Empirical Manuscript

Intersubjective Interaction Between Deaf Parents/Deaf Infants During the Infant's First 18 Months

Carin Roos1, Emelie Cramér-Wolrath2, Kerstin W. Falkman3

1Karlstad University 2National Agency for Special Needs Education and Schools 3Göteborg University

Abstract

This study is part of a larger longitudinal project with the aim of focusing early social interaction and development of mentalizing ability in 12 deaf infants, including the interaction between the infants and their deaf parents. The aim of the present paper is to describe early social interaction and moments of intersubjectivity between the deaf infants and their deaf parents during the first 18 months of the infant's life. The study is focused on the dyadic interaction rather than on the behaviors of the infant and the caregiver separately. In the analysis, the Intersubjective Developmental Theory Model (Loots, Devisé, & Sermijn, 2003) and the definitions of moments of intersubjectivity (Loots, Devisé, & Jacquet, 2005) were used. The findings show that the participating infants follow a typical developmental trajectory of intersubjectivity, both with regard to developmental stages and age. This development is supported by a visual, simultaneous way of communicating by gaze rather than having constant eye contact. Parents use complex visual communication skills in maintaining joint attention and also expect the infant to grasp the meaning of the interaction by use of gaze contact.

A considerable body of research has focused the importance of early interaction between caregivers and infants, including research identifying the communicative behavior of deaf parents with deaf children (Harris, 2001; Loots & Devisé, 2003; Loots, Devisé, & Jacquet, 2005), hearing mothers with hearing children (Green, Nip, Wilson, Mefferd, & Yumnosova, 2010; Meins, 1997; Meins et al., 2002; Trevarthen, 1979), and hearing parents with deaf children (Nowakowski, Tasker, & Schmidt, 2009). This research has also analyzed the impact of these behaviors on the dyadic interaction, both on the ongoing interaction and on the infant’s later development and learning. The capacity for triangular intersubjective interaction in very young infants, involving the infant as well as both mother and father, has also previously been described in the literature (Fivaz-Depeursinge, Favez, Lavanchy, de Noni, & Frascarolo, 2005). However, only a few studies focusing on deaf infants younger than 18 months have been reported (Koester, Traci, Brooks, Karkowski, & Smith-Gray, 2004; Spencer, 2004; Waxman & Spencer, 1997), and none have described the development of intersubjectivity in deaf children of such young age. The present study is thus an important contribution to this field of research because it analyzes data from children between 1 and 18 months of age.

This study is part of a larger, longitudinal study with the aim of describing early social interaction and development of mentalizing skills in deaf infants with deaf parents during their first 24 months of life. All but two of the infants participating in the study are deaf. The remaining two infants have a severe hearing loss (70–90 dB on the best ear). All parents except five of the mothers are also deaf. The mothers who are not deaf all have severe hearing loss.1 All participants in the study use Swedish Sign Language (SSL) as their primary mode of communication. The part of the study presented in the current paper aims at describing moments of intersubjectivity with focus on visual preconditions in the environment and the use of sign language, using Loots, Devisé, and Sermijn (2003) intersubjective developmental theory as a starting point.
Intersubjectivity

Gillespie and Cornish (2009) state that researchers broadly “take intersubjectivity to refer to the variety of possible relations between people’s perspectives.... Perhaps because of this broad relevancy research has been fragmented” (p. 19). They outline six different definitions of intersubjectivity found in research: intersubjectivity as (a) agreement between people in the sense of having the same definition; (b) having mutual awareness of agreement or disagreement; (c) the attribution of intentionality, feelings and beliefs to others; (d) conceptualizing intersubjectivity as implicit and automatic behavior orientating toward the other; (e) situated, interactional and performative in nature; and (f) shared and taken-for-granted agreements people assume they have, which make them act accordingly. We agree with Gillespie and Cornish’ suggestion that all these definitions ought to be taken into account because the concept is complex.

In the present study, the concept of intersubjectivity refers to the shared involvement in another person and to “interaction sequences of shared involvement in a reciprocal exchange” (Loots et al., 2005, p. 358).

The Development of Intersubjectivity

The development of intersubjectivity begins early in life (Trevarthen, 1979, 1993) and continues in mutual interchange, where the child has the possibility to perceptualize what takes place in the interaction (Akhtar & Tomasello, 1998). It is well established that infants possess communicative competence from the very beginning in life (Koester & Lahti-Harper, 2010). Hearing infants, for example, have innate skills that predispose them to recognize and adapt to parents’ voices and faces (Nagy, 2008), skills that are important for the development of intersubjectivity. Newborn infants not only imitate but are also able to initiate communication, which means they are able to participate in reciprocal interactions (Nagy & Molnar, 2004; Trevarthen, 1979). The child is motivated by his or her innate intersubjectivity (Trevarthen, 1979) and stimulated to take an active part in interaction with others, especially with the caregiver. When an adult talks about the things that a child is looking at, following the child’s pointing gesture or eye gaze, tuning in and creating a mutual feeling of understanding, they also provide an opportunity for the child to grow cognitively.

Eye gaze, crying, and reaching for objects are examples of early behaviors through which the child expresses intersubjectivity. Later in development, the child will show intention by requesting things, first by looking from an object to the caregiver and back and even later by linguistically labeling the object of joint attentional focus (Tomasello & Farrar, 1986).

Intersubjective Developmental Theory of Early Caregiver–Child Interaction

Loots et al. (2003) have presented an intersubjective developmental theory of early caregiver–child interaction, based on Crossley’s (1996) and Stern’s (2000) work, describing four stages of development. This framework has been successfully used in previous studies analyzing the interaction in deaf parent/deaf child dyads where the child has been between 18 and 29 months of age (Loots et al., 2005) and suits the aim of the present study very well.

The first stage in this model, when mother and infant are involved in physical “joined synchronizations of behavior patterns and vitality affects” (Loots et al., 2003, p. 406), is called emerging intersubjectivity. An example of this could be the mother and infant facing each other, the mother moving her head back and forth toward the infant and the infant, while looking at mother, opens and closes his/her mouth at a similar rate as mother’s movements (Loots & Devisé, 2003, p. 27). During the second stage, physical intersubjectivity, the infant and caregiver are involved in a mutual exchange of behavior patterns where they experience reciprocal interaction and play. This could, for example, entail a situation where the parent plays peak-a-boo with the infant. The parent holding hands up in front of face and then peaking out between hands saying “peek-a-boo,” the child laughs and the parent is ready to hide behind hands again waiting for the infant to laugh and so on (Loots & Devisé, 2003, p. 27). The third stage is called existential intersubjectivity, when the infant learns to see himself/herself and others as subjects with intentions and feelings during sequences of joint attention and plays with caregiver and others. The infant points to an object, while looking at parent, parent picks the toy up, naming it, and giving it to the infant who then gives it back to the parent and so on (Loots & Devisé, 2003, p. 27). The fourth and last stage is called symbolic intersubjectivity and refers to “mental involvement in a mutual exchange of linguistic or symbolic meaning” (p. 406) and leads to the “acquisition of language and is expanded by language” (p. 408). The infant points to a doll while looking at parent, parent takes the doll, saying “Let’s dress her,” the infant looks for the dolls clothes, gives them to parent and so on (Loots & Devisé, 2003, p. 27).

Development of Intersubjectivity in Deaf Children

In deaf parent/deaf child dyads and hearing parent/deaf child dyads, children’s development regarding the impact of visual-tactile behavior on communicative interaction has been described for children after the age of 18 months (Loots et al., 2005). Not much research, however, has been presented describing the communicative behavior of younger deaf infants or parents’ ways of involving their very young infants in moments of intersubjectivity. The hypothesis in the present paper is that the three stages of intersubjectivity described by Loots and Devisé (before symbolic intersubjectivity is reached, can be found in the Deaf/deaf dyads interaction before the age of 18 months. It is of great importance that this can be described because these stages are presumably guided by visual-sequential communication patterns (Roos & Falkman, 2015). There is a risk that hearing parents holding on to an auditory way of communication only, “risk being excluded form involvement in symbolic intersubjectivity with their deaf infants, and the development of mother-infant interaction is at risk of stagnating” (Loots & Devisé, 2003, p. 304). Because intersubjectivity is also crucial for the development of other cognitive processes, including the development of language, we suggest that hearing parents need to learn how to support communicative interaction with their deaf infants even before speech or sign language develops in order not to delay this important developmental process.

One central factor in interaction when one or both interlocutors in a dyad are deaf is of course the importance of visuality. It is equally important that both interlocutors are aware of the importance of the visual parameters of the interaction itself, as well as of the importance of the visual conditions for...
Deaf children growing up in deaf families acquire sign language in much the same way and time span as hearing children acquire spoken language (Ahlgren & Bergman, 2006; Emmorey, 2002; Etting, Prezioso, & O’Grady Hynes, 1994; Roos, 2006; see also Schick, Marschark, & Spencer, 2006). This means that the children will begin to interact and start to learn language during their first year of life. Sign language development in a naturalistic sign language environment, such as in a deaf family, takes place in spontaneous interaction just as in a hearing family in a hearing environment (Maestas y Moores, 1980). Because the majority of deaf children are born to hearing parents, most of the research reported so far has dealt with the interaction between deaf children and their hearing families (Knoors & Marschark, 2014; Roos, 2006).

In Sweden, there are only a few studies reporting on very young deaf children and their communicative development (Cramér-Wolrath, 2013; Roos & Falkman, 2012). Ahlgren (1980) carried out a longitudinal study in which she followed four toddlers, two with deaf parents and two with hearing parents. Malmström and Preisler (1991) observed seven Swedish deaf infants aged between 6 and 19 months, three with deaf parents and four with hearing parents. The main results from both studies showed that the deaf infants’ communicative competence and language developed much in the same way as for hearing infants of the same age. Differences were found, however, between the infants with hearing parents and the infants who had deaf parents due to the fact that the hearing parents were not aware of the importance of visual attention and not as fluent in SSL. The hearing parents often failed to ensure that the infant could see what was done or said. Along with the children being more and more active and proficient in SSL, they found that the children could also adjust their way of signing in order to help their hearing parents to better understand what they were communicating.

Cramér-Wolrath (2012) shows that parents use different strategies depending on the child's level of language acquisition and hearing status. The children in Cramér-Wolrath’s study, who were twins, were followed between 10 and 40 months of age. Different expressions were used with and by the children in order to get, maintain, direct, and redirect attention as well as to check for others attention during ongoing communication. The study also included a description of the infant's gaze development as altering over time and was related to the mother's encouragement of gaze contact. Such gaze contact was used for a “flexible and altering contact by eye” (Cramér-Wolrath, 2012, p. 146).

In the Cramér-Wolrath (2012) study, the mother, when the twins were 10 and 11 months old, mainly waited for them to look at her and then immediately encouraged them by smiling, nodding, and commenting on what the infant had just been focusing. However, the mother also moved herself, toys or signed in the infant’s field of vision in order to get or carry on an already ongoing interaction. When the twins were 12 and 13 months old, they participated in joint attention with their mother sitting in her lap. Due to the infant sitting in his/her mother’s lap, the mother’s signing was performed in front of the infant or tactically on the infant while at the same time focusing the target of attention. This is expressed in simultaneous tactile looking (Cramér-Wolrath, 2013, 2015), which seems to be the counterpart to joint attention while visually focusing an object also attending aurally to another individual (Carpenter, Nagell, & Tomasello, 1998). Cramér-Wolrath (2012, 2015) also describes how the infant’s gaze from age 15 month was mediated toward the signer’s face in order to also include the linguistic structure.

Loots and Devisé (2003) suggest that deafness may have a specific influence on the development of intersubjectivity. First, they suggest that there may be difficulties creating moments of shared intention, as the child is not able to hear the parents commenting on an object or event, and at the same time focus on that same object or event. Dyads with hearing parent/deaf child have to focus either on language input or on the object and therefore divide their focus between these two and thus “acquire in sequence what the hearing child gets simultaneously in a visual-auditory way” (p. 302). Second, they assume that this may restrict the infusion of symbols and thus of language input. Third, they suggest that deaf parents “wait for the child to look back at them before commenting on the child's previous focus of attention” (p. 302). Fourth, deaf parents use movements of own body, objects, and other visual-tactile strategies to get the attention of and maintain communication with their deaf infants, whereas hearing parents restrict and control the infant in an adult-centered way without showing visual awareness. This means that the parents act as if the child could hear them or they act as if the child is not capable of understanding their intentions.

Research Aim and Goals
As research on deaf dyads is lacking, this study is to be regarded as basic scientific research in this field. A study describing the development of intersubjectivity during the first 18 months of life in deaf parent–infant dyads offers an important and unique contribution to this field of research. It may also be an important contribution to practice in the field of early education of deaf infants. The goal of the present study was thus to address this gap in empirically based knowledge. The study is exploratory with the aim of describing moments of intersubjectivity between deaf infants and their deaf parents during the infants’ first 18 months of life. The specific research questions to be answered are the following:

- What general patterns of interaction can be found using a dialogical analysis of the dyadic interaction, presumably underpinning moments of intersubjectivity to occur?
- How can moments of intersubjectivity in the participating dyads be described based on the stages of intersubjectivity described by Loots et al. (2003, see Table 1)?

Method
Using video observations, an analysis of spontaneous interaction between deaf caregivers and their deaf infants was carried out based on the Loots et al. (2005) Definition of Moment of Intersubjectivity and the Intersubjective Developmental Theory of Early Caregiver–Child Interaction (Loots et al., 2003, Table 1). The video observations were carried out in the homes of the participating families and they were instructed to act as typical as possible, doing what they would normally do in the given situation.
Table 1. Definition of developmental stages of intersubjectivity (Loots et al., 2003, p. 406, based on Crossley’s and Stern’s theory)

<table>
<thead>
<tr>
<th>Developmental stage</th>
<th>Age of onset</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emerging intersubjectivity</td>
<td>Birth</td>
<td>Physical involvement in a joined synchronization of behavior patterns and vitality affects</td>
</tr>
<tr>
<td>Physical intersubjectivity</td>
<td>2–3 months</td>
<td>Physical involvement in a mutual exchange of behavior patterns and vitality affects</td>
</tr>
<tr>
<td>Existential intersubjectivity</td>
<td>8–10 months</td>
<td>Concrete and affective involvement in a mutual exchange of attachments, feelings, and objects</td>
</tr>
<tr>
<td>Symbolic intersubjectivity</td>
<td>13–15 months</td>
<td>Mental involvement in a mutual exchange of linguistic or symbolic meaning</td>
</tr>
</tbody>
</table>

Participants

Twelve infants participated in the present study and were followed from birth to 18 months of age. The participants in the study constitute, to the best of our knowledge, the whole cohort of deaf children born into deaf families in Sweden during 2008–2010. The families were recruited through direct contact or via health centers. In a pilot study (Roos, 2009), a questionnaire was sent out to all medical centers diagnosing children with hearing difficulties and deafness in Sweden, asking how many deaf children of deaf parents were born in their district during 2007 and 2008. The response rate was 100%. It was found that the total number of deaf children with a hearing loss of 80 dB or greater on the best ear were 25–30 per year. The number of deaf children born to deaf parents in Sweden were 4–6 children per year, which is 16-18% of the total number of deaf children born every year in Sweden. This figure is higher than the 5–10%, which is usually reported, which may be due to fewer cases of deafness caused by rubella, meningitis, or complications of premature birth while heredity in deaf families is constant. This relationship may also be the case in other European countries of today (Table 2).

Background information about the participating families has been kept to an absolute minimum to protect their privacy as much as possible. Six of the parents grew up in hearing families. Three of them attended oral education, grew up in nonsigning families, and learned SSL during later school years. The rest of the parents grew up in deaf families attending schools where SSL was the language of instruction. Two of the parents were born in another European country and the rest of them were born in Sweden. Background information about parents and infants, such as hearing status, education, age of the parents, and language use in the family was gathered from the parents themselves in an initial shorter interview. In the case of the two infants with severe hearing loss, additional information regarding the hearing loss was received from the medical center.

Seven of the 12 participating infants had siblings; one participant had hearing siblings only, five participants had deaf siblings only, and one participant had both hearing and deaf siblings. All participating infants followed a normal trajectory of development and no one is reported to have any additional disabilities.

Data Collection

Data were collected from as early in each infant’s life as possible. The age of each infant at the time of the first observation varies depending on when we got in touch with the family, the youngest infant being 3 weeks old at the time of the first observation and the oldest being 10 months old (Table 3). In this particular paper, only the first 18 months, and in most of the cases this means from the age of 2 to 18 months, are reported. This is due to missing data for four of the children after 18 months of age due to different reasons, mostly because of the project was limited in time.

The parents were videotaped while interacting with their infant. Videotaping was done by the primary author of this paper, who is hearing and fluent in SSL. Most of the video sessions consisted of mother–infant dyads. On average, each video session lasted 1 hr. The shortest video recording is with Eva, 3 weeks old, lasting only 14 min. In some cases, both mother and father were present and in some cases older deaf siblings and/or other relatives were also present. The video sessions always took place in the families’ own home and as often as the family could accept, with the aim to videotape approximately every 6–8 weeks. In some cases, due to family reasons, the visits in the family did not occur as often as planned, which resulted in missing data for some of the children during shorter periods of time. It was important however to be sensitive and adapt to the families in order not to disturb their daily lives more than necessary. The families were followed over a long period of time and they thus got used to being observed and expressed no negative emotion regarding the actual videotaping.

The families were asked to act as much as possible in the same way as they would normally do and to do what they would normally do at that time of day (usually just after breakfast or when the infant had just woken up from a nap). The most common situation in the video sessions are playing together on the floor with the infant’s own toys or interacting with the infant sitting or lying on the parent’s lap.

Data Analysis

The Loots et al. (2005) definition of a moment of intersubjectivity and Loots et al. (2003) developmental stages of intersubjectivity were used to analyze the data.

Moment of intersubjectivity is defined as “a sequence of interaction that succeeds an initiation of the parent or the infant and that meets the next three terms …” (Loots et al., 2005, p. 364). These three terms are described as (a) the interaction moment consisting of four or more consecutive interaction turns with responses within a time span of 5 s; (b) the interaction moment characterized by topic continuity, which is referred to in any part of the prior turn; and (c) the interaction moment characterized by behavior and/or attention by both caregiver and infant being directed at the same activity, object, or event, with no interruption lasting more than a time span of 1 s.

The interaction between the 12 participating infants and their parents was analyzed by using the mid 10 min of every video recording (usually 30–45 min long in total). As previously described, there are missing data for some periods of time for some of the participating infants. Recordings were thus selected evenly distributed across time choosing recordings from 1 to 3, 6 to 8, 11 to 13, and 16 to 18 months, focusing periods of time with as little missing data as possible.

Data were coded using ELAN, a professional tool for the creation of complex annotations on video and audio resources.
from Max Planck Institute for Psycholinguistics, Nijmegen, Netherlands. The coding was carried out in four steps. First, all moments of interaction were registered as labels on the ELAN window space for tiers. Moments of interaction are here defined as moments of reciprocal action in a dyad with the aim of giving and receiving attention. Because ELAN makes it possible to work
they did not (e.g., when the infant and caregiver were only looking at different things or the child was playing alone and the parent was simply waiting).

This process made it easier to proceed to the second step of the analysis in which the interaction turns were registered according to the definitions of moments of intersubjectivity reported by Loots et al. (2005). The sequences of interaction were in this step labeled according to the three terms for moments of intersubjectivity, with the aim to ensure that all these terms were met in the sequences.

The third step was to register the developmental stages of intersubjectivity (see Table 1) as defined by Loots et al. (2003). Both initiations and responses were registered, for both adults and infants, in the videos as annotations visible in the ELAN Timeline Viewer in line with the Loots et al.’s (2005) coding scheme. Signs were first written in italics sign for sign, and the utterances were then transcribed and translated into written Swedish.

Following the definition of Developmental Stages of Intersubjectivity in Loots et al. (2003, p. 406), based on Crossley’s and Stern’s theory (see Table 1), moments of intersubjectivity were coded as labels, one for each stage of intersubjectivity in the ELAN Timeline Viewer.

The interaction was labeled as emergent intersubjectivity when the infant and parent were involved in a joint synchronized body movement or exchange of facial expressions. We also coded the interactive moment as emergent intersubjectivity when the infant was looking at the parent’s signing and moving his or her own hand in a synchronized movement. The moments of physical intersubjectivity were coded as such when parent and infant were involved in a mutual physical exchange of behavior patterns like tickling and laughing for example.

Moments of intersubjectivity when parent and infant were playing together involved in a concrete exchange of intentions, feelings, and objects were coded as existential intersubjectivity. These moments are characterized by facial expressions or movements to initiate play with parent or sibling. The initiative coming from the child was here of specific interest.

Moments of intersubjectivity were coded as symbolic intersubjectivity when the infant either responded correctly to a verbal statement from the parent or the infant used words or referential gestures (with a semantic content understood both by the infant and the parent) at least once during the sequence.

The fourth and last step was to analyze all the sequences once more, observing also the complexity of them and the context in which they occurred. This step was inspired by Gillespie and Cornish (2009) suggestions that the study of intersubjectivity is complex and that there is a need not only to register the behaviors of the participants but also what they say and how this seems to be understood by the other and what impact the context and environment may have on the particular situation.

In the present case, the impact of the visual environment and the fact that the dyads use SSL as mode of communication have been taken into account. A dialogical analysis as suggested by Gillespie and Cornish made us aware of the importance of visual perception and visuality in what occurs in these dyads. The aim here was to make a dialogical analysis of the dyadic interaction. This was done using the concepts context, addressivity, and voices. Context was used with the notion that “every utterance or communicative gesture can only be understood in terms of the expected audience to which it orients and the actual audience that it finds” (Gillespie & Cornish, 2009, p. 33). This means that the analysis was done reanalyzing every sequence with this in mind looking for the parent or the infant explicitly showing expectations of the other as a competent audience; the parent seemingly thinking of the infant as someone understanding and wanting to communicate, and accordingly the child expecting to be listened to. Addressivity was used in reanalyzing the sequences looking for the “way in which utterances orient to, and position, the audience” (Gillespie & Cornish, 2009, p. 34). The analysis dealt with finding out how the moments of interaction were shaped with focus on how parents were positioning the infant, orienting toward him or her, and vice versa. The idea of voice is useful for the study of intersubjectivity because it may reveal “the presence of multiple perspectives within a single utterance or brief exchange” (Gillespie & Cornish, 2009, p. 35). In the case of voice, it includes an analysis of what is said, or in other ways communicated, and with what meaning. These three concepts made it possible to not only describe that intersubjectivity seems to occur but also with whom, how, and in what way.

This dialogical analysis resulted in what we describe as general interaction patterns important in enabling intersubjectivity.

Reliability

An intrarater reliability procedure was used (Armstrong, Gosling, Weinman, & Marteau, 1997). Two of the researchers independently labeled and coded randomly selected video observations (4 of the total 34 observations that were included in the analysis) using ELAN in the same way as all data later were labeled and coded in the four steps described earlier. Both researchers doing the coding are fluent in SSL. In cases when disagreement was found, the coded sections were discussed until consensus was reached. Differences were found in coding only regarding sequences where the primary researcher coded the initial part of longer interactions as moments of existential intersubjectivity and the rest as symbolic intersubjectivity, whereas the secondary researcher coded the whole sequence as symbolic intersubjectivity. This means there was total agreement for part of the sequences but different interpretations of the change from existential to symbolic intersubjectivity in the same sequence. Using an interrater procedure was not aimed at finding out the percentage of agreement, but to be able to critically reflect on disagreements and to improve consistency of analyses (Armstrong et al., 1997; Pope, Ziebland, & Mays, 2000). Agreement was reached that it is important to distinguish between these two categories of intersubjectivity because it establishes how the interactions often start, namely by a mutual interest in an object or event expressed through eye contact, mutual smiling, or other facial expressions, and which is then commented upon by both parent and infant. The primary researcher alone coded the rest of the sections but discussed them continuously with the secondary researcher.

Findings

The aim of the present paper is to describe early social interaction and moments of intersubjectivity between deaf infants and their deaf parents. The excerpts in the following sections were selected because they are typical for the whole category of data that is put forward. We chose not to focus on the variation but instead on what we found to be common for the whole group of infants. On some occasions, however, it is also worth mentioning some findings that point to differences, showing for instance parents’ views or a single infant’s exceptional
or different behavior to broaden the reader's understanding. Because there are very few (4–5) deaf children born each year to deaf families in Sweden, we have tried to give as few excerpts as possible in order to maintain anonymity, while still providing enough for reliability reasons. Thus, the excerpts given were selected to provide a good description of the categories found in the data. The names used for participants are fictitious (see Table 2).

General Interaction Patterns

The interaction in the analyzed sessions shows some interesting and important general findings. These findings are interesting because they show the general interaction patterns and give us an idea of the parents' underlying conscious and unconscious assumptions about the children's competence and about their idea of how an interaction should be shaped in a signing context.

First are the findings showing the competence in the dyad's interaction. The parents did seem to expect even the very young infant to understand language, even if they, when asked a straight question, said that the child of course did not always do so. The importance here is the parents' way of thinking about their child as competent and the way they also acted accordingly. The parents generally assumed that the children would and could learn to sign as soon as they could move their fingers and arms and that they meanwhile have to sign with their child in order to provide the child with the opportunity to learn. One example of this is that they fingerspelled even with their very young infants, first seen in the data with a child aged 2:2 (i.e., the child was 2 months and 2 weeks old at the time). All families, with only one exception, seemed to have high expectations of their infant's ability to understand language. The family that acted differently and expressed a different view during the video observations had several children already, all of them hearing. They seemed to have underlying negative assumptions concerning their own signing and whether very young children can learn to sign as early as hearing children can learn to speak. The hearing children in the family had developed their signing and speech during the second year of life. When talking to the family before and after sessions, they seemed not to be in any way worried that their deaf child would not learn to sign later on. The main focus for them now was that their child was happy and that they in turn had time to spend playing with the child. When asked about why they used a lot of mimic and gestures and few conventional signs, the mother said "Children that young are not able to sign!" She had a smile on her face and did not in any way seem to think her answer was odd. On the contrary, her facial expression showed forbearance with the researcher's question. She signed now and then look at the infant who is continuously looking at the camera. Filming you.

Developmental Stages of Intersubjectivity

Table 4 provides a summary of the ages at which each infant participating in the study reached each step of intersubjective development. It needs to be stressed that the month given in the table is the first month found in the data set for each infant and developmental stage. This means that it is possible that an infant has reached a certain stage before we had the opportunity to record it on tape. In the text below, the findings are described and illustrated by excerpts from the findings.

Emerging intersubjectivity

Emerging intersubjectivity is described as physical involvement in a joint synchronization of behavior patterns and play where the child and parent join in emotional expressions of movements and face. During such moments of intersubjectivity the infant did not always look at the parents' face. However, the infants often seem to be looking at their parents' hands consistently moving in the field of their vision, this was especially true for the very young infants. Often in these cases, the infant is resting on the parent's left arm while the parent is signing with the right hand conversing with another person. Parents additionally located their signs in front of the infant's face whenever they did not have eye contact. When the child is sitting on someone else's lap, the parent seeks eye contact by leaning down near the infant's face, beginning to sign immediately when obtaining eye contact. The parents also often tapped the infant gently on arm or leg at the same time as seeking eye contact. The intersubjective moment often consisted of smiling and moving hands or head in a joint synchronized movement. The infant sometimes also moved his or her hands in a way that corresponds to the infant's facial expressions at the same time. In this way, the parents could always sign in the infant's field of vision, even if they also often signed in his or her peripheral field of vision.

The third finding of a general kind was the infants' great interest in visually following the parents' interaction with others. The infants participating in the study were all visually alert and showed visual attention early in life. We found, for instance, one section in the data where a child as young as 3;3 was following the conversation between four other persons. The camera was in this session focusing the infant sitting in a baby-sitter on the floor in the kitchen. The mother is sitting on the floor beside him. The researcher is standing up on the other side of the baby-sitter. An older sibling and the father are sitting, each sitting on a chair, facing the infant on the floor. Mother, researcher, sibling, and father are conversing about the infant. While doing so, they now and then look at the infant who is continuously looking at the person signing at the moment, turning head, and gaze toward the current signer. Suddenly, the mother signs "Oh he is interested. He is following them with his eyes, back and forth." She turns to the father and sibling signing, "He is following what you two are signing." Some minutes later he is also seen looking at the researcher with the camera (holding a small camera low, near the hip) signing something to the mother. Mother comments on that and then, leaning toward the infant, signing and pointing in the peripheral field of the child's vision "That is a camera. Filming you."

Table 4

Table 4 provides a summary of the ages at which each infant participating in the study reached each step of intersubjective development. It needs to be stressed that the month given in the table is the first month found in the data set for each infant and developmental stage. This means that it is possible that an infant has reached a certain stage before we had the opportunity to record it on tape. In the text below, the findings are described and illustrated by excerpts from the findings.
especially noted how the infant would make a distinct open- and-closing hand movement when parent used a sign with an open hand and outstretched fingers. One such an example was when Eva (2;3) is lying on her mother’s left arm looking at her mother’s right-hand signing. Mother is communicating with another person. Mother is signing “No there is no problem!” (NO is signed with an open hand and outstretched fingers, shaking it a little). Mother is signing the NO for 0.7 s. When mother has signed NO for 0.2 s, the infant opens her hand with outstretched fingers, holding it in this way for 1.4 s, thus 0.9 s longer than the mother. This occurred several times in the same video sequence.

**Physical intersubjectivity**

Physical intersubjectivity is described as physical involvement in a mutual exchange of behavior patterns and vitality affects. The parents in the study tend to be very aware of where their infant is looking and responds by commenting on what the infant is looking at or holding the object up so that the infant can touch it. An example of this is when Miles (6;3) is sitting in his high chair at the dinner table. Mother is looking at him but he is looking at a toy lying on the table, but out of reach. Mother picks it up and puts it near his hand. He does not pick it up, but continues to look at it while moving the palm of his hand upwards. Mother smiles and picks the toy up and puts it near his hand. He does not pick it up, but continues to look at it while turning the palm of his hand

---

Table 4. Overview, onset for each child on each developmental stage

<table>
<thead>
<tr>
<th>Child name*</th>
<th>Age at first recording (in months)</th>
<th>Emerging intersubjectivity</th>
<th>Physical intersubjectivity</th>
<th>Existential intersubjectivity</th>
<th>Symbolic intersubjectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age of onset: birth</td>
<td>Age of onset: 2–8 months</td>
<td>Age of onset: 8–13 months</td>
<td>Age of onset: 13 ≥ months</td>
<td></td>
</tr>
<tr>
<td>1. Laura, girl, November 2007</td>
<td>10</td>
<td>10;2</td>
<td>11;0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Neal, boy, January 2008</td>
<td>10</td>
<td>10;0</td>
<td>13;3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Ally, girl, April 2008</td>
<td>1</td>
<td>1;2</td>
<td>6;3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Kalin, boy, May 2008</td>
<td>8</td>
<td>6;3</td>
<td>6;3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Lilly, girl, December 2008</td>
<td>2</td>
<td>4;2</td>
<td>11;3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Amy, girl, December 2008</td>
<td>6</td>
<td>6;1</td>
<td>8;0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Ashley, girl, January 2009</td>
<td>5</td>
<td>5;1</td>
<td>10;3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Miles, boy, February 2009</td>
<td>6</td>
<td>6;3</td>
<td>11;1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Eva, girl, February 2010</td>
<td>3 weeks</td>
<td>2;3</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Emmy, girl, March 2010</td>
<td>1</td>
<td>1;1</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Leonard, boy, April 2010</td>
<td>1</td>
<td>1;2</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Rose, girl, July 2010</td>
<td>4</td>
<td>4;1</td>
<td>11;2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Names are fictitious.

It is a most advanced example in the data is when Amy (17;2) has a discussion with her mother out on the parking lot near a small road she apparently knows she is not supposed to go to. She has stopped just nearby, looking up at her mother that has a wrinkle between her eyes, thus looking a little bit angry. It seems Amy knows she is not supposed to be that close to the road but does not want to admit it. The contrary, she wants to state her own will and her mother does not stop her. The mother instead shows confidence in the child and stays where she is, waiting for her to turn around and come back. Amy is showing that she knows that her mother knows what she is aiming at, and the mother shows that she knows that Amy knows the rules and she is also showing her confidence that Amy will not break them (in the excerpt below signs are written in uppercase letters, the translation within parentheses in italics, and comments in normal style).

---

*Overview, onset for each child on each developmental stage*
Amy: LOOK (Look here! she signs while walking towards the road. Turns and looks up at mother who has an angry wrinkle on her forehead)
Amy: LOOK (I am looking. Turns around. Standing still looking out on the road. Then she turns around and looks up at mother)
Mother: WHAT LOOK WHAT question (What are you looking at?)
Amy: SEARCH (leans forward and signs: I am searching.)
SEARCH SEARCH (I am searching and searching. Looks up at mother.)
Mother: WHAT SEARCH WHAT (What are you searching for? What?)
Amy: BIRD nods (A bird, yes.)
Mother: BIRD nods (Oh a bird. She smiles.)

In the excerpt given above, sequential looking was the case but in many sequences it was found that the dyads were looking at objects and commenting on them simultaneously; for example, Kalin (16;1) and his father snapping and unsnapping a buckle on a belt, pointing and commenting on it while focusing on the buckle; parents reading to their children while looking at the pictures at the same time and simultaneously commenting on them; and Leonard (13;0) and father looking at a toy that can spin while father comments on the toy and what the boy is doing with it and Leonard asking sometimes for help to make it spin.

Differences and Similarities Between the Children

Differences found between the infants participating in the study consisted mostly of a variety in expressive language skill and thus a variation in the age at which the infants reached the stage of symbolic intersubjectivity. One infant never reached this stage, whereas another showed signs of emerging symbolic intersubjectivity, both with parents and with other adults already at the age of 8;0. The infant was using signs for DOG and LAMP, while pointing (with whole flat hand) to objects she wanted the parent to give her or to comment on. Observations of emerging symbolic intersubjectivity were found between an adult (other than parent) and the infant, albeit in a very short interaction sequence lasting for 8 s;

Mother: DOG pointing (A dog over there. Pointing to the dog resting in the corner of the room. Amy looks intensely at her mother.)
Adult: DOG pointing (A dog over there. Amy looks at mother, probably had seen the sign in her peripheral field of vision.)
Amy: (Looks at the dog, turns towards the adult, grabbing the adults arm with her left hand, and stands up with difficulty. Looks back at the adult.) DOG (A dog.)
Adult: nods DOG nods (Yes a dog!)
Amy: (Turns around and sits down. Looks towards the dog) DOG pointing (A dog over there. pointing with whole flat hand. Turns her head and looks at the adult.)
Adult: DOG nods (Yes a dog.)
Amy: (turns to face the dog and crawls towards it)
(Note: In SSL DOG is signed with a flat hand shape. Pointing is conventionally signed with index finger.)

Frequent use of expressive signing was often first seen when the infants were between the ages of 8;0 and 10;0. This was true in all cases but one. The exception was one infant (Miles) using the first single signs at age 8;3 but using them very seldom. During all visits (from the time that he was age 6;3–18 months) there are only a few recordings where this infant uses any signs at all, but he does however seem to understand and probably has an age-appropriate passive vocabulary because he seems to respond in a consistent way with the utterances from interlocutors. He can do things he is asked to do and he can answer with nodding or shaking his head for yes and no. When he wants something, he puts up an unhappy face. Parents ask him and he shakes his head until they have asked the right question so that he gets what he wants and answers with a happy face.

Usually, the infant’s first signs were imitations of parents initiated interaction. These were first observed between 8 and 10 months of age. Exceptions at that early age consisted of interactions like in the excerpt above when several turn-takings took place and the infant was not only imitating but seemingly also commenting on the interaction. This happened in two other cases with children around 10 months of age. Most of the participating infants, however, did not reach the stage of symbolic intersubjectivity until later when their expressive vocabulary had grown substantially. On group level, however, the infants seem to reach the different stages a little bit earlier than what is mostly reported for hearing infants (see Table 4).

Discussion

Loots et al. (2005) found that the deaf toddlers shift “visual attention back and forth between the environment and their communication partners in order to /.../share meaning and acquire language” (p. 359). The findings in the present study show that the infant seems to be able to follow conversation and to be involved in mutual exchange at an early age, even when eye contact is not established. In the data, several instances were found where infants as early as 6–8 months of age are involved in mutual exchange with their parents. In addition to this, a video recording of an infant, Leonard 3;3, sitting in a baby-sitter on the floor following the conversation between father and sister sitting in front of him at the table. The parents seem to support their children by placing signs and moving their own body or face so that the interaction can continue. One example of this is Ally’s mother who already when her little girl is 1;2 bends down to be able to make eye contact with her baby, tap on her body, and continue to sign even when she looses eye contact. She continues to sign in the peripheral field of the infant’s vision and tries constantly to regain eye contact. This supporting behavior has also been reported by Cramér-Wolrath (2012) for an older child in a triadic interaction. The data found in the present study suggest that this kind of supported interaction occurs very early, already shortly after birth, and is a prerequisite for the development of intersubjectivity.

The importance of access to a common language for infant and parents is described in the literature about deaf and hearing children in relation to development of social cognition (Falkman, Roos, & Hjelmqvist, 2007; Levrez, Bourdin, Le Driant, Forget D’Arc, & Vandromme, 2012; Meristo et al. 2007). In the present study, the findings show that the infants develop language and use it in intersubjective interaction with parents. Furthermore, the development of intersubjectivity reached the stage of symbolic intersubjectivity for all but one of the participating infants before the age of 18 months. The main difference between this infant and the other 11 infants was the parents’ thoughts on the child’s ability to learn and understand language. This infant’s parents expressed view was that they did not think the infant could learn to sign that early and in accordance with this view they often did not use conventional sign language when conversing with their infant. This may play an important part in explaining the infant’s delay in the development of intersubjectivity.

The findings suggest that the infants participating in the present study develop and reach the same stages of intersubjectivity in the same age span as expected in the case of hearing children, according to Loots and Devisé (2003) and in line
with the Intersubjective Developmental Theory Model by Loots et al. (2003), this is:

- emerging intersubjectivity before 2 months,
- physical intersubjectivity between 2 and 8 months,
- existential intersubjectivity between 8 and 13 months and
- symbolic intersubjectivity at 13 months or older

However, there are also single infants within the group participating in the present study who reach the stage of symbolic intersubjectivity earlier than has been reported for hearing infants, and all of the infants reach each developmental stage early in the age span for each stage.

Loots and Devisé (2003) suggest four specific ways that deafness may influence the development of symbolic intersubjectivity, and these are important to address when supporting hearing parents interaction with their deaf children. First, they suggest that the child’s deafness may make it difficult to create moments of shared intentions; second, they assume the lack of eye contact may restrict the infusion of symbols, and thus also of language input; third, they assume that deaf parents wait to comment on things until they make eye contact with the child; and last, they suggest the need for the parents to use movements of own body, objects, and other visual-tactile strategies to initiate and maintain communicative interaction. In the study presented here, there were findings interesting to add to this suggested influence of deafness on the development of symbolic intersubjectivity.

In the case of the first assumption about difficulty to create moments of shared intentions due to the child not being able to hear the parents commenting on an object or event, a different picture emerged in the present study. The findings show that the participating deaf infants of deaf parents did not seem to have this problem. On the contrary, a different, and in some respect, more complex, picture emerged as parents used and combined many strategies to get and maintain interaction having gaze contact rather than eye contact. These patterns could be found early in the infant’s life, well before the development of symbolic intersubjectivity, and may suggest that the infants in the study were used to and tuned in to communication patterns that made up for the lack of constant eye contact. In these cases parents simply signed in the peripheral field of the infant’s vision or on the infant’s body, which in most cases resulted in an ongoing interaction where both the child and the parent commented on the event or the object first, and then very briefly looked at each other before continuing the interaction. Thus, there were no data showing that these dyads had to focus either on language input or on the object separately, but managed to focus on both simultaneously. This is similar to the findings of Cramér-Wolrath (2012, 2015) who has also shown how a parent and two children may succeed in a bimodal sign and speech interaction with simultaneous visual attention toward the same object.

Second, Loots and Devisé (2003) assume that lack of eye contact may restrict the infusion of symbols, and thus also of language input. The infant participates in interplay alternating between commenting on a shared topic or object and elaborating thoughts and experiences linguistically. If this sharing is restricted by the lack of joint visual attention to something other than parents’ signing, this may restrict language development. In the present study, it was found that because the deaf dyads could continue conversation and look at object simultaneously, the language input did not have to stop in order to look at the parents face. The dyads seemed to assume they had mutual understanding and shared focus of interest. The tuning in, both by infant and parent, made them aware of the other’s interest and made them continue the conversation and thus the language input.

Third, Loots and Devisé (2003) assume that deaf parents wait to comment on things until they make eye contact with the child and then comment on previous focus of attention, which was not found in the present study. On the contrary, the interactions seem to go on smoothly in a visual and simultaneous way, even when both parent and infant are looking at the same object instead of making eye contact. This also made it possible for parent and infant to push the conversation further.

Last, it was true also in the present study that deaf parents use movements of own body, objects, and other visual-tactile strategies to initiate and maintain communicative interaction with their deaf infants, which means they most often could stimulate and uphold joint attention.

Limitations of the Study

There are some limitations and some aspects important to comment on in this study. First, the parents in the study are in most cases well educated. Only one parent has only graduated from primary school, whereas the rest of the parents have upper secondary education or higher. They may not therefore be representative of the whole population of deaf people in Sweden, but they do however represent the younger generation well. Deaf persons born before 1980, in most cases educated orally or sign supported, have been reported having a lower degree of education compared to the main population (Rydberg, Gellersted, & Danermark, 2010). Deaf persons born after 1980 however, like most of the parents in the study presented here, have been educated in a bilingual school system and this may explain the higher educational degree among them. They have grown up in deaf families, studied in schools where SSL has been the language of all communication and teaching, mostly taught by well-trained teachers in SSL. They are probably the whole population of deaf parents having deaf children during the years targeted in the present study, but still, because Sweden is a small country, the group size is small, only 4–5 deaf children born into deaf families each year.

Other limitation maybe the small sample. They are however known to the whole cohort of deaf children born into deaf families in Sweden during 2008–2010. Additional studies within deaf families with deaf children born in the near future would strengthen the findings. Another limitation is that two of the researchers, first and second author, are well-known persons in the field, which might mean that there is a potential for bias. On the other hand, it was necessary that the researchers knew SSL very well to be able to understand both parents and children and thus to code and analyze the data. To compensate for this potential weakness, the findings were in depth discussed with the third researcher who has knowledge and experience in the field of the theory used in this study, but not the role of an insider. In a qualitative study, there is always a potential for bias; however, in this case the team of researchers consists of both persons that can bring an outsider’s gaze as well as insider’s, fluent signers as well as nonfluent, and well-known to the setting as well as unfamiliar with the context of a signing, visual-oriented family home.

Conclusions and Implications for Special Education

By presenting our findings using the intersubjective developmental model for early deaf parent/deaf child interaction, we hope to shed light on and stimulate hearing parents and
teachers to use the example of deaf parents who shape their interaction so that the deaf child can observe events and objects at the same time as they comment on it in sign language. The deaf parents participating in the present study showed a strong belief in their infants’ ability to simultaneously grasp what parents’ talk about while at the same time being able to focus on objects or events being the topic of the interaction. The parents also showed a belief in the child as a competent communicator from birth. This is a very important aspect because many deaf children today are implanted with cochlear implants, which in many cases lead to parents waiting for their children first to have the operation and then begin to develop the ability to hear and speak, thus loosing valuable time which is hard to make up for later in life. The hearing parents may most often refrain from learning to sign and thus unnecessarily hamper early language development. There are unfortunately still beliefs about visual-tactile communications strategies and sign language inhibiting these children’s later speech development, which leads them to this dissociation.

Note
1. In the paper, they are all referred to as deaf because they all use SSL and present themselves as culturally deaf. Audio-logically, fathers are deaf and five of mothers have severe hearing loss (see Table 2).

Conflicts of Interest
No conflicts of interest were reported.

Funding
Swedish Research Council (Vetenskapsrådet 2008:4962).

Acknowledgments
The authors wish to thank all families participating in this research project.

References


