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Qualitative and Quantitative Aspects of Conversations of Deaf Peers:
Some Preliminary Findings

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Qualitative and Quantitative Aspects of Conversations of Deaf Peers: Some Preliminary Findings

Abstract. Hearing impaired and deaf infants and children experience a period of degraded auditory access to social linguistic interactions, and a lack of opportunity to actively participate in social linguistic interactions which impacts language acquisition and communicative competence. The present study investigates both quantitative (duration of conversational turns, duration of talk and silence) and qualitative (semantic connectivity) linguistic aspects of conversations of oral deaf peers during undirected play. Preliminary data will be presented regarding the frequency and duration of 1) conversational turns, 2) talk and silence, and 3) connected and failed turns in individual children and between children in a dyad. Comparisons to existing data with normal-hearing preschoolers and children with cochlear implants are made and directions for the next step in the analyses and methodology are proposed.

Introduction

Human infants are born into a richly structured socio-cultural environment of caregivers, objects, and routines that create affordances for the emergence of uniquely human capacities such as spoken language (Tomasello, 1992). American infants are immersed in Western practices of child-rearing that include close contact and frequent interactions with a caregiver, infant-inspired cultural artifacts such as bouncy seats, “Boppy’s”, pacifiers, and changing tables, and highly structured routines such as diapering, feeding, “tummy-time”, and sleeping. In addition, typically developing humans possess social-cognitive abilities such as social imitation, shared gaze, and joint attention that allow them to “tune-in” to others from in the first hours of life. Socio-cultural theories of development posit that the phylogenetic and ontogenetic development of higher psychological functions such as spoken language acquisition, reasoning, problem-solving, and concept development emerge from the intimate relationship between our socio-cultural environment and our social-cognitive and social learning abilities (Nelson, 1996; Tomasello, 1992). From this perspective, human cognition is socially—and linguistically—mediated through interactions with others using cultural artifacts within socially shared events that make up everyday life (Vygotsky, 1978).

A usage-based or functional theory of language acquisition suggests that language structure—lexical, grammatical, syntactical, and conversational—emerges from language function thus taking seriously a socio-cultural perspective of cognitive development (Tomasello, 2003). From this perspective, the acquisition of a new piece of language emerges naturally through a child’s active use of joint attention and imitative learning in prestructured events so that “…communicative uses of words and utterances…serve as resources for the individual language learner’s construction of structure” (Nelson, 2006). The functional perspective obviates the need for a priori linguistic knowledge on the part of the child as posited by formalist theories, and suggests rather that social learning and socio-cognitive abilities are sufficient for explaining language acquisition. Consideration of the social and linguistic experiences of an individual child is therefore essential to understanding language acquisition; differences in experience will result in individual differences in development (Nelson et al., 2003).

Deaf children of hearing parents experience degraded or limited opportunities to actively listen and participate in communicative exchanges; therefore their functional use of language is very different from normal-hearing children. The structure of language that emerges from these experiences will be
very different as well. Differences in structure and function of language will affect higher cognitive processes that are mediated by language such as executive function, theory of mind (ToM), reasoning, and problem solving.

A large part of our knowledge of speech and language development of hearing impaired children and deaf children with cochlear implants is obtained through context free assessments of speech perception, production and standardized language measures. Although highly controlled testing procedures and normed measures are necessary for evaluating speech and language outcomes more proximal to hearing loss, they provide little information about more distal outcomes such as a child’s functional use of language in everyday social interactions from which the lexical, syntactical, and grammatical structure of language emerge (Tomasello, 2003). Sociocultural theory and research suggests that from birth the social and linguistic environments of normal-hearing children and a child’s active participation in social exchanges are integral to language and vocabulary acquisition (Akhtar, Jipson, & Callanan, 2001; Tomasello, 2003), socio-cognitive development (Ontai & Thompson, 2008; Racine & Carpendale, 2007), autobiographical memory (Fivush & Nelson, 2004) and communicative competence (Tomasello, 1992).

Atypical development of linguistic structure and impoverished communicative exchanges may contribute to some of the delays observed in social and emotional understanding of deaf children (Moeller & Schick, 2006; Peterson, 2004; Schick, de Villiers, de Villiers, & Hoffmeister, 2007; Woolfe, Want, & Siegal, 2002). In normal-hearing preschoolers, maternal talk about mental states such as cognitions, desires, and emotions is related to children’s performance on tasks of emotion understanding (Denham, Zoller, & Couchoud, 1994; Taumoepau & Ruffman, 2006). Mother’s and children’s mental state talk within semantically connected conversation at 2 years of age both independently predicted social understanding at 4 years of age (Ensor & Hughes, 2008). In a comparison study of maternal linguistic input, Moeller and Schick (2006) reported that hearing mothers of normal-hearing children referenced mental states more frequently than hearing mothers of deaf children, suggesting a functional explanation of the developmental lag in social understanding experienced by deaf children of hearing parents (Peterson, 2004).

There is evidence that both qualitative and quantitative linguistic maternal input is related to language ability in preschoolers who are CI (cochlear implant) users. DesJardin and Eisenberg (2007) found that mother’s mean length of utterance (MLU) and facilitative language techniques such as open-ended questions and recasts were significantly correlated with their child’s expressive and receptive language ability and also accounted for a significant portion of the variance in language beyond that explained by the child’s age. Schick and her colleagues (2007) reported that vocabulary and comprehension of false complement clauses, which allow for a false proposition in a true sentence, were independent predictors of successful reasoning about false beliefs in deaf children who use oral language or American Sign Language. Combined, this research suggests that rich conversational environments that include conversational scaffolding by parents and syntax for representing mental state concepts may explain some of the contribution of language to the development of social understanding in young deaf children.

During the preschool years children begin to forge friendships and relationships beyond their immediate family. These relationships expand the range of collaborative activities and conversational environments available to children. In normal-hearing preschoolers, the linguistic features of conversation between a child and her mother, sibling, or peer are different suggesting that children converse and interact with different interlocutors in different ways (Brown, Donelan-McCall, & Dunn, 1996; Cutting & Dunn, 2006). We know very little about the qualitative linguistic features of
conversation between oral deaf peers such as ignoring, repeating, and elaborating. Nor do we know much about how these functional uses of social dialogue relate to speech, language and academic outcomes. Investigation of conversational interactions of deaf peers who use spoken language is important because a percentage of these children will likely be mainstreamed into classroom environments of typically developing children and mainstreamed classroom instruction. This classroom environment will require children to be competent users of spoken language so they may actively participate in social and linguistic interactions with peers and teachers.

One qualitative feature of conversational interactions is connectedness of alternating exchanges of two people engaged in a conversation. A speaker’s utterance is defined as connected if it is semantically related to the interlocutor’s prior utterance (Gottman, 1983). A measure of connectivity between two speakers engaged in a joint activity can give us information about how well the speakers are “tuned in” to one another. Tuning in requires general knowledge about the desires, beliefs, and intentions of one’s interlocutor and linguistic ability to negotiate an activity using this knowledge. Connectedness of conversations is related to the development of social understanding in typically developing preschoolers. In their investigation of mother-child conversations with 2 year olds, Ensor and Hughes (2008) found that mothers referred to mental states most often during connected turns and that both children’s and mother’s references to mental states within connected turns predicted social understanding at age 4. In a study of the play conversations of 4 year old peers, Slomkowski and Dunn (1996) found that children spent the majority of the play session in connected communication and that the average percentage of connected turns was highest during pretend play. Connected communication was positively correlated with false belief performance and affective perspective-taking. These findings suggest that the ability to engage in connected conversations with an interlocutor may facilitate the development of social understanding.

The present study examines the conversations of oral deaf peer dyads during undirected play. Measures of both qualitative and quantitative aspects of conversational exchanges are assessed. As this is a work in progress, the measures analyzed thus far include the semantic connectivity of the exchanges between peers, the amount of time they spend in silence during a play session, and the duration of their conversational turns. Future analyses will examine children’s use of mental state references within connected and failed exchanges and intelligibility of exchanges. These measures will be compared to those of normal-hearing age-matched peers engaged in the same activity. Normal-hearing data has been collected and is presently being transcribed. These qualitative aspects of conversation are hypothesized to be responsible for the contribution of everyday conversations to social understanding in normal-hearing children (Beer, In preparation; de Rosnay & Hughes, 2006; Ensor & Hughes, 2008; Harris, de Rosnay, & Pons, 2005)

Methods

Participants

Children were recruited from an oral deaf school in Indianapolis. A speech/language pathologist familiar with the spoken language abilities of each child paired children into dyads based on her assessment of their ability to use spoken language to communicate and the availability of a familiar same gender peer. Criteria for inclusion to the study were that the child used oral language to communicate, had no disabilities that would impede him or her from engaging in pretend play with a peer, could be paired with a same gender peer, and had a monolingual English home environment. Eight children (4 dyads) participated in this study ($M$ age = 5.58 yr $SD = .92$, $Range = 4.5$ to 7.25 yrs). Table 1 provides descriptive information regarding hearing loss. Hearing age refers to the number of years the child has
experienced aided hearing, either through the use of a hearing aid or a cochlear implant. It is calculated by subtracting the age at which the child received aided hearing from the child’s chronological age at testing.

<table>
<thead>
<tr>
<th>Dyad</th>
<th>Child</th>
<th>Age</th>
<th>Hearing Age</th>
<th>Type of Aid</th>
<th>Degree of Loss</th>
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<tr>
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<td>1</td>
<td>7.25</td>
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<td>CI&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Sev-Prof&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>2</td>
<td>5.75</td>
<td>2.5</td>
<td>CI (bi)&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Sev-Prof</td>
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<td>B</td>
<td>3</td>
<td>4.92</td>
<td>3.25</td>
<td>CI</td>
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<td>HA (bi)&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Mod-Sev&lt;sup&gt;e&lt;/sup&gt;</td>
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</table>

Table 1. Participant Descriptives
<sup>a</sup>Cochlear implant.  
<sup>b</sup>Severe to profound hearing loss.  
<sup>c</sup>Bilateral cochlear implants.  
<sup>d</sup>Bilateral hearing aids.  
<sup>e</sup>Moderate to severe hearing loss.

Procedures

Each peer dyad played in a familiar room at their school for 15 minutes, after which they returned to their classroom. The interactions were recorded by a video camera. Each child wore a wireless microphone and mini audio recorder in a fanny pack. Total participation time took approximately 30 minutes from start to finish. Parents were informed of their child’s peer partner prior to the play session so they could prepare their child prior to participation. Toys for both boy-boy and girl-girl pairs included kitchen items and pretend food. Toys for boy-boy pairs also included a castle with knights and Rescue Hero’s with their vehicles. Toys for girl-girl pairs included and a dollhouse with Polly Pockets and Barbie’s with their vehicles. Children were introduced to the toys and encouraged to play. Once the children appeared to be comfortable with the room and the equipment, the experimenter told them to play independently while she did some work in another area of the room and assured them that she could still see and hear them should they need her. Children received a small toy for their participation.

Measures

**Qualitative linguistic measures.** Each videotape was transcribed into alternating conversational turns. A conversational turn included the utterances of one child bound by the utterances of the other child including non-words, talk to self, and silence within the turn (adapted from Shatz & Gelman, 1973). Nonverbal responses and elicitations consisting of gestures and shifts in gaze were coded as conversational turns. Each turn was coded for semantic connectivity. A connected turn is one that is semantically related to the partner’s previous utterance. A failed turn is not semantically related to the partner’s prior utterance.

**Quantitative linguistic measures.** After transcription of the play session was complete, two duration measures were calculated using the soundwave of the individual audio recordings. The duration of each conversational turn was measured and excluded? within-talker time in silence that measured over 5 seconds in duration. The second measure of duration was total time in silence for the 15 minute play session. This measure included silence between talkers and silence within a talker of more than 5 seconds in duration.
**Language measures.** Two measures of language were obtained for each child. Vocabulary ability was assessed using the Peabody Picture Vocabulary Test (PPVT-4; Dunn & Dunn, 2007). Overall language ability was assessed using the Clinical Evaluation of Language Fundamentals-Preschool (CELF-P; Wiig, Secord & Semel, 1992). Both the PPVT and the CELF-P have means of 100 and standard deviations of 15. Clinically significant scores are those that fall one standard deviation below the mean (85 or less). All but one child fell within the normal range in vocabulary whereas only two children fell within the normal range in overall language (See Figure 1).

![Figure 1. Language scores for each child.](image)

**Results**

**Connected Conversation**

Each of the 8 children had more connected than failed turns during the 15 minute play session with a mean proportion of connected to total turns of .62. There was surprisingly little variability in the number of connected turns across children with the frequency of connected turns within the 15 minute play session ranging between 37 and 44 for all but one child (See Figure 2).

![Figure 2. Number of connected and failed turns for each child.](image)
Time in Silence

All but one of the four peer dyads spent more of the play session in silence than talking with a mean percent time in silence across all dyads of 34% (Range = 26% to 47%) (See Figure 3). Tye-Murray (2003) reported percent time in silence of 15% for oral deaf children and 5% for normal-hearing children age 8 and 9 in conversation with an unfamiliar adult.

![Time in Silence for Each Dyad](figure3)

**Figure 3.** Percent time in silence and talk for each dyad. Off task refers to the percent of time children disengaged from one another to address the experimenter.

Duration of Conversational Turns

The durations of conversational turns across all children were highly variable with a mean of 3.83 seconds ($SD = 6.09$, Range = 0 to 59.99 seconds). Seventy-five percent of all conversational turns were between 0 and 4 seconds in duration. As shown in Figure 4, within individual children there was a large amount of variability in the duration of conversational turns. A large amount of individual variability in duration of speaker turns may lead to imbalance in the conversation when examined at the level of the dyad with one child doing most of the talking during the play session.

![Conversational Turn Duration by Child](figure4)

**Figure 4.** Mean durations of conversational turns for each child. Error bars represent standard error.
CONVERSATIONS OF DEAF PEERS

Duration of Connected and Failed Turns

In this analysis the duration of connected and failed turns were calculated, thus combining both a qualitative and quantitative measure of conversation. Results indicate that failed turns were longer than connected turns for six of the children, and that the mean duration of failed turns was greater than the mean duration of connected turns ($M_{failed} = 4.5, SD = 7.1$ vs. $M_{connected} = 3.4$ sec, $SD = 5.4$). Figure 5 shows durations of connected and failed turns for each child.

![Duration of Connected and Failed Turns](image)

**Figure 5.** Durations of connected and failed turns for each child. Error bars represent standard error.

Discussion

The results of this study indicate that deaf children who use oral language are able to engage in connected conversation with a peer and do so in about 60% of their exchanges. This percentage is close to that reported by Slomkowski and Dunn (1996) in normal-hearing 4 year old peer play. The children in the present study are on average one and one-half years older than the children in the Slomkowski and Dunn study, suggesting a possible lag in the ability of deaf children to engage in connected conversation compared to normal-hearing same age peers. Whether or not there is a lag will be answered by comparing this data to normal-hearing age-matched controls. It is encouraging, however, to find that oral deaf children who have had on average three years of aided hearing are able to engage in connected exchanges with another oral deaf peer. This type of exchange can be thought of as the necessary foundation upon which more socially and cognitively complex exchanges may be co-constructed.

With regard to time in silence, findings show that 3 out of the 4 peer dyads spent more time talking than in silence. Time in silence is a measure used by Tye-Murray (2003) to assess conversational fluency in cochlear implant recipients. She reported that time in silence is negatively correlated with intelligibility, AV speech perception, and auditory only speech perception. The children in the present study spent more time in silence than the oral deaf children in the Tye-Murray study. However, a direct comparison should be made with caution because the children in the present study were 3 years younger than the children in the Tye-Murray study and played with a peer as opposed to conversing with an unfamiliar adult. A normal-hearing age-matched control group engaged in the same free play activity is necessary in order to identify group differences in conversational measures.
The durations of conversational turns were highly variable between children with some turns lasting a few seconds and others lasting almost one minute. Comparisons of the durations of connected versus failed turns suggest that failed turns are, in general, longer than connected turns. It is possible that failed turns are longer due to expressive language delays of oral deaf children or to socio-cognitive deficits that make it difficult for these children to “tune in” to a peer using spoken language. By tuning in I am referring to a child’s ability to use perspective taking and coordination skills to engage in collaborative activities with a peer.

These preliminary findings suggest that oral deaf children may have difficulty establishing and maintaining connected conversation with a peer—a necessary precursor to more sophisticated linguistic interactions that require collaborative co-construction among conversational partners. Connected talk and time in silence are key tools for assessing a child’s ability to engage a person verbally and sustain successful and collaborative conversations. These measures speak directly to a child’s functional use of language, or communicative competency. These types of measures are not routinely used to evaluate outcome in cochlear implant recipients, but are highly relevant to understanding the efficacy of cochlear implantation (Pisoni et al., 2008). This line of research will allow the identification of differences in linguistic features of conversation between normal-hearing peers and oral deaf peers. These differences may explain some of the variability in more distal outcomes related to hearing loss such as the delay in social understanding observed in deaf of hearing children (Peterson, 2004; Peterson & Siegal, 1999), as well as contribute to our understanding of new areas of research such as communicative competence of oral deaf children. In addition, assessment of both qualitative and quantitative aspects of conversations may explain other language-related delays in deaf of hearing children such as ToM (Theory of Mind), emotion understanding, and particular aspects of executive function (Pisoni et. al., In press; Figueras, 2008).

Future Directions

The data presented in this report are descriptive and represent preliminary findings. I am presently transcribing and coding data of age-matched normal-hearing peer dyads in order to identify differences in the conversations between the two groups of children engaged in the same 15 minute play activity. Preliminary comparisons between the four hearing impaired (HI) dyads and the four normal-hearing (NH) dyads indicate group differences in the mean number of exchanges per dyad (M (HI) = 136.5, M (NH) = 162.5), the percent of connected turns (M (HI) = 61%, M (NH) = 70% ), and the mean number of references to mental states (M (HI) = 14.5, M (NH) = 26.5) during the 15 minute play episode. Both groups referred to mental states most often during connected turns and the differences between groups in the percent of mental state references that occur within connected turns was minimal (M (HI) = 67%, M (NH) = 71% ). This preliminary data suggests differences in both the qualitative and quantitative aspects of conversations of hearing impaired and normal-hearing peers. Hearing impaired children may have difficulty engaging in and maintaining perspective-rich conversation with a peer. Correlations between language ability and these qualitative and quantitative aspects of conversations will be calculated.

References


