Peer Interactions of Preschool Children With and Without Hearing Loss

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Purpose: Little is known about the social interaction skills of children with severe to profound hearing loss (SPHL) in terms of how they manage conversational exchanges with peers. This study compared the initiation and response skills of children with SPHL with those of children with typical hearing during group play in integrated preschool programs.

Method: Two groups of 12 children were matched on a number of variables and assessed for intelligence, language, speech, and social development. All initiations, responses, and resulting interactions during 20 min of group play were transcribed and coded. Outcome measures included number and type of initiation strategies, number of responses, and length of interactions.

Results: Despite poorer speech, language, and social development, there were no significant differences in initiation and response skills measured between children with SPHL and their matched peers. The small sample size may have made differences difficult to detect; however, playmates initiated interactions less often with the children with SPHL and ignored their initiations more often than those of other children.

Conclusions: Preschool children with SPHL were excluded from interactions by their playmates. Having age-appropriate language skills did not ensure successful peer interactions. Inclusive preschool programs may consider offering classroom-wide social skills training to enhance interaction opportunities.

Key Words: hearing loss, cochlear implants, peer interaction, preschool, inclusion

Young children’s successful engagement in peer interaction is reported to provide significant contributions to children’s social, emotional, communicative, and academic development (Deater-Deckard, 2001; Guralnick, 1990; Hartup, 1983; Hay, Payne, & Chadwick, 2004; Ladd, 2005). Early peer relationships influence social acceptance, self-esteem, and the ability to form social relationships later in life (Antia, 1994; Ladd, 2005). The importance of peer interaction is underscored by the finding that children who are unable to establish positive peer relationships at young ages are more likely to demonstrate poor social adjustment in later childhood and adolescence (Bierman, 2004; Howes & Phillipsen, 1998). Rejection by peers at the preschool level may be a contributing factor in the development of psychopathologies (see Deater-Deckard, 2001) and problems with school adjustment in higher grades (Buhs & Ladd, 2001; Buhs, Ladd, & Herald, 2006). Across a number of studies, positive preschool peer interactions have been reported to positively influence children’s outcomes and provide a buffer against future developmental problems.

The objective of this study was to examine the initiation and response skills of children with hearing loss who are integrated into preschool classrooms with typically hearing children. Initiations and responses were of particular interest because the ability to initiate peer interactions and respond to peers is required before an interaction exchange can be established. In typically developing children, these skills emerge in the preschool years as children move away from the nuclear family and begin to relate to peers within group contexts such as preschool, child care, or informal play groups (Campbell, 1995; Ghuman, Peebles, & Ghuman, 1998; Hay et al., 2004; Thyssen, 2003). Investigations of children’s initiations reveal that preschool children seldom use direct initiation strategies (e.g., “Can I play with you?”) to enter into interactions with their peers; instead, they typically approach a peer group and join the ongoing play that is in progress (Corsaro, 1979, 1981, 1985; Dodge, Pettit, Gregory, McClaskey, & Brown, 1986; Putallaz & Gottman, 1981). This strategy of simply “joining in” is...
reported to have the greatest success in achieving group entry at the preschool level (Corsaro, 1979, 1981, 1985; Dodge et al., 1986; Putallaz & Gottman, 1981). Initiation strategies that are not effective in gaining group entry include waiting and hovering, disrupting play, and making a direct verbal request to join ongoing activities (Corsaro, 1981, 1985; Dodge et al., 1986; Putallaz & Gottman, 1981; Putallaz & Wasserman, 1990). In general, preschool children are not very successful at initiating peer interactions on their first attempt and require multiple attempts, achieving greater success when they persist (Corsaro, 1981; Putallaz & Wasserman, 1990).

In typical development, children’s ability to gain peer entry improves over a relatively prolonged developmental period, between the ages of 2 and 5 years (Corsaro, 1981, 1985; Tremblay, Strain, Hendrickson, & Shores, 1981). This period is marked by significant developmental progress in a number of skills, including language, play, and cognition. Theoretically, peer interactions develop and occur during play interactions with other children (Gallagher, 1993; Ladd, Price, & Hart, 1988). Play interactions are mediated by cognitive ability (i.e., the ability to symbolize or mentally represent actions in abstract ways) and language skills (i.e., the ability to comment on or describe one’s actions or plans using phrases and sentences); as a consequence, play, cognition, and language are interrelated skills. Around the age of 3 years there is a shift from solitary and parallel play to more complex, cooperative play with peers (Guralnick & Weinhouse, 1984). This shift is marked by significant increases in vocabulary development, receptive language, and combinatorial expressive language skills. By 30 months of age, typically developing children are beginning to plan and script complex, symbolic, pretend play with social themes using imaginary objects, people, and settings (Casby, 2003) and are using appropriately complex language to talk about their play. As play becomes more symbolic, children begin to function in more social and interactive ways. Thus, developmental progress in play, in communicative competence, and in social competence occurs in tandem because entering into cooperative play or peer interaction is realized, in part, using the medium of language. Social–cognitive theories suggest that the locus of social learning occurs during multiple encounters with other children (siblings or peers). Under the supervision of adults, social strategies (e.g., access, negotiation, conflict resolution, compromise, discourse adjustments) are practiced and consolidated during increasingly complex social pretend play (e.g., Beckman & Lieber, 1992; Howes & Matheson, 1992). Together, these early social experiences lay the foundation for more advanced social competencies, including playing complementary pretend roles, becoming aware of behavioral characteristics of group members, and social perspective taking (Beckman & Lieber, 1992). In addition, there are other developmenta...
earlier diagnoses of children with hearing loss (Dettman, Pinder, Briggs, Dowell, & Leigh, 2007; Thompson et al., 2001) and more age-appropriate spoken language outcomes (Geers, Nicholas, & Sedey, 2003; Nicholas & Geers, 2006, 2007). Because the most apparent consequence of congenital hearing loss is difficulty with speech, language, and communication development, intervention in these areas is widely reported to be the key to the children’s success in social interactions (e.g., Calderon & Greenberg, 1997; Nicholas & Geers, 2006). However, despite recent advances in promoting spoken language skills, children with hearing loss do not necessarily experience successful interactions with their peers (Bat-Chava & Deignan, 2001; Capelli, Daniels, Durieux-Smith, McGrath, & Neuss, 1995; Preisler et al., 2002). For example, Bat-Chava, Martin, and Kosciw (2005) studied changes over time in the communication, socialization, and daily living skills of 41 children with hearing loss using the Vineland Adaptive Behavior Scales (Sparrow, Balla, & Cicchetti, 1984) and reported that, over a 7-year period, all of the children made significant improvements on the Communication scale. There were some improvements on both the Socialization and Daily Living scales, but these improvements did not achieve significance. Bat-Chava et al.’s study suggests that improvements in socialization may be partially due to improvements in language development but that communication and socialization abilities may progress at different rates. Given that most of the studies targeting the peer interaction skills of preschool children with hearing loss were published prior to 2002, a reinvestigation of the initiation and response skills of these children is timely.

In this study, we compared the initiation and response skills of preschool children with SPHL with those of preschool children with typical hearing in the context of small, naturalistic play groups with familiar peers. The first set of questions was established to investigate the skills of children with SPHL in initiating interactions and responding to the initiations addressed to them by their playmates. We hypothesized that the two groups of children would initiate with the same frequency but would differ in terms of three variables: (a) the type and modality of initiations used, (b) the proportion of responses, and (c) the mean length of the three longest peer interaction exchanges. This hypothesis is consistent with reports in the literature that children with hearing loss who have good spoken language skills may still have difficulty with peer interactions (Bat-Chava & Deignan, 2001; Capelli et al., 1995; Preisler et al., 2002). The purpose of the second set of questions was to examine the initiations and responses of the typically hearing playmates to the children with SPHL and their matched typically hearing peers. We hypothesized that the playmates would initiate interactions less often to the children with SPHL and respond to proportionally fewer of their initiations in comparison to the typically hearing children. This hypothesis was based on earlier literature indicating that typically hearing children prefer to communicate with other typically hearing children (Antia et al., 1993; Levine & Antia, 1997; Minnet et al., 1994; Spencer et al., 1994).

**Method**

**Participants**

Twelve children, ages 37 to 62 months ($M = 49.3, SD = 8.4$), who had a congenital SPHL (average of audiometric thresholds from 500 to 4000 Hz bilaterally of 70 dB HL or greater) that was identified by age 24 months ($M = 10.5, SD = 9.2, Mdn = 8.0$) participated in this study. Six of these children had cochlear implants, and six had bilateral hearing aids. These groups were evenly divided between male and female children. There were no significant differences between the children with cochlear implants and the children with hearing aids with respect to age of identification or age at which they began intervention. The children with cochlear implants were identified by 10 months of age ($M = 9.5, SD = 8.7$), and the children with hearing aids were identified by 12 months of age ($M = 11.5, SD = 10.4$). The children with cochlear implants were implanted unilaterally between 8 and 27 months of age ($M = 16.8, SD = 8.2, Mdn = 14.5$) with a cochlear implant. One male and one female child received a second implant that was activated more than 12 months prior to the videotaping. Children wearing conventional hearing aids were fitted binaurally between 4 and 27 months of age ($M = 16.3, SD = 9.9, Mdn = 18.0$). See Table 1 for the audiological information of the individual children with hearing loss. It is important to note that the children with cochlear implants had profound hearing loss preimplant ($M = 100.0$ dB HL, $SD = 8.9$), whereas the children wearing hearing aids had severe hearing loss ($M = 74.8$ dB HL, $SD = 7.0$). All of the children with SPHL were receiving auditory therapy once a week, and none of them had any formal exposure to sign language. Eleven of the children came from homes where English was the only language spoken. One child was exposed to English and Arabic in the home.

Each child with SPHL was matched for age, sex, parents’ educational level, and number of siblings with a typically hearing child from their own preschool classroom. These variables were controlled to increase the likelihood that any differences found between the two groups of children could be attributed to the presence of SPHL. The typically hearing matched children were 38 to 58 months of age ($M = 48.7, SD = 6.6$). Eight of them passed a hearing screening conducted at 20 dB HL at 1000, 2000, and 4000 Hz. The remaining four children had an audiogram conducted within 2 months of the videotaping confirming that their hearing was within the
Eleven of these children came from homes where English was the only language spoken. One child was exposed to English and Hindi in the home (this child was selected as the typically hearing match for the child with SPHL who had two home languages). The 12 matched pairs of children (child with SPHL—child with typical hearing) served as target children for this investigation. All of the target children had normal cognitive development confirmed by standard scores on the Leiter International Performance Scale—Revised Brief Intelligence Test (Roid & Miller, 1997) with no known or suspected behavioral difficulties according to parents’ and educators’ subjective reports. See Table 2 for a description of the family characteristics of the target children.

The primary investigator assessed the 24 target children individually over one to three sessions. See Table 3 for a summary of all the group assessment results. Children’s intelligence was screened using the Leiter International Performance Scale—Revised Brief Intelligence Test. Expressive and receptive language skills were assessed with the Preschool Language Scale, Fourth Edition (Zimmerman, Steiner, & Pond, 2002) and the Peabody Picture Vocabulary Test.

### Table 2. Family characteristics of target children.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Children with hearing loss (n = 12)</th>
<th>Children with typical hearing (n = 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother’s education (years)</td>
<td>M (SD)</td>
<td>16.6 (1.2)</td>
</tr>
<tr>
<td></td>
<td>Min–Max</td>
<td>13–20</td>
</tr>
<tr>
<td>No. siblings</td>
<td>M (SD)</td>
<td>0.92 (0.67)</td>
</tr>
<tr>
<td></td>
<td>Min–Max</td>
<td>0–2</td>
</tr>
<tr>
<td>Birth order</td>
<td>First</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Second</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Third</td>
<td>1</td>
</tr>
</tbody>
</table>

**Note.** Min = minimum; Max = maximum.

### Table 1. Individual characteristics of children with hearing loss.

<table>
<thead>
<tr>
<th>Child and gender</th>
<th>Age</th>
<th>Age at identification</th>
<th>Degree of lossa</th>
<th>Device</th>
<th>Amplification ageb</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Male</td>
<td>51</td>
<td>23</td>
<td>107 dB HL</td>
<td>Cochlear implant</td>
<td>26 left ear (aided at 23)</td>
</tr>
<tr>
<td>2. Male</td>
<td>47</td>
<td>16</td>
<td>92 dB HL</td>
<td>Cochlear implant</td>
<td>18 right ear (aided at 16)</td>
</tr>
<tr>
<td>3. Female</td>
<td>44</td>
<td>10</td>
<td>102 dB HL</td>
<td>Cochlear implant</td>
<td>27 right ear</td>
</tr>
<tr>
<td>4. Female</td>
<td>56</td>
<td>1</td>
<td>93 dB HL</td>
<td>Cochlear implant</td>
<td>11 right ear</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>42 left ear</td>
</tr>
<tr>
<td>5. Male</td>
<td>43</td>
<td>1</td>
<td>100 dB HL</td>
<td>Cochlear implant</td>
<td>8 right ear</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18 left ear</td>
</tr>
<tr>
<td>6. Female</td>
<td>38</td>
<td>6</td>
<td>106 dB HL</td>
<td>Cochlear implant</td>
<td>11 right ear (aided at 6)</td>
</tr>
<tr>
<td>7. Female</td>
<td>54</td>
<td>14</td>
<td>70 dB HL</td>
<td>Hearing aid</td>
<td>24 bilateral</td>
</tr>
<tr>
<td>8. Female</td>
<td>43</td>
<td>1</td>
<td>73 dB HL</td>
<td>Hearing aid</td>
<td>7 bilateral</td>
</tr>
<tr>
<td>9. Male</td>
<td>59</td>
<td>23</td>
<td>73 dB HL</td>
<td>Hearing aid</td>
<td>24 bilateral</td>
</tr>
<tr>
<td>10. Female</td>
<td>57</td>
<td>6</td>
<td>80 dB HL</td>
<td>Hearing aid</td>
<td>12 bilateral</td>
</tr>
<tr>
<td>11. Male</td>
<td>62</td>
<td>24</td>
<td>70 dB HL</td>
<td>Hearing aid</td>
<td>27 bilateral</td>
</tr>
<tr>
<td>12. Male</td>
<td>37</td>
<td>1</td>
<td>86 dB HL</td>
<td>Hearing aid</td>
<td>4 bilateral</td>
</tr>
</tbody>
</table>

**Note.** All ages are given in months.
aAverage of air conduction thresholds from 500 to 4000 Hz bilaterally. bAge at implant activation or hearing aid fitting.

Additional 28 typically developing children from the same classrooms served as playmates for the target children. These children were 37 to 60 months of age and had no known or suspected disabilities according to educator report. Twenty-six playmate children came from homes where English was the only language spoken. Two of them came from homes where both English and Hindi were spoken. Four of the playgroups had a total of five children (three playmates and two target children), and eight of the playgroups had a total of four children (two playmates and two target children).

The integrated programs that the children attended were monolingual English programs. Twenty-two of the target children had been in the same preschool program for at least 6 months. One child with SPHL and her typically hearing matched counterpart had been in attendance at the same preschool for only 4 months at the time of the videotaping. Six of the children with SPHL attended programs where they were the only child at the facility with known, permanent hearing loss, and six of them attended programs where there were other children with known, permanent hearing loss in attendance.

### Assessment

The primary investigator assessed the 24 target children individually over one to three sessions. See Table 3 for a summary of all the group assessment results. Children’s intelligence was screened using the Leiter International Performance Scale—Revised Brief Intelligence Test. Expressive and receptive language skills were assessed with the Preschool Language Scale, Fourth Edition (Zimmerman, Steiner, & Pond, 2002) and the Peabody Picture Vocabulary Test.
Table 3. Group assessment results.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Children with hearing loss (n = 12)</th>
<th>Children with typical hearing (n = 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IQ (Leiter—Revised Brief)</td>
<td>118.1 (9.0)</td>
<td>114.5 (8.0)</td>
</tr>
<tr>
<td>Min–Max</td>
<td>109.0–135.0</td>
<td>102.0–126.0</td>
</tr>
<tr>
<td>Auditory Comprehension</td>
<td>100.3 (16.2)</td>
<td>116.5 (10.9)</td>
</tr>
<tr>
<td>Min–Max</td>
<td>67.0–123.0</td>
<td>95.0–136.0</td>
</tr>
<tr>
<td>Expressive Communication</td>
<td>93.0 (19.7)</td>
<td>118.0 (11.8)</td>
</tr>
<tr>
<td>Min–Max</td>
<td>51.0–122.0</td>
<td>99.0–140.0</td>
</tr>
<tr>
<td>Receptive vocabulary</td>
<td>93.1 (11.1)</td>
<td>110.7 (12.5)</td>
</tr>
<tr>
<td>Min–Max</td>
<td>71.0–114.0</td>
<td>96.0–138.0</td>
</tr>
<tr>
<td>Vineland Interpersonal Scale</td>
<td>101.9 (11.7)</td>
<td>113.0 (8.6)</td>
</tr>
<tr>
<td>Min–Max</td>
<td>85–118</td>
<td>96–120</td>
</tr>
<tr>
<td>Educators’ intelligibility rating</td>
<td>2.6 (1.1)</td>
<td>3.8 (0.9)</td>
</tr>
<tr>
<td>Min–Max</td>
<td>1.0–5.0</td>
<td>2.0–5.0</td>
</tr>
<tr>
<td>Students’ intelligibility rating</td>
<td>2.7 (1.1)</td>
<td>4.4 (1.5)</td>
</tr>
<tr>
<td>Min–Max</td>
<td>1.3–4.5</td>
<td>1.0–6.0</td>
</tr>
</tbody>
</table>

*Subtest of the Preschool Language Scale, Fourth Edition. *Peabody Picture Vocabulary Test—III. *Results on the unfamiliar students’ measure are for 22 children. One child with hearing loss and one child with typical hearing were excluded because there was not a 1-min speech sample available for them.

Data Collection and Coding

The playgroups were videotaped in their own preschool programs playing with the same toy farm set on two different occasions separated by not more than 1 week (for 15 min per play session). To ensure consistency across preschool/child care settings, the toys available to the children during videotaping were controlled. A farm was selected because most preschool children are familiar with farm animals, it is gender neutral, and the wide range of associated accessories could potentially stimulate creative and varied interactions. Previous research with toddlers in preschool programs suggests that the available toys and the play context can influence the interactions occurring between children. For example, O’Brien and Xiufen (1995) reported longer and more complex utterances when typically hearing children played with blocks and trucks than when they were engaged in gross motor play. In addition, less frequent use of negative behaviors during peer interactions has been reported when appealing items, such as objects found in a grocery store, are available (Craig-Unkefer & Kaiser, 2002).

To reduce the amount of background noise present during the videotaping, children not participating were either engaged in outdoor play or kept away from the videotaping area. Two video cameras were used to focus on the child with SPHL and the typically hearing target child. The cameras were hand held to permit the primary investigator and research assistant to remain focused on the children as they changed positions. The first 5 min of each videotaped sample were omitted from the analysis to allow time for the children to adapt to being videotaped. This resulted in a total of 20 min of videotaped data for each of the 24 target children.

Transcription and coding procedures were conducted simultaneously. A research assistant who was blind to the group assignment and questions of the study reviewed the videotapes to identify all communicative initiations attempted by a target child or directed to a target child by any of the other children in the playgroup. Each initiation and all subsequent utterances following the initiation were transcribed using the Systematic Analysis of Language Transcripts (Miller & Chapman, 2002). The resulting transcripts yielded a series of consecutive exchanges that began with an initiation and ended with the final utterance in the exchange. Interactions were considered finished when the topic was changed, a child involved in the exchange moved away, or the two children became involved in an activity unrelated to their previous interaction. A coding system that examined the transcribed initiations and responses was adapted from existing peer interaction coding systems reported by Corsaro (1979), Roberts et al. (1995), and Messenheimer-Young and Kretschmer (1994). Each initiation was coded to yield the strategy type, modality, and outcome of the
initiation. The six initiation codes were (a) Direct Initiation, defined as an overt request for access into an interaction or a play activity (e.g., “Can I play too?”); (b) Related Activity, defined as a comment or question related to the ongoing play activity (e.g., “My horse is eating apples.”); (c) Unrelated Activity, defined as a comment about objects, events, people, or feelings not related to the ongoing play activity (e.g., “I have a dress on.”); (d) Wait and Hover, in which the child observed and/or circled the play area but made no attempt to join in the ongoing play activity; and (e) Disruption, in which the child interrupted or disrupted the ongoing play activity (e.g., grabbed a toy). In addition, initiation strategies (with the exception of Wait and Hover) were coded for four possible modalities: (a) verbal, (b) vocal, (c) gestural, or (d) a combination of the modalities. The outcome of initiations was coded as Response, Ignore, or Reject. Initiations that received a response were further coded to indicate how many exchanges ensued in the interaction. See Appendix B for a detailed description of the coding system.

The first author completed agreement reliability on 100% of the transcripts. Point-by-point reliability was determined by dividing the number of agreements by the total number of agreements and disagreements (Sacket, 1978). For transcript reliability, the agreement was 95% for words and 100% for number of utterances. For coding reliability, the agreement was 92% for initiation strategy (range: 86%–100%), 100% for initiation modality, and 98% for outcome of initiation (range: 95%–100%).

Results

To preserve power, data from the six children with hearing aids and the six children with cochlear implants were collapsed into one group of children with SPHL for all analyses. We conducted a series of five paired-samples t tests to determine whether the 12 children with SPHL differed from the 12 target children with typical hearing on measures of language development, social development, and nonverbal IQ. We controlled the familywise Type I error rate across the five tests at the .05 level by using the Holm’s sequential Bonferroni procedure. The smallest p value, .002, occurred for the comparison of receptive vocabulary, t(11) = 3.91, p = .002, d = 1.14. This reported p value is less than .05/5 = .01, so the difference between the two groups on this measure is significant. The second-smallest p value, .003, occurred for the comparison of expressive language, t(11) = 3.74, p = .003, d = 1.08. This reported p value is less than .05/4 = .0125, which is significant. The third-smallest p value, .004, occurred for the comparison of receptive language, t(11) = 3.63, p = .004, d = 1.05, which is smaller than the α of .05/3 = .017. Therefore, the difference between the two groups in terms of receptive language is significant. The fourth-smallest p value, .01, occurring for the comparison on the Interpersonal Relationships scale of the Vineland Social–Emotional Maturity Scales, t(11) = 3.09, p = .01, d = 0.89, is less than the α of .05/2 = .025. Therefore, this comparison between the two groups of children is also significant. In each of these comparisons, the children with typical hearing obtained significantly higher scores than the children with SPHL. The effect size was large for all of these analyses. Finally, the two groups of children did not differ on nonverbal IQ, t(11) = 1.23, p = .232, d = 0.36.

It is important to note that most children with SPHL had language and social interaction scores that fell within the normal range on standardized tests. An examination of the individual data revealed that 10 children with SPHL had language and vocabulary scores within 1 SD of the mean, and two children with SPHL (Child 1 and Child 3 in Table 1) demonstrated significantly delayed abilities on these measures (i.e., scores 2 SDs below the mean).

For the comparison of ratings of speech intelligibility, we used the Wilcoxon signed-ranks test because equal intervals between consecutive points on the rating scales could not be assumed. The educators and the university students rated the children with typical hearing as having significantly better speech intelligibility than the children with SPHL: z = –2.72, p = .006, d = 1.0, for the educators, and z = –2.85, p = .004, d = 1.08, for the university students. In summary, the two groups of children did not differ in nonverbal IQ but differed systematically on all other developmental measures. These differences need to be kept in mind when interpreting the results of this study.

The first research question was whether children with SPHL differed from the children with typical hearing in the frequency, type, and modality of initiation strategies used. A summary of the initiation strategies used by the two groups of children during 20 min of small-group play can be found in Table 4. We conducted a paired-samples t test to compare the frequency of initiations used by the two groups of children. The results of this analysis indicated that there was no significant difference in the frequency of initiations between the children with SPHL and the children with typical hearing, t(11) = .36, p = .727, d = 0.10. Next, we compared the children’s use of different initiation strategies. The children seldom used Direct Initiation, so this code was excluded from the analysis. We converted the data for the four remaining initiation strategies into proportions of the total number of initiations produced. We conducted a group comparison of the type of strategies using compositional analysis (Aitchison, 1986), a “technique that uses [multivariate analysis of variance] to analyze two sets
of data in which variables are represented as proportions. It is used to determine the statistical significance of differences and the rank order of differences between the variables” (Smith, 2006, p. 3). The results of this analysis did not reveal any significant group differences in the proportions of initiation strategies used by the two groups of children. Wilks' $\Lambda = 0.622$, $\chi^2(3, N = 24) = 5.69$, $p = .28$. However, Wait and Hover was used 32% of the time by the children with SPHL and 20% of the time by the children with typical hearing. Related Activity was used 11% of the time by the children with SPHL compared with 27% of the time by the children with typical hearing. It is possible that the small sample size and the large variance in strategy use made it difficult to detect differences between the two groups of children.

The modalities (i.e., verbal, vocal, gestural, or a combination) were converted into proportions of the total number of initiations produced. We conducted compositional analysis to determine whether there were differences between the two groups of children in the proportions of modalities used. This analysis did not yield any significant differences between the two groups of children for modality, Wilks’ $\Lambda = 0.866$, $\chi^2(3, N = 24) = 1.77$, $p = .62$. When the children were not using Wait and Hover, the children with SPHL used verbal initiations 53% of the time, and the children with typical hearing used them 60% of the time.

The second question in this study focused on responses and whether children with SPHL differed from their typically hearing peers in the proportion of responses they provided to the initiations of their playmates. The results of a paired-samples $t$ test indicated that there was no significant difference between the proportion of responses provided by the children with SPHL ($M = .56$, $SD = .30$) and the children with typical hearing ($M = .44$, $SD = .20$), $t(11) = 1.43$, $p = .182$, $d = .41$. Thus, the ability to respond to the initiations of others did not differentiate the two groups of children. It is interesting to note that three of the 12 children with SPHL responded to 100% of initiations directed toward them. None of the children with typical hearing responded to 100% of their interaction invitations.

We had posed the third research question to determine whether preschool children with SPHL differed from typically hearing children in the mean length of their peer interactions. We computed the mean length of interactions by taking an average of the children’s three longest exchanges in utterances during the 20-min group interaction. The summary data for this measure are found in Table 4. We conducted a paired-samples $t$ test to determine whether the two groups of children differed in the mean length of peer interactions. The results indicated that there was no significant difference between the two groups on this measure, $t(11) = -1.61$, $p = .136$, $d = 0.46$. In summary, the two groups of children did not differ statistically in their ability to maintain interactions with their peers.

The fourth research question of this study was formulated to investigate whether the playmates initiated interactions with the children with SPHL as often as they initiated with the matched typically hearing children. The two target children played in small groups with two or three additional playmates. For this question, all of the playmates’ initiations were used. We conducted a paired-samples $t$ test to compare the number of initiations addressed to the 12 children with SPHL and their matched peers during 20 min of interaction. The data revealed that the mean frequency of initiations addressed to the children with typical hearing ($M = 20.3$, $SD = 15.6$) was more than twice that of initiations addressed to the children with SPHL ($M = 9.6$, $SD = 6.7$). This difference was statistically significant, with a large effect size, $t(11) = -3.20$, $p = .008$, $d = 0.92$. Thus, the playmates directed twice as many initiations to children with typical hearing as compared with the children with SPHL.

The final question in this study was whether the playmate children responded as often to the initiations of the children with SPHL as they did to the matched peers. Responses were calculated as the proportion of initiations
from the target children that received responses from playmates during the 20 min of peer play. The data revealed that the children with typical hearing received proportionately more responses to their initiations ($M = .38, SD = .19$) compared with the children with SPHL ($M = .17, SD = .15$), and this difference was significant, $t(11) = 3.34, p = .007$. Examination of the responses to the four different initiation strategies indicated that the Related Activity initiation strategy received the most responses overall (42% for children with typical hearing and 18% for children with SPHL), whereas the strategy of Wait and Hover rarely, if ever, worked (0% for children with typical hearing and 1% for children with SPHL). These data are displayed in Figure 1.

**Discussion**

One key finding of this study is that the 12 target children with SPHL did not differ from the 12 target children with typical hearing in their frequency of initiations, their ability to respond to others’ initiations, or their skill in maintaining peer interactions. Even though there were preexisting differences between the two groups of children on standardized measures of language, speech intelligibility, and social development, these differences did not measurably influence their initiation and response skills during small-group play in a naturalistic setting. The finding that children with SPHL initiate interaction as often as their peers is consistent with the results of many studies of children with hearing loss in integrated preschool or kindergarten classrooms (Brown et al., 2000; Duncan, 2001; Roberts et al., 1995). Moreover, with respect to initiation strategies used, previous studies have reported that children with hearing loss used Related Activity strategies less often (Brown et al., 2000; Roberts et al., 1995) and used Wait and Hover and Disruption more often than did their typical hearing peers (Brown et al., 2000). In the present study, the children with hearing loss used Related Activity half as often as did the children with SPHL and used Wait and Hover almost twice as much, although these differences did not achieve statistical significance. The very large variance in initiation strategy use in both groups of children would have required sample sizes in excess of 400 children to detect significant differences for this variable. Therefore, there is the possibility of a Type II error with respect to this particular measure. It is noteworthy that in the current study, Disruptions appeared to be used very infrequently by both groups (8% and 6% by the children with SPHL and typical hearing, respectively). This finding is in contrast to previous findings by Brown and colleagues (2000). One possible explanation for this divergent finding is that all of the children with hearing loss in Brown et al.’s study had significant language delays of 12 months or more and may have been using more disruptive behaviors because of their inability to express themselves (Dionne, Tremblay, Boivin, Laplante, & Perusse, 2003). The findings of the current study also contrast with those of previous studies, which have reported that children with hearing loss used more gestural and nonverbal initiation strategies than did typically hearing children of the same age (Duncan, 2001; McKirdy & Blank, 1982). Duncan (2001) studied interactions in large group sizes in noisy classrooms, whereas McKirdy and Blank (1982) studied children who used a combination of speech and sign language. Higher levels of nonverbal communication might be expected in these two contexts.

An examination of the children’s pattern of responses revealed that, although unsuccessful, Wait and Hover was used frequently by both groups of children (32% and 19% for the SPHL and typically hearing groups, respectively). Its frequent use may provide children with an opportunity to understand ongoing play activities before making a verbal initiation attempt. It has been hypothesized that children can then reference themselves to a peer’s activity by making a comment that is linked to the ongoing activity (Corsaro, 1981; Putallaz & Wasserman, 1990). A post hoc examination of Wait and Hover in the present study indicated that the children with SPHL and typical hearing who used this strategy rarely followed up with a verbal initiation; however, further research using longer videotaped samples is necessary to determine the usefulness of Wait and Hover as an initiation strategy and also to disentangle the relationship between Wait and Hover and children’s individual personality traits.

A second key finding of this study is that the playmate children with typical hearing systematically excluded
children with SPHL from interactions by responding to them less often and issuing fewer initiations inviting them to interact. The playmate children responded to only 17% of the initiations of children with SPHL; in contrast, the response rate of the children with SPHL to the target children with typical hearing was more than double. A post hoc examination of the data in the current investigation revealed that when initiations were unsuccessful, they were simply ignored (i.e., there was no response 95% of the time). The data also revealed that, compared with children with typical hearing, the children with SPHL were invited to interact less often than were their hearing peers (i.e., they received fewer initiations). As a consequence, children with SPHL who needed more frequent peer interaction practice experienced fewer peer interaction opportunities overall. Earlier research also reported that children with typical hearing in integrated programs prefer to interact with other typically hearing children (Antia et al., 1993; Arnold & Tremblay, 1979; Levine & Antia, 1997; Minnet et al., 1994; Spencer et al., 1994; Vandell et al., 1982). It is worth mentioning that the majority of children with hearing loss in these earlier studies demonstrated significantly delayed language abilities, whereas most of the children in the present study had age-appropriate language skills on standardized measures. However, a post hoc examination of the data revealed that, for the children with hearing loss in this study, having age-appropriate language skills did not ensure the peers would interact with them. Children with SPHL with both high and low language levels had more of their initiations ignored and fewer interaction invitations than did the typically hearing children. For example, one child with hearing loss (Child 8; see Table 1) had auditory comprehension, expressive communication, and receptive vocabulary standard scores of 123, 122, and 104, respectively, but nevertheless, 90% of her initiations were ignored. This same child responded to 100% of the three peer invitations for her to interact.

One potential explanation may reside in the results obtained for children’s speech intelligibility. The speech intelligibility of the children with SPHL was rated as being significantly poorer than that of the children with typical hearing. Previous studies have speculated that, for children with hearing loss, it is the delay in their speech development that creates the greatest barrier for them in establishing and maintaining social relationships (Antia & Stinson, 1999; Stinson & Whitmire, 1991). In the current study, speech intelligibility alone was not the only explanation for the results; for example, the child with SPHL who was rated as having the poorest speech intelligibility overall (Child 3; see Table 1) did have all of her initiations ignored. At the same time, she was only one of two children with SPHL who had more interaction invitations than did the typically hearing matched child. In addition, the child with SPHL with the strongest language skills overall (Child 8; see Table 1) was rated by her educator as having very high speech intelligibility, and she still had her initiations ignored by her peers. An alternative explanation is that the children with typical hearing may have perceived the children with SPHL as inherently different by virtue of their hearing aids, cochlear implants, or some other quality that was not measured by this study. For example, there may have been differences in the emotional regulation and control or development of theory of mind in the children with SPHL that were not assessed in this study.

A second explanation for this finding concerns the children’s vocabulary knowledge. In order to have successful conversation with peers during play, preschool children require the necessary vocabulary to reference the items being used in play and sufficient language to make topic-related comments and to role play (Craig-Unkefer & Kaiser, 2002). It is possible that the children with SPHL were deficient in the vocabulary that is specific to their classroom and peer group even when they had standardized receptive vocabulary scores that were within the normal range. It has been estimated that up to 90% of a preschool child’s knowledge can be attributed to incidental hearing of information transmitted by sound (Northern & Downs, 2002). Children with SPHL cannot easily access this information, particularly if the classroom environment is noisy.

The findings of the current study have several important implications for educators and other professionals responsible for promoting the social, communicative, and linguistic development of children with SPHL. First, as Harrist and Bradley (2003) argued, it may be important to implement programs that encourage the inclusion and participation of all children in preschool classrooms. Evidence from intervention studies in the field of autism and other developmental disabilities provides support for preschool programs that train typically developing peers to promote peer interaction (e.g., Laushey & Heflin, 2000). Similar peer-mediated models of intervention may be useful for classrooms that integrate children with SPHL. Second, the results of this study revealed that Wait and Hover was used 32% of the time by the children with SPHL and that it was rarely successful; thus, intervention explicitly focusing on the interaction skills of children with SPHL should teach alternative initiation strategies. Children may require several individual sessions with a clinician to learn activity-related strategies through role play (e.g., joining in the play). Once the children have been taught specific social entry strategies, they may be integrated into small peer group settings where they are prompted to use their newly learned strategies (Timler, Olswang, & Coggins, 2005). As children continue to practice their peer interactions, they can transition to progressively larger group situations. Third, the individual data in this study revealed that some children...
with SPHL were high initiators but had limited speech intelligibility. These children may benefit from therapy to improve the intelligibility of their speech for common vocabulary and language used during play activities with peers. In addition, they may need encouragement to rephrase (e.g., “Say it in a different way”) when they are not understood. Finally, the children with SPHL may need assistance in acquiring vocabulary items that are specific to the play topics of their peer groups.

There are several limitations to the current study. First, the sample size of 12 children with SPHL is small, which may make it difficult to generalize the results to the larger population of preschool children with SPHL in integrated preschool/child care programs. In addition, a small sample size limits the statistical power, which may have made it difficult to detect group differences on some measures, particularly when the variance (e.g., type of initiations used) was large. It is essential to note that there is a wide range of social behavior in the general population of preschool children (Koegel, Koegel, Frea, & Fredeen, 2001; Luk, Leung, Bacon-Shone, & Lieh-Mak, 1991), which makes group differences in this age group difficult to detect without very large sample sizes. Even though the sample size used in the current study appears small, it is larger than many of the samples in the available literature that have previously compared interactions of preschool and kindergarten children with and without hearing loss (e.g., Arnold & Tremblay, 1979; Brown et al., 2000; Duncan, 2001; Hulsing et al., 1995; Spencer et al., 1994). A second limitation is that the present investigation considered the children with cochlear implants and the children with hearing aids within the same group. It is important to note that the habilitation experiences of children with hearing aids and children with cochlear implants may differ in ways that could potentially influence the children’s peer interaction development. Future research is needed with larger groups of children with SPHL who have cochlear implants versus hearing aids to examine systematically the differences between these two groups in terms of their initiation and response skills, as well as other aspects of peer interaction. A third limitation of the present investigation is the use of only one play context and small-group interaction. The farm play context selected for the study allowed for consistency of toys among the playgroups and is a situation that children attending regular preschool and child care programs encounter on a daily basis. However, it may have limited the vocabulary, language, and type of interactions that occurred among the children. Thus, the observed pattern of results may not be generalizable to outdoor play, dramatic play, or other preschool interaction contexts; moreover, they may not be representative of interactions in dyads, larger groups, or groups of unfamiliar peers. Future research is needed to examine the diverse interaction contexts within child care contexts and their potential influences on children’s developmental experiences.

A final limitation concerns family characteristics of the children. To control for issues related to second language learning, the children in this study came from homes where English was the primary language spoken, and the preschool programs were all monolingual English programs. It is not known how children with SPHL from non-English-speaking families would interact with peers in an English-speaking child care environment, but it is likely that they would experience different challenges. Future research is required to provide a profile of the challenges experienced by these children who are also learning English as a second language.

This study contributes to the literature on the peer interaction abilities of preschool children with SPHL and suggests areas for further assessment and intervention in the area of peer interaction skills. Perhaps most important, the results of this study suggest that placing children with SPHL into integrated preschools and assuming that successful peer interactions will flourish may not be sufficient. The data in this study indicated that over 80% of initiations by children with SPHL were ignored by their peers; thus, children with SPHL may require support to optimize their opportunities to interact with peers. Their peers may also require facilitative interventions to help them integrate children with SPHL into their interactions.

**Acknowledgment**

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**References**

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**References**


### Appendix A. Speech intelligibility scores of the 24 target children.

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<tr>
<th>Child</th>
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<td>Students’ rating&lt;sup&gt;b&lt;/sup&gt;</td>
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<sup>a</sup>On a 5-point Likert scale, on which 1 = very low intelligibility and 5 = very high intelligibility.  
<sup>b</sup>Average of ratings by three undergraduate university students on a 7-point Likert scale.
Appendix B. Description of coding system.

All initiations and any resulting turns are coded. Initiations will be coded as:
[I] [strategy code/modality code] [outcome code] [L#]
(where L = length of interaction in total # turns)

Turns will be coded as:
[T] [modality code]

SECTION A: Initiation/Peer Entry Strategy

DI: Direct initiation. Child requests/suggests access into conversation or activity. a Suggesting access can include the greeting b of one or more children.

RA: Related activity: Child talks about the play of others, imitates actions, exchanges related materials. Child asks a question about related actions, conversations, or materials. a Turns are related to the toys/objects currently being used.

UA: Unrelated activity: Child talks about feelings, plans, accomplishments, attributes, events/displays, asks a question, or uses materials not related to ongoing activity/conversation. a Suggests another activity b or requests help. b Introduces toy(s) not currently being used into the interaction.

WH: Wait and hover: c Child observes/circles play area and purposefully looks at the other children, but there is no attempt to interact with others. This is distinguished from a child looking around at her surroundings, looking for a toy, or turning eyes or head in response to a noise or motion. The key in determining WH is that the child is focusing on (a) peer(s). Note: WH does not have a modality code.

DIS: Disruption: Child interrupts/disrupts situation. a This includes the taking away of another child’s toy.

SECTION B: Modality of Initiations and Turns

VERB: Verbal: The child uses intelligible word(s) or approximations of words. Words are transcribed orthographically. (Unintelligible word = X.)

VOC: Vocal: The child uses his or her voice (including crying, fretting, whining, laughing) to produce sounds that are not words or approximations of words.

GES: Gestural: Use of body movements/gestures, eye gaze. No use of voice. A gesture must be contained in the definitions in order to be coded.

COMB: Combination: Use of combination of verbal/vocal + gestural.

SECTION C: Outcome of Initiation Codes

ST1: Success gaining entry. (Initiating child does not receive another turn following entry acceptance.)

ST2, ST3, ST4, etc.: Child initiating has two or more turns.

FI: Fail ignore: Initiation strategy is ignored (no response).

FR: Fail reject: Response to initiation is an attempt in any modality to prevent the child from entering into conversation/play.

SECTION D: Definitions of Acceptable Gestures c

a. Shakes head to indicate “no.”
b. Nods head to indicate “yes.”
c. Shrugs shoulders to indicate “I don’t know.”
d. Holds out an object to show it (not offer).
e. Offers or gives object to another child.
f. Accepts an offered object.
g. Pushes or throws object away, or toward another child.
h. Points at a child or object (includes pretend objects).
i. Tapping, touching, pulling, or waving at another child.
j. Looks at or turns to peer/referred object as the only response (i.e., no words used).
k. Action response: Child responds to a requested action (could be a negative response; e.g., Child 1: “Can I have your horse?” / Child 2: Hands the horse to the first child). Includes unsolicited response in looking for requested toy (e.g., Child 1: “I need a horse” / Child 2: Finds/gives Child 1 a horse).

aTaken from Roberts et al. (1995). bAdapted from Messenheimer-Young and Kretschmer (1994). cAdapted from Girolametto, Sussman, and Weitzman (2007).
Peer Interactions of Preschool Children With and Without Hearing Loss

Joanne DeLuzio, and Luigi Girolametto

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