cochlear implants, as a group reported a low level of loneliness - 32 on a scale of 16 to 80. The children with normal hearing reported a similar level, 28, which is not significantly different from children with cochlear implants. In the original description of the test design the children sampled reported a score of 35. The range of scores was 16 to 61.

ANALYSIS This assessment provides information on the feelings of loneliness in school. Children with cochlear implants do not feel lonelier than children with normal hearing. This assessment asked if children feel that they have someone to turn to if they need help, if they can make friends easily, and so forth. This is definitely good news. However, there were a few children who reported high loneliness and it is important to find ways to support their social inclusion at school.

CONCLUSION

We hope that this review of the results of our study was easy to understand and informative for you. We think that overwhelmingly, the children with cochlear implants who participated in the study are doing incredibly well. They are holding their own with normal hearing peers and developing the emotional skills that we would expect from children their age. There are small areas of concern and we think that further research is needed to understand more about how children with cochlear implants develop social and emotional skills. Again, thank you for your participation – this study would not have been possible without you.