Attention Interchanges at Story-Time: A Case Study From a Deaf and Hearing Twin Pair Acquiring Swedish Sign Language in Their Deaf Family

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This case study longitudinally analyzes and describes the changes of attentional expressions in interchanges between a pair of fraternal twins, 1 deaf and 1 hearing, from the age of 10–40 months, and their Deaf family members. The video-observed attentional expressions of initiating and reestablishing interchange were grouped in 5 functional categories: “getting,” “directing,” “maintaining,” “redirecting,” and “checking” attention. Changes appear to be associated with development during the twins’ ages of 10–13, 15–24, and 28–40 months, including the use of vision in communication. Although there are similarities in the changes of each twin’s communicative initiations, there are also differences based on hearing status, personality, and use of modality. This is evident in the ways in which each twin’s individual attention interchanges unfold over time; it is also connected with the parents’ negotiating attention and arranging “seating positions” with them. Implications and findings for special educational purposes are discussed.

This article is a part of a larger longitudinal case study focused on language acquisitions in a family communicating primarily in Swedish Sign Language (SSL), though spoken Swedish was also used, between the caregivers and the hearing twin. Considerable research has been conducted concerning hearing caregiver–young child interactions regarding the upbringing of twins, as well as research pertaining to the ways mothers vary their attention-getting strategies depending on their own and the child’s hearing status. On the other hand, there is a lack of longitudinal research that concerns the combination of these parameters with the interactional functions of expressions initiating and continuing joint attention between three or more persons and also from the children’s different modality perspectives.

The Communicative Environment of Twins
Being a parent of twins entails not only a doubling of most activities but also interacting with two individuals of the same age (Thorpe, Rutter, & Greenwood, 2003). Lytton and Gallagher (2002) noted that parents of twins try to divide their attention between them in order to adapt interactions to each child’s needs and personality. Tomasello, Mannle, and Kruger (1986) found that twin children received less individually directed speech, participated in fewer and shorter episodes of joint attention. Mothers of twins were more directive in their interaction, and twins had fewer and shorter conversations with their mothers (p. 169). Due to environmental factors, slightly delayed vocabulary development was indicated among twins (Bishop & Bishop, 1998; Seung, Holmes, & Colburn, 2004). Thorpe et al. (2003) suggested that environmental stimulation, such as the presence of an older sibling, could balance the situation by providing a linguistic environment on a higher developmental level than a twin sibling does. Munoz-Silva and Sanchez-Garcia’s (2004) study of a hearing mother of twins with differing hearing status noted that the hearing-impaired
sibling was provided with so much special attention that his cognitive-linguistic development was more advanced than that of his hearing brother. Van den Bogaerde (2000) reported that deaf parents differentiate their communication based on their child’s hearing status when using vocal mode. Taken together, these studies suggest that twin child language acquisition has added complexities when the twins have different hearing status.

Development of Intersubjective Sharing

According to Susswein and Racine (2008), an infant quickly begins to show signs of primary intersubjectivity by sharing emotions and showing interest in interchanges with a more mature individual. This engagement develops in mutual activities such as play and games. By the end of the first year, the infant shows secondary intersubjectivity that focuses on joint attention with reference to objects in the world (Susswein & Racine, 2008; Trevarthen, 1993). An example of this is when the infant actively shows things or intentionally points toward something that has captured the infant’s interest and then looks at the caregiver to make sure that the reference is shared (e.g., Akhtar & Tomasello, 1998). The most straightforward form of protolinguistic intentional communication is requesting (Stern, 1985), as when a child reaches to get something by looking back and forth between the object and the caregiver. This triadic coordinated joint attention (CJA) is what Carpenter, Nagell, and Tomasello (1998) defined as joint attention engagement. When the engagement also included more complex joint attentional behaviors, such as pointing, gaze following, learning by following behavior, and gestural communication, these are defined as parts of the joint attentional skills or as social-cognitive skills. These skills are culturally learned through meaningful interactions exemplified as when a child understands another person’s communicative intentional expression (Akhtar & Tomasello, 1998). As children’s symbolic representational capacities develop, there is an associated shift in sharing about the here-and-now to sharing about referents that are displaced in time and place (Trevarthen, 1993).

Sensorial Modifications for Attention-Getting Between Adults and Young Children

Both deaf and hearing adults have been found to modify their attention-getting behaviors according to the child’s hearing potential (Koester, Karowski, & Traci, 1998; Koester, Traci, Brooks, Karowski, & Smith-Gray, 2004; Spencer, 2004; Waxman & Spencer, 1997). Deaf adults often use vocal expression to get a hearing infant’s attention (Koester et al., 1998; Van den Bogaerde, 2000; Waxman & Spencer, 1997).

According to studies (Guarinello, Berberian, Oliviera Santana, & Athaide Massi, 2007; Harris & Mohay, 1997; Loots & Devisé, 2003a, 2003b; Smith & Sutton-Spence, 2005; Spencer & Meadow-Orlans, 2004), the deaf child often has to shift visual attention between exploring the environment and their communication partner in order to share information. This shift or sequential looking (Spencer, 2004) was not observed in hearing dyads as exemplified by, for instance, Estigarribia and Clark (2007). The latter authors noted that between the ages of 18 and 36 months, the parents’ vocal attention-getting strategies consisted of verbal interjections, deictics, anticipations, and naming. The children’s initial gaze toward an object was interpreted as an attentional signal and parents took communicative turn with the child.

However, Carpenter et al. (1998) as well as Estigarribia and Clark (2007) emphasized that gaze alternation per se is not an automatic indicator of joint engagement. In joint attention, an infant can visually focus on an object while also attending aurally to another individual.

Attention-Getting Between Deaf Parents and Their Hearing or Deaf Child

The preceding studies report the actions used by deaf parents to get their infant’s visual attention. These modifications are referred to by Bailes, Erting, Erting, and Thumann-Prezioso (2009) as Child-Directed Signing (CDSi). This includes, for instance, moving objects, tactile signing on the infant’s body, displacing the sign production so that it is close to the object, or lifting objects close to their own faces to facilitate the establishment of eye-contact with the infant (Erting, Prezioso, & O'Grady Hynes, 1994; Koester et al.,
1998; Malmström & Preisler, 1991; Spencer, Swisher, & Waxman, 2004). Attention-getting and joint attention by displaced signing close to a target and in the visual line of the young child (Erting et al., 1994) are reported as “simultaneously looking” (Loots & Devisé, 2003a, 2003b) or “onlooking” (Spencer et al., 2004).

Van den Bogaerde (2000) categorized attention strategies as “non-explicit” and “explicit” strategies. The non-explicit included strategies that did not actively manipulate the addressee, whereas the explicit were defined as actively seeking the addressee’s attention and consisted of displaced signs, tapping, or waving to attract their deaf children’s attention. The results showed that the mothers used the same strategies with their deaf and their hearing children but with the latter to a lesser extent and often vocally accompanied. The mothers waited for the child to look at them rather than interrupt their infant’s exploration of their environment or objects before responding to the infant’s focus. This “not interrupting” or “waiting” pattern was reported and related to mothers’ immediate responses when the infant looked at them (Koester et al., 1998; Malmström & Preisler, 1991; Spencer, 2004; Spencer, Bodner-Johnson, & Gutfreund, 1992; Spencer & Harris, 2006; Spencer et al., 2004; Van den Bogaerde, 2000).

In order to gain the child’s attention, studies report that mothers also use visual-tactile strategies such as tapping and waving (Bailes et al., 2009; Erting et al., 1994; Gale & Schick, 2008; Harris, Clibbens, Chasin, & Tibbits, 1989; Harris & Mohay, 1997; Koester et al., 2004; Loots & Devisé, 2003a, 2003b; Loots, Devié, & Jacquet, 2005; Malmström & Preisler, 1991; Spencer & Harris, 2006; Spencer et al., 2004; Van den Bogaerde, 2000; Waxman & Spencer, 1997). Tapping on the child’s body, the book, or the floor and waving to redirect the child’s gaze were found to increase especially between the child’s age of 12–18 months. These visual-tactile strategies are more often used by the mother–deaf child dyads than by the mother–hearing child dyads (Spencer et al., 2004; Waxman & Spencer, 1997) and more used by fathers than mothers (Loots & Devisé, 2003a). Mothers rewarded their infant’s switch (requested and spontaneous) to make eye-contact by smiling, laughing, and signing, thus teaching the child that turning could provide them with interesting content (Harris & Mohay, 1997).

Mather, Rodriguez-Fraticelli, Andrews, and Rodriguez (2006) summarized the preparatory actions in order to make the upcoming communicative signing visible to a toddler (24 months). These preparations or “preinitiation regulators” (Mather, 1996) were different from those used for adults though eye gaze, waving, tapping, and an eye-contact signal confirming the partner’s visual readiness for exchange. The first of four distinct preinitiation preparations was bringing an object like a toy or a book to indicate exchange. Second, a sight triangle was established that connected the child’s field of vision with the parent’s signing and the object. Third, parents engaged in eye-assessment strategies to maintain the sight triangle. These were conducted by waving in the child’s visual field, tapping on the child’s body, or signing “LOOK AT ME.” The fourth step was that parents waited for the child to indicate readiness by eye-contacting the parent (Mather et al., 2006).

Deaf toddlers’ spontaneous looking at their mothers at 18 months gave mothers a natural opportunity to verbally (sign or speak) communicate with the child (Harris & Mohay, 1997). Both Spencer et al. (2004) and Waxman and Spencer (1997) found responsiveness of the young hearing child to sound as well as to their developing bilingualism in sign. This may have confused mothers and led them to use the vocal modality, thereby interacting in some way differently than with a deaf child. However, the authors observed that this “confusion” was resolved by the age of 18 months. Van den Bogaerde (2000) commented that mothers’ use of voice showed adaptation to the child’s hearing status. Whether hearing or deaf, all six children in Van den Bogaerde’s study started, between 2 and 3 years of age, to use explicit attentional strategies by waving an arm or tapping on their mother. This was also the age range when the children established adequate visual behavior, that is, used mutual eye-gaze or signed within the addressee’s field of vision. Van den Bogaerde concluded that mothers took responsibility for the visibility of their communications until their children had passed the age of 2.5 years.

Although substantial research has been conducted regarding joint attention, intersubjectivity, and the
effect different hearing statuses have on caregiver and child attention-getting strategies, this study extends previous research in respect of twins with differing hearing status living in primarily a sign language environment. This study also complements prevailing research by addressing these interactions from a longitudinal perspective.

Purpose of the Study

The purpose of this case study is to longitudinally analyze and describe the changes in attentional expressions used in interchanges between a pair of fraternal twins, one deaf and one hearing from the age of 10 to 40 months, and their Deaf family members viewed within an interactional frame.

Research Questions

- How do the twins initiate and reestablish attention with their family members and vice versa? Do these change over time, and if so, how?
- What similarities and differences can be detected between the deaf bilingual caregiver, the hearing twin and the deaf twin in their use of attentional expressions? Do these change over time, and if so, how?

Methods

This case study consists of a longitudinal collection of video observations, brief field notes, and an interview with the parents, all of which were conducted in their home. Using case study methodology, data were explored, in-depth analyzed, and in details described (Creswell, 2007; Yin, 2009).

Participants

The main participants are a pair of fraternal twins and their deaf mother. The twin’s older deaf sister, Nicolia, and their deaf father also contributed (Table 1, column C). All participants have been given fictive names: Hugo who is Hearing and Diana who is Deaf. At the onset of the study, they were 10 months old, and at the end, they were 40 months old. Their father attended a school for the deaf where SSL, signed Swedish, speech-reading, written Swedish, and speech were used. SSL was the language of choice in his peer group. Their mother grew up with a severe hearing loss and attended a school for the hard of hearing where the language of instruction was spoken. She used sign language with her schoolmates from the first grade. The family consider themselves to be part of the Deaf community.

After spending her early life at home, at 16 months of age Diana attended a full-day preschool for deaf children with a sign language approach. Hugo was 19 months old when he began a local full-day preschool using spoken Swedish. At 35 months, Diana received a unilateral cochlear implant.

In order to protect the family members’ confidentiality, background information has been kept to the absolute minimum.

Data Collection

This study was designed to observe young children longitudinally and more frequently at the younger ages in order to document their early interactional development. Video observations in the family’s home were collected on two activities, story-time and playtime on 12 separate occasions over a 30-month period. At the onset of the observations, the parents were asked to act and communicate as they normally would.

Interaction of naturalistic play- and story-time was with a Handycam recorded by the researcher. As can be seen in Table 1, the number of participants in each session varied from two to five (column C). Mother was present at all sessions except for the 11th. The twins’ older sister, Nicolia, participated in 8 of the 12 sessions, though data concerning her attention-getting expressions are only included when she was a communicating partner with a twin. Father participated in Sessions 7, 8, and 11. Hugo’s and Diana’s participation, referred to as “active time,” consists of involvement in activity with a family member (columns F and G). Included in the analysis were also the few initiations the twins made with the observer/researcher (a SSL signer). There were moments during the sessions when several communicative interactions occurred simultaneously. In these cases, the observational recording has, whenever possible, covered all participants’ interactions.
or followed one interaction to completion before changing to another. Effort was made to record each twin equally.

Playtime was mostly carried out with toys, paper, and crayons. Story-time consisted of parents and children looking at and commenting on pictures in children’s books. This was first observed at the 12th month’s session. In order to follow one specific story over time, from the 13th months’ session, the observer brought the book “Frog and Pig” (Velthuijs, 1999) and used it throughout the study (not used at the 24th month’s session because the children played outdoors then). The duration of activities varied (Table 1, columns D and E). Each story-time session lasted between 8 and 33 min, whereas the eight playtime sessions lasted 8–38 min.

The field notes were made immediately after the observations and contained impressions about interactional changes from the previous session and caregivers’ comments on the twin’s acquisitions. At the offset of the study, a semi-structured interview with the caregivers was conducted in their home. Their thoughts about the children’s acquirement of attentional expressions were video-documented.

Data Analysis Process

Transcriptions were made by numerous viewings of the sessions in which all story-time observations have

Table 1 Information regarding video observations

<table>
<thead>
<tr>
<th>No</th>
<th>Twin's age</th>
<th>Participants in the recorded observation</th>
<th>D: Length of story-time</th>
<th>E: Length of playtime</th>
<th>F: Hugo active time</th>
<th>G: Diana active time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10 months</td>
<td>Diana, Hugo, and Mother</td>
<td>—</td>
<td>0:24</td>
<td>0:18 play</td>
<td>0:20 play</td>
</tr>
<tr>
<td>2</td>
<td>11 months</td>
<td>Hugo, Diana, Nicolia, and Mother</td>
<td>—</td>
<td>0:38</td>
<td>0:19 play</td>
<td>0:08 play</td>
</tr>
<tr>
<td>3</td>
<td>12 months</td>
<td>Diana, Hugo, and Mother</td>
<td>0:19</td>
<td>0:08</td>
<td>0:17 story</td>
<td>0:19 story</td>
</tr>
<tr>
<td>4</td>
<td>13 months</td>
<td>Diana, Hugo, and Mother</td>
<td>0:22</td>
<td>0:17</td>
<td>0:08 play</td>
<td>0:04 play</td>
</tr>
<tr>
<td>5</td>
<td>15 months</td>
<td>Diana, Hugo, and Mother</td>
<td>0:33</td>
<td>0:10</td>
<td>0:23 story</td>
<td>0:33 story</td>
</tr>
<tr>
<td>6</td>
<td>17 months</td>
<td>Diana, Hugo, Nicolia, and Mother</td>
<td>0:08</td>
<td>—</td>
<td>0:04 story</td>
<td>0:05 story</td>
</tr>
<tr>
<td>7</td>
<td>22 months</td>
<td>Diana, Hugo, Nicolia, and Father</td>
<td>0:08 Diana and Mother</td>
<td>0:38 All five active</td>
<td>0 story</td>
<td>0:08 story</td>
</tr>
<tr>
<td>8</td>
<td>24 months</td>
<td>Diana, Hugo, Nicolia, and Mother</td>
<td>—</td>
<td>0:16</td>
<td>0:13 play</td>
<td>0:10 play</td>
</tr>
<tr>
<td>9</td>
<td>28 months</td>
<td>Diana, Hugo, and Mother</td>
<td>0:13</td>
<td>—</td>
<td>0:10 story</td>
<td>0:12 story</td>
</tr>
<tr>
<td>10</td>
<td>32 months</td>
<td>Diana, Hugo, Nicolia, and Father</td>
<td>0:08</td>
<td>—</td>
<td>0:04 story</td>
<td>0:08 story</td>
</tr>
<tr>
<td>11</td>
<td>36 months</td>
<td>Diana, Hugo, Nicolia, and Father</td>
<td>0:14</td>
<td>—</td>
<td>0:06 story</td>
<td>0:10 story</td>
</tr>
<tr>
<td>12</td>
<td>40 months</td>
<td>Diana, Hugo, Nicolia, and Mother</td>
<td>0:23</td>
<td>0:12</td>
<td>0:13 story</td>
<td>0:23 story</td>
</tr>
</tbody>
</table>

between 8 and 33 min, whereas the eight playtime sessions lasted 8–38 min.
been fully transcribed as have 7 of 12 playtime observations (Table 1). Two types of analysis were conducted. The first, being inductive looking for the emergence of attentional expressions. These were noted on the transcripts until saturated (Glaser, 1998) or completed (Yin, 2009) and no new expressions occurred. Analysis of these notes derived five categories based on the expressional characteristics these are gaze, physical, vocal, object/point, and peripheral. For this study, the categories mainly concerning story-time were put together in new ways to be in-depth analyzed between participants within a session, over time and compared to playtime data. The analysis was made both quantitatively (e.g., the frequencies of expressions calculated per minute) and qualitatively (the use of expressions within and descriptions of the episodes) and was finally compared to previous research in order to find patterns (Ahlström, 2000; Cohen, Manion, & Morrison, 2007; Creswell, 2007; Guvä & Hylander, 2003; Yin, 2009).

Further analysis and continual comparisons of the ways the qualitative uses of attentional expressions come into play, selecting all interchanges consisting of initial and reestablishing expressions, were inspired by the Ninio and Wheeler (1987) taxonomy. Ninio and Wheeler listed 28 functional and grammatical choices, of which negotiating “immediate course of interaction and action” (p. 19) categories were merged to its function and extended to the modality conditions of this study. Expressions not acquiring the interlocutor’s switch of attention were divided into two categories, getting and maintaining attention. Choices included in the “directing attention” type (p. 25) were, with the extension of modes, adequate for this study. Directing expressions acquiring an attentional switch were extended to the redirecting category. The video viewings indicated that an additional attentional category emerged: “checking for attention.” Thus, five interchanging attentional categories are used in this study:

- **Getting attention**: Accidentally or intentionally you get someone’s attention either towards you or towards the thing you are manipulating.
- **Maintaining attention**: You want someone to maintain attention on target.
- **Directing attention**: You direct someone’s attention towards or by target.
- **Redirecting attention**: You want to turn someone’s attention towards you
- **Checking attention**: You plug in quick gaze checks to ensure the interlocutor’s attention.

According to Ninio and Wheeler (1987) an interchange is “one or more rounds of talk, all of which serve a unitary interactive function” (p. 2). The interchange may be interrupted, for instance, by a sound or a visual break and may after a short interlude be reestablished by the same or another attentional category.

Gaze is used in the visual modality for multiple purposes. This made additional analyses of the playtime and story-time episodes necessary in order to distinguish between establishing and reestablishing gaze and other uses of gaze. Eye-contact (Smith & Sutton-Spence, 2005) is used for dyadic, often locked, mutual contact by eye and in situations that commonly use “eye-contact” as a part of a regulated continuum, for instance in signed narratives. Another use of gaze is the flexible gaze altering between signing, object, and partner’s face. The third eye gaze (Bailes et al., 2009) indicates at least a triadic, dynamic gaze primarily focusing on the signer’s face, perceiving signing, and objects peripherally. As described by Baker and Cokely (1981), the signer also constantly makes quick gaze checks for the addressee’s continued attention, often responded by PROTRUDING-MOUTH movements (Mesch, 1998), the visual counterpart to “attention-hmming.” An utterance completed by mutual gaze thus gives the interchanging turn to the next interlocutor. This visual behavior in fluent and conventional sign languages also contains grammatical components and references but that aspect is not within this article’s scope. Three distinctions between different contacts by eye are:

- **Eye-contact**: used for dyadic, often locked, mutual contact by eye.
- **Gaze-contact**: used for flexible and altering contact by eye.
- **Visual-contact**: used for dynamic contact by eye.
Trustworthiness and Validity

Validity has been a matter of continual concern, from the planning to the presentation of the study (Cohen et al., 2007). In order to ensure the trustworthiness of both transcriptions and analyses, both the author and another researcher independently transcribed video Sessions 5 and 7. Consistency was high: A few differences of opinions were discussed until consensus was reached. The author analyzed the remaining data. The parents were consulted regarding one case of uncertainty about one of the twin’s utterances.

Data and in-depth analyses were constantly checked and compared throughout the research process. Video observation over a 30-month span, by the same participants engaging in the same activities and in the same environment, made it possible to follow, compare, and confirm each participant’s interactional changes over time until the data were completed (Yin, 2009). For validity reasons, the transcription and coding of all 12 sessions were compared by viewings and analyses with seven playtime observations. These comparisons gave important information concerning the use of gaze and differences such as personality and attentional expressions between the two activities. Some playtime results are therefore included. Field notes and interviews with the caregivers were used to extend information and critically examine the data. “Episodes” of joint attention interchanges are chronologically described, making it possible for the reader to come close to the contexts and consider the results.

Presentation of Results

The findings are presented in three sections describing the interactional changes when the twins were 10–13, 15–24, and 28–40 months old. The “descriptive terminological framework for vocal and gestural modalities” proposed by Volterra and Erting (1994, p. 301) has been used. The concepts “simplified word-form” or “simplified sign-form” were added to elucidate the symbolic utterances of a young child using symbolic vocalization or symbolic gesture as well as spoken word/s or signed sign/s not (yet) performed conventionally (e.g., doggie or birdie).

Each interactional section is introduced by a brief compilation of general changes found in the interaction. Examples of the participants’ interchanges were chosen from the larger transcripts to represent the distinguished attentional expressions over time. These are presented in descriptive “Episodes” within their interactional and communicational context. The key to the structure used in the Episodes is presented below.

Key to the Episodes:

The Episodes are structured as the written transcription form of visual-gestural languages often is. Utterances, both vocal and signed, are in their original syntax but translated into English words. Simplified sign as well as signs are presented in CAPITALS. Spoken utterances, simplified words and vocalizations are presented in italics and lowercase letters. Equivalent combinations of SIGN and word are written in CAPITALIZED ITALICS and supplementary combinations are divided by a slash: SIGN/word. Simplified words [uttered in Swedish], when considered important, are shown within square brackets [ ]. A colon is often used to indicate someone’s utterance.

The description of attentional interchanges within the Episode includes a code for the attentional interchange given in round brackets ‘()’. The bracket contains the type of attentional expression represented by its first letter followed by a colon: continued by the person initiating the interchange with an arrow indicating to whom, e.g. (R: Mo → Hu).

In the descriptive presentations of the interchange episode, the attentional category is abbreviated in brackets showing the underlying initiating and reestablishing category of attentional interchanges: “Getting” (G), “Directing” (D), “Maintaining” (M), “Redirecting” (R) “Checking” (C), and reestablished (r). In addition, the bracket contains the first two letters of the initiatee followed by an arrow toward the
first two letters in the interlocutor’s name. The text beneath the Episode informs about the sequential number, the initiatee, and partner of the interaction and the twin’s age on that occasion. Just above some of the Episodes, a translation of the communication within the Episode can be found.

Methodology Discussion

The Longitudinal Case Study method is vulnerable in its dependence on a single case, in this present study a young family. When collecting naturalistic data, the researcher first has to get entrance to the case/family and thereafter maintain trust in order to have further access (Ball, 1990). This includes an adaptation to the family’s conditions in their everyday life. Furthermore, technical quality is crucial; thus, a session at the 19th month could not be transcribed or coded because the twins moved around, and when they were still, they mostly showed their backs. Other methodological issues were the long time needed to collect, analyze, and especially transcribe the large amount of data. However, this was considered necessary because it allowed the possibility to detect connected patterns. One such result was the acquisition of gaze, which required additional data comparisons from another activity, playtime.

The translation work was a major challenge in doing the children’s expressions justice, from simplified gestural and simplified vocal utterances to SSL and spoken Swedish, when transcribing them into written words.

Results

The interaction between the twins and their parents was characterized by intensive interchanges in which mostly all three participated or were more or less involved. To make the results clear to the reader, the majority of the Episode descriptions are chosen from interchanges between one of the twins and a parent. In the cases in which interchange involved more than one dyad, that is inserted in the descriptions.

The names of the attentional categories can be used grammatically and are therefore in the text highlighted by italic.

Interaction from 10 until 13 months

The twin’s ages from 10 until 13 months were characterized by Diana, Hugo, and Mother sitting on the floor, playing with toys or reading children’s books that lay between them. Diana, especially during story-time, sat herself on Mother’s lap. In interaction with the infants, Mother followed-in and expanded on whatever the infants were engaged in. An initial attentional expression started and at times continued the interchange by means of a reestablishing expression.

At 10 months, Mother was continually arranging the setting, thus forming a visible triangle space that all of them could share. When providing the twins with toys, Mother gave them time to explore the toys, and when one or both looked toward her (getting), Mother responded by naming. Mother’s movements in the infants’ peripheral field of vision often got the infants’ attention (getting), as exemplified in Episodes 1 and 2. Hugo shifted his eye-contact from the object to the observer and to Mother (Episode 2) or commented in simplified word-form on Mother’s actions. For example, Mother got up to answer the phone, Hugo looked at the observer and said mo(m) (c)all then gaze followed her in the direction she went away. Diana was observed to make social references by looking back and forth between Mother and the observer (Episode 1).

Mother stands up and walks toward the toy box while the twins follow her by gaze. (G: Mo → Di, Hu)

Mother sits down opposite Diana and picks up a car from the box and with an exaggerated face she holds the car in front of Diana. Diana takes the car (D: Mo → Di) while Mother signs close to the car GREEN CAR pointing at the car in Diana’s hand, Diana looks at the car and investigates it. Mother watches Diana.

Diana looks at Mother, who signs GREEN CAR point-car while nodding. (G: Di → Mo)

During eye-contact and while holding the car in her hand Diana takes Mother’s hands and raises herself. Diana looks at the observer and back to Mother. (Social referring) Mother, while smiling, loosens her hands from Diana’s, taking the car. Diana falls onto Mother who looks at Diana (with an expectant face) and hugs her. Mother lifts her
up onto her lap while Diana looks down towards Mother’s hand Mother shows the car in her hand (D: Di \text{→} Mo)

Mother signs close to the GREEN CAR/\textit{brrr}, rolls it on Diana’s leg, chest and onto Mother’s own leg while Diana’s follows the movement by gaze. (rM: Mo \text{→} Di)

Diana looks up at Mother who nods. (rG: Di \text{→} Mo)

Episode 1: Mother and Diana, at 10 months.

In Episode 1, Mother’s purposive movement with respect to the toy box while Diana follows this by gaze can be described as an act of preparation for the interchange. The car is brought to Diana’s attention (directing) through Mother holding it in front of Diana. This sequence establishes the car as the joint focus of attention about which information will be imparted. At this age, Mother typically directed Diana’s attention to an object with the object. The interchange in Episode 1 contains multiple turns interrupted by Diana’s falling onto Mother’s lap. Diana renewed Mother’s attention by looking at her (getting). Diana’s looking could also have been an orientation to what was going on around her. Mother, however, responded as if Diana’s looking at her was an act of intentionally seeking to get attentional contact or information, in this case about the car. Finally, while Mother held the car in her hand, Diana looked toward Mother’s hand. This directed Mother’s attention to her own hand (and the car) and she took the opportunity to reintroduce the car. Mother maintained Diana’s visual attention by displacing the naming sign close to the car and then by expanding a quality of it by rolling the car tactilely on Diana. The CJA was then completed by Diana getting reestablished eye-contact with Mother’s confirming nod. In cases when Mother, using the displaced sign, got Diana to look at her, Mother instead continued signing in her own space, rather than maintaining displaced as in Episode 1.

Both Diana and Hugo got Mother’s attention when they looked up at, or towards, her from what they were doing (getting). Mother met the infants’ eye-contact and gave an immediate response. Her responses were made through facial expressions of confirmation such as exaggeration of excitement or smiling, often combined with a nod or utterance about what the infant had focused on before eye-contact. Utterances consisted in labeling objects and activities in signs with both infants. However, with Hugo, Mother also used spoken words or a simultaneous combination (SimCom) of sign/word.

By “looking at,” Hugo got the attention that Mother responded to as an intentional request. Hugo’s handling or pointing at real objects often occurred in combination with vocalizations or with sounds made with or by the object. This is exemplified in Episode 2.

Hugo and Mother are sitting opposite each other with a cube box between them. Hugo is trying to put a cube into a square box hole. Holding the cube, Hugo looks at and gets eye-contact with Mother (G: Hu \text{→} Mo) and slightly moves his body forward towards Mother / the box. Hugo: vrr rr v v uh while looking at each other Mother makes a move towards him/the box: \textit{muff}. Hugo responds \textit{uf} by moving his body forward and smiling. Mother makes a chest movement: \textit{nau}, Hugo smiles: \textit{eh} and makes a body movement forward.

Hugo looks down (at the cube). Mother looks at the cube/box. (rD: Hu \text{→} Mo) Mother points at the hole: \textit{here}, Hugo tries but drops the cube. Mother picks it up, holding it half way into the hole: \textit{here} while making a slight move with the cube towards Hugo. He grabs the cube, (rD: Mo \text{→} Hu) Hugo tries, fails and frowns at the observer then at Mother. (rG: Hu \text{→} Mo) Mother (tone into Hugo’s emotion by looking frustrated): says/signs \textit{HAARD} [Sw: \textit{SVÅÅÄR}]. Hugo responds \textit{uááá}. Mother: \textit{HARD} while Hugo looks down at the box and pushes the cube towards the hole. The box glides away bit by bit. Mother moves the box back and holds it in place in front of Hugo. Mother: \textit{so}. Hugo manipulates the cube by the hole. (rM: Mo \text{→} Hu) The cube passes into the box. Hugo still looks at the hole, Mother: \textit{GOOOD!}
Episode 2: Hugo and Mother, at 10 months.

Hugo’s looking down at the cube directed Mother’s attention. She continued by directing Hugo’s attention toward the action of “putting the cube in the hole,” using a simultaneous deictic gestural point and word (point/here) at the hole of the box. Hugo, emotionally frustrated, continued by looking at Mother and got her attention. The joint attention was continued by the maintained cooperative operation of Mother holding the box, indicating by saying so that Hugo could continue to concentrate on what was now their “joint goal” at the box, thus making the manipulation successful.

At 11 months, Diana’s expression for getting attention was still to simply look at Mother, whereas Hugo made eye-contact normally followed by questions or comments, using simplified words such as mo(m) or a directing lo(ook) while pointing.

At the 12-month story-time session (also during 13 months), Diana typically sat on Mother’s lap, with her back toward Mother, whereas Hugo sat opposite them. Mother arranged a triangular setting by placing the book, so all of them could see and share the pictures.

Mother is sitting on the floor with her arms around Diana, who is sitting on her lap with her back towards Mother. They are looking at pictures in a book lying on the floor.

Mother points at a picture of a cap Diana looks at the picture (D: Mo → Di)
Diana looks at the picture while Mother signs CAP on Diana’s head, then making a movement as if putting a cap on Diana’s head. (rM: Mo → Di)
Mother points at a picture of a shoe, then takes Diana’s right foot, and Diana follows with her gaze as Mother pulls the foot to the picture and points with it at the picture. (rD: Mo → Di)
While holding Diana’s foot, Mother uses the fist of her left and free hand to perform the sign SHOE with Diana’s foot (the sign SHOE is conventionally made by two fists moving towards each other twice) Diana’s foot follows while she looks at the picture. (rM: Mo → Di)

Mother moves Diana’s foot around the shoe picture and signs SHOE in front of and in Diana’s line of vision. Diana follows. (rM: Mo → Di)

Episode 3: Mother and Diana, at 12 months.

Mother shared attention with Diana by physically involving parts of Diana’s body, as if she was giving a symbolic response while simultaneously looking at the picture. The attention was initiated by a directing pointing at the chosen picture. This was continued in Mother’s maintaining the episodes by involving or making Diana’s body cooperate in producing signs (e.g., CAP, SHOE in Episode 3).

Mother also with Hugo redirected attention by using objects (like toys, a bike, a ball etc.) by vocal deictic words like look, here called Hugo’s name or made sounds like brr corresponding to the picture Mother and Diana was looking at. Presumably, Diana could perceive the vocal utterances kinesthetically when being in close physical contact with the speaker and when positioned opposite possibly notice those visually.

Hugo used two modes, gestural and vocal, to initiate communication with Mother. These were quite often used vocally simultaneously with physical touch or with real objects or by pointing to pictured objects. The exchange in Episode 4 shows that a mismatch might have occurred when Hugo initiated attention in the vocal mode without eye-contact or gestures.

While looking at animals in a book Hugo says doggie [Sw: vovve]. Hugo looks in the book and repeats doggie three times (G: Hu → Mo no response). Mother points at a cat and simultaneously sign/says CAT CAT. Hugo looks at her (D: Mo → Hu) and responds mimimijaje. Mother smiles and responds (with a soft face and voice) yeaa. Hugo looks down at the book, points at the dog: doggie. Mother points at the dog (rD: Hu → Mo)
And continues: that is a doggie/DOG, repeating DOG five times. Hugo looks at Mother’s hands signing (conventionally signed on one’s thigh). Hugo responds DOG on Mother’s thigh while saying doggie. Mother moves Hugo’s hand back to his thigh, there making the DOG-sign with Hugo’s hand while saying doggie. Hugo responds DOG on the own thigh and then points at the dog picture.
Episode 4: Hugo and Mother, at 12 months.

Hugo was focusing on the dog, whereas Mother directed to the cat. Hugo responded by imitating a cat mewing to which Mother responded vocally (yeaa) but not correlated to his vocal utterance or by following-in his focus. In Episode 4, Hugo continued the interchange by a directing point; on other occasions, he initiated attention by (getting) gaze, simplified word, or sign-form to which his gazing, signing, and pointing were properly responded. The modality used by Mother was connected to whether she had mutual gaze or not with Hugo. Consequently, it was noted that Mother’s responses to Hugo while having mutual gaze generally began in the gestural mode. Making a sign with Hugo’s hand, as in Episode 4, was only observed a few times in the entire study.

At 13 months, Mother was observed to increase her facial expressions and with Diana making an effort by bending forward to show her face. In turn, Diana began to move herself into a triangle position beside Mother, which she had not been observed to do earlier during story-time. She altered her gaze between the book, sign, and Mother’s facial expressions, which was easier to grasp by gaze shift from beside.

Diana and Hugo sit beside Mother looking at pictures in a book. (Mother watches Diana) Diana looks at Observer and signs BANANA, makes a pointing hint and looks towards the picture. Diana repeats BANANA Mother responds BANANA in Diana’s line of vision. (G: Di → Mo) Diana points at the picture, gazes Mother (rD: Di → Mo) and signs BANANA, Mother: Y-E-S BANANA, pointing at the picture. Diana looks at the picture. Mother signs RIGHT in Diana’s line of vision. Diana points at the picture, looks at Observer and signs BANANA, points at the picture, Mother smiles.

Episode 5: Diana and Mother, at 13 months.

Diana started to combine her utterances with pictured objects by imperative directive pointing as in “Look at the banana!” (Episode 5). Mother kept the interchange at target by displacing BANANA in Diana’s line of vision, simultaneously maintaining Hugo’s attention to the picture by adding vocal mode.

Hugo increased his vocal expressions such as getting attention by equivalent simplified sign and simplified word combinations (COW/oo). He combined attentional directive expressions complementary with object (point/brrr), which he eventually expanded with words containing supplementary meaning (look there/point).

Questions and imperatives were frequently used with pointing, supported by vocal mode, maintaining attention to target (Episode 6).

Mother and Hugo look at pictures. Mother signs asks in Hugo’s periphery: WHAT is that/point?, Hugo looks at the picture (M: Mo → Hu) Mother: point/there! signs in Hugo’s line of vision BALL-point. Hugo looks at Mother’s hands signing BALL-point. Hugo looks at the picture. Mother: point-BALL, Hugo follows her hand moving from point to form the sign BALL. (rD: Mo → Hu) Mother signs BALL EAGER BALL-point at the Frog kicking the ball. Hugo looks at the picture.

Episode 6: Mother and Hugo, at 13 months.

Mother was sensitive to when Hugo gaze followed in the visual-gestural modality (BALL) and turned to solely signing. Then, Mother’s directing point also guided Hugo’s gaze, altering between pictures and utterances and when to continue the interchange.

Summarizing 10 until 13 months. Mother following-in the focus of the infants typically meant waiting until Diana and often Hugo initiated attention by (getting) looking up at the caregiver. Mother seemed during the first months to ensure that this eye-contact was encouraged. Mother in interchange with one of the twins often involved the other twin. At story-time, she arranged a shared triangle setting and got or maintained the other twin’s attention through simultaneous use of gestural or vocal modes. The use of vocal mode was commented on in the parent interview as caused by the meaningful feedback on vocal utterances that Hugo gave from early life. Hugo also initiated interaction, often simultaneously, in both modalities with them. When the parent used vocal modality, Diana
presumably occasionally perceived this kinesthetically or visually. At 13 months, Diana started to position herself beside Mother, thus getting mutual gaze contact followed by gestural modality.

Tables summarizing the attentional categories and changes of the expressions are included before the Discussion section.

Interaction From 15 Until 24 Months

During these months, the interaction changed from the previous, as the twins took increasingly more initiatives followed by a communicative content. The parents’ initiations decreased, but their responses increasingly extended and enlarged the twins’ phrases. Tactile signing was not observed now or onward.

Diana’s and Hugo’s communicative initiatives developed along different paths. Therefore, Diana’s and Hugo’s communicative interactions are presented individually.

Hugo. Hugo, from 15 until 24 months, successfully got attention by mutual gaze and pointing, which were also used as directing expression and from 22 months redirecting tap or wave was observed.

To get and keep Hugo’s attention during story-time, interest was an important factor, one of them was balls. When Mother opened the book that got Hugo to act in order to get a glimpse of the picture. Mother directed Hugo toward a specific object of interest, a ball. Finally, Hugo’s attention was maintained on the picture while Mother begun her narration, which Hugo followed by an altering gaze contact.

Translation: “Frog kicks the football that flies up in the air and away. -Ball fly over-head, there. Yea, Pig sees the ball come and pass over his head. -Oh, Ball-up”

Mother sits opposite Hugo on the floor with Diana in her lap. Mother opens the book. Hugo pulls the book in her hand (to get a view of the picture) looks at the picture. (G: Mo → Hu)

Mother holds the book in front of him, points at a picture signs WHAT, Mother points at the ball WHAT mutual gaze with Hugo. (D: Mo → Hu)

Hugo signs/says WHAT/what(t is) that(t) [Sw: vadå?] looks at and points at the ball. Mother lays the book down on the floor, turning towards all of them. Mother points at the pictured ball, nods. Hugo looks at the picture. (rD: Mo → Hu & Di)

Mother signs close to the book and in Hugo’s periphery field of vision BALL, FOOTBALL. During the last sign Hugo looks at (focuses on) the sign (rM: Mo → Hu) and then looks at the picture. Diana crawls away. Hugo raises his hand over his head FLY-UP (simplified signs), points at the picture while looking at it, gazes Mother. (rG:Hu → Mo)

Mother (has his gaze while) pointing towards the book (a picture of Frog kicking a ball) as in ‘that’ nods FOOTBALL, then narrating in sign language while Hugo looks at the signing: FOOTBALL. FIST-hand (as classifier for ball with her left hand) right index finger-KICK left hand-FIST-straightens out in a SPHERE-hand movement as going up and far away ahead of the kicker. Mother gazes Hugo, they smile and he bumps on his butt, looks at the picture, gazes Mother and looks at the picture, simplified BALL(-shaped)-fly-UP-slightly backwards over his head.

Mother points, taps at the picture and narrates: PIG, LOOK BALL FLAT-hand classifier moves towards and passes over head accompanied by gaze. Hugo looks up sees Mother signing (rG:Mo → Hu) LOOK BALL. Hugo looks at the picture: BALL(-shaped)-fly-UP.

Episode 7: Mother and Hugo, at 15 months.

From 15 months, Mother changed her attentional repertoire she was observed not to make simultaneous attentional expressions. On the other hand, at 15 months, Hugo’s simultaneous attentional expressions were dominant. He combined simultaneous simplified words with gazing (mutual gaze) and gestural utterance in the parents’ peripheral field of vision. Concerning Mother’s vocal attentional initiations, they had declined at 15 and 17 months were few. By waving redirectively in Hugo’s periphery, parents reestablished interchange with him.

Some months later, Hugo differentiated visual attentional expressions both in story-time and in playtime. Parents generally made mutual contact
by gaze before communicating to get attention, which Hugo from 22 months also did. Hugo was observed to look for responses in gestural mode and he focused on Parents’ face rather than altering his gaze between signing and face. Consequently, Hugo initiated attention by redirecting physical tap (22 months) and peripheral waving (24 months). At 24 months, Hugo persistently looked for getting and redirecting a more or less mutual contact with Father’s gaze before and during the most part of his utterance (Episode 8).

Translation: “Dad! Hugo swinging. Dad! Fall/jump off is dangerous, it’s like flying off.”

The family is outside in a playground. Diana nearly gets hit by a swing and begins to cry. Father lifts her up and comforts Diana while explaining to Hugo about the danger of a swinging swing. Father looks at Diana. Hugo waves in Father’s periphery, DAD. While running towards Father Hugo gets mutual gaze. (G: Hu → Fa)

Father looks at Diana. Hugo taps Father, Father looks at him (rR: Hu → Fa)
Hugo: HG (-sign-name for Hugo) SIT-on SWING. Hugo sneezes (breaks the gaze-contact). Hugo waves in Father’s field of vision signs DAD! Hugo taps Father and gets mutual gaze, (rR:Hu → Fa)
Hugo signs DANGEROUS fall/JUMP-OFF (word fall uttered simultaneously as the sign JUMP where the sign-segment continued into OFF), turning around, thus breaking the gaze-contact while signing FLY (as a flapping bird) running ahead.

Episode 8: Hugo and Father, at 24 months.

At this age, Hugo kept mutual gaze-contact showing consciousness of partner’s visual attention although he (still) did not finish his utterance with a final gaze. As seen in Episode 8, Hugo turns around while signing.

Diana. Diana’s getting attention by making contact with mutual gaze, directing by gaze or pointing, and finally with redirecting expressions were followed by simplified sign; signs increased from 15 months.

Mother typically initiated and got Diana’s attention by pointing, and she was also making mutual gaze before utterances at 15 months. From 17 months, reestablished attention by redirecting peripheral wave was observed. Pointing declined at each session, whereas physical touch, mutual gaze, and peripheral signing increased. Mother’s sign as a maintaining attentional expression continued throughout the study, often followed by a referral pointing to a picture.

From 22 months, Diana’s gaze focused on the partner’s face. Diana’s attentional initial and continuing interchanges increased, and her main expression was getting attention by mutual gaze before utterances. Second, there was signing in the partner’s peripheral field of vision, thus getting the partner’s visual attention. Third, there was pointing at real or pictured objects, which directed the attendance of the partner’s gaze.

Translation: “(Pig) He’s baking. From that he takes a huge bite and loads in a mouthful, Wow! Baking, he loads in. The Pig eats, there.”

Diana makes mutual gaze-contact with Mother (G: Di → Mo)
Diana signs BAKE BAKE, brakes gaze points at the picture of the baking Pig, renewed mutual gaze BAKE BIG (big distinct movements, enlarged eyes and blown cheeks) BITE-MOUTHFUL SWALLOW-BOLT WOW! (non-manual big grabbing bite swallowed bodily accompanied by enlarged eyes)
Diana looks at the picture, signs BAKE (displaced in Mother’s field of vision) (rG: Di → Mo) points at the Pig and signs SWALLOW. PIG EAT touching the Pig picture.

Episode 9: Diana and Mother, at 22 months.

At times, as also in Episode 9, Diana was observed to get reestablished attention by displacing her signs in the interlocutor’s visual field, from where the utterance continued into her conventional signing space. The displaced peripheral signing indicated a growing consciousness of the partner’s visual attention. This coincides with Diana beginning at 22 months to use redirecting attention expression.

Summarizing 15 until 24 months. These months were characterized by the twin’s increased initiations. This
contained initial attentional expression followed by symbolic content. The parents got both twins’ attention by mutual gaze contact, pointing, and maintaining peripheral signing during these months. The parents’ redirecting tapping and peripheral wave were observed from the twins’ age of 17 months. Reestablishing redirecting expressions was in the twins’ regular repertoire at the age of 2 years.

Diana initiated in gestural expression, as Hugo also successfully did, although during the first sessions, he additionally used multiple attentional expressions. The twins developed a flexible gaze contact, which alternated between the interlocutor’s (including displaced peripheral) signing, face, and object. However, by the end of these months, both twins focused their gaze toward the partner’s face perceiving signing from the peripheral visual field.

The frequencies in Diana’s attentional repertoires developed during these months from using object to pointing in order to get, direct, and continue attention. Diana (at 22 months) displaced peripheral signing also indicated a growing consciousness of the partner’s visual attention. This coincides with her redirecting attention consisting of physical tap, and at 24 months, she also used peripheral wave to reestablish attention.

Already from the time Hugo was 15 months, the parents decreased their initiating interchange in vocal modality, which was not observed after 17 months (however, it was observed again at 36 months). Hugo used vocal and gestural mode simultaneously at 15 and 17 months then getting mutual gaze contact before utterances became vital to ensure attention. This initial gaze contact differed in comparison to Diana’s more directive attentions. Hugo looked for visual responses at the age of 22 months, and at 24 months, he showed consciousness of his partner’s visual attention by insisting on mutual gaze. (Summary Tables 2 and 3, included before the Discussion).

Interaction From 28 Until 40 Months

During the twins’ age from 28 until 40 months, the parents were more active in initiating attention than between 15 and 24 months. The mutual communication became a more equal conversation in which the parents enlarged the interchange with explanations about things and activities. The parents were not as attentive to the toddlers, asked them to wait, and interrupted the toddlers’ watching pictures, for instance by continuing to read. Mother’s pointing, as initial attentional expression, at pictured objects decreased and was seldom observed.

Diana’s mutual gaze was the typically used attentional expression, and peripheral signing to get or maintain attention was also frequently used. Physical tap was the commonly observed redirecting expression at 28 months. At 32 months, Diana used a few gaze checks, and at 36 months, physical tapping and peripheral waving increased in reestablishing attention.

Diana received a cochlear implant at 35 months and was at the 40-month session observed to utter speech sounds according to the symbolic content while play-reading to Hugo.

Translation: “That bird is flying. Turn the page! There is the same bird flying.”

Diana and Hugo sit beside each other (in a sofa with the book on Hugo’s knee) looking at the pictures. Diana points at the bird in the picture, Hugo looks at the picture (M: Di → Hu).

Diana signs in Hugo’ peripheral visual field: BIRD FLY. SHALL TURN-PAGE! Hugo turns the page. Diana: BIRD/bibi [Sw. simplified word pippi: bibi] SAME BIRD FLY [Sw: (fyga)] pointing at the bird/the(r)e [Sw: d/at(r)]. Hugo looks at the pictures and follows her story in signs, vocative and pointing made in his visual field. Nicolia comes and sits down. Diana continues in sign language.

Episode 10: Diana and Hugo, at 40 months.

Diana additionally used displaced peripheral signing while maintaining Hugo’s simultaneous-looking at the book (Episode 10). In interchange, Diana differentiated between partners. She did not use vocatives with Parents and Nicolia.

Parents frequently used redirection both to initiate and to regain attention with Diana mostly by physical tap and with Hugo mostly by wave. Maintaining gaze at focus while peripheral signing and getting attention by mutual gaze were also used.
Table 2  Diana and Partners Attentional categories and most-used expressions between Partners and Diana, age 10–40 months

<table>
<thead>
<tr>
<th>Interchange age and contact</th>
<th>Get(G), reestablish(rG)</th>
<th>Direct(D), reestablish(rD)</th>
<th>Redirect(R), reestablish(rR)</th>
<th>Maintain(M), reestablish(rM)</th>
<th>Check (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother → Diana (10–13 months) Eye-contact</td>
<td>(G) moves herself or object or moves-/acts on objects in Diana’s field of vision; mutual often locked gaze; displaces gesture and sign, tactiley also by object; capturing gaze (11); tactile signing (12–13)</td>
<td>(D) pointing, by object; tactile use of Diana’s body parts (at 12); pointing linked to body parts (at 13)</td>
<td>(R) touch (10)</td>
<td>(rM) displaces gesture and signs in Diana’s field of vision also close to objects; moves object also tactiley (until 12); performs sign with body parts (12); (M, rM) displaces, peripheral and tactile signing (12–13)</td>
<td>Check (C)</td>
</tr>
<tr>
<td>Partners → Diana (15–24) Gaze-contact</td>
<td>(G) displaces signing; peripheral-signing; pointing; (G, rG) mutual gaze</td>
<td>(D) points out (17) followed by mutual gaze and comment</td>
<td>(R, rR) physical touch; (R, rR) peripheral wave (17); (R, rR) physical tap (22)</td>
<td>(M) displaces signing; peripheral-signing; (M, rM) pointing</td>
<td></td>
</tr>
<tr>
<td>Partners → Diana (28–40) Visual-contact</td>
<td>(G) mutual gaze; (rG) pointing at referent</td>
<td>as previous</td>
<td>(R, rR) physical tap; (R) peripheral wave</td>
<td>(M) peripheral–; displaced signing (28)</td>
<td></td>
</tr>
<tr>
<td>Diana → Mother (10–13 months) Eye-contact</td>
<td>(G) looks up at, or towards, Mother; often locked gaze (11 m); mutual gaze before gesture or sign (13); (rG) pointing</td>
<td>(D) gaze looking toward object; (rD) gazes or/and points at focus then symbolic utterance (13)</td>
<td>(R) physical tap (22)</td>
<td>(M) displaces signing (22)</td>
<td></td>
</tr>
<tr>
<td>Diana → Partners (15–24) Gaze-contact</td>
<td>(G, rG) mutual gaze before symbolic utterance; pointing before mutual gaze and signing; (G, rG) displaces signing in other’s field of vision (22)</td>
<td>(rD) gazes at, touches or points out</td>
<td>(rR) physical tap (22)</td>
<td>(rR) peripheral wave (24)</td>
<td></td>
</tr>
</tbody>
</table>
In the last studied session, Hugo dynamically, in context, used a repertoire of getting, redirecting, maintaining, and checking attentional expressions in a smooth visual-contact interchange of communication. When close to the interlocutor, Hugo redirected attention by physical tap and maintained signing peripherally, followed by checking for attendance. Hugo (Episode 11) shifted his gaze between the partner and the objects he was conversing about. Also, when not expecting a response, he continually checked for the listener’s continued attention.

Translation: “I want, please? (short response not observable probably ‘PETROL’) In that car, fill petrol? (short response not observable probably ‘NOD’) Petrol in that, hmmm, there is no petrol in that. No there is no petrol in that. There is no. Me filming, can I please come over to film, you do believe I can film, Yes? (short response not observable probably ‘PETROL’) Yes yes petrol, drive to the station and fill petrol, I think it’s, what’s it called, a country that’s run out of petrol. So fill from another.”

Hugo has been driving with his remote-controlled car, then tries to negotiate with the observer to film with the camera. Hugo gets mutual gaze with Observer (G: Hu → Ob)

Hugo: points to himself (as in I) WANT (to film? He gets a short response not observable probably PETROL). Hugo looks towards the remote-controlled car on the floor (mutual gaze) FILL (break gaze) PETROL point (mutual gaze holding his pointing toward the) car? (Short response not observable, probably: NOD). Hugo: PETROL looks at the car then towards observer PETROL, (break gaze) point-car/wrinkle-on-nose, (C: Hu → Ob) NO PETROL point-car, NO-shake head HAVE-NO-shake head PETROL, squint eyes HAVE-NO.

Hugo gazes Observer (rG:Hu → Ob)

Point Hugo (as in I) FILM—FILM(-verbalizing) appealingly-APPLY? (break gaze) point camera point Hugo (as in I) (mutual gaze) FILM (-verbalizing) CAN BELIEVE point observer (as in you) Y-E? (Short response not observable,
<table>
<thead>
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<th>Check</th>
</tr>
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<tbody>
<tr>
<td>Mother → Hugo (10–13 months)</td>
<td>(G) moves herself or object in Hugo’s field of vision; mutual often locked gaze; (G, rG) vocally; (rG) with -simultaneous signing; vocal/gestural deictic pointing (12); vocal words (13)</td>
<td>(rD) by real object; (D, rD) pointing (13)</td>
<td>(R) vocal calls name (12)</td>
<td>(M) sound; displaces gesture, vocal instruction (10); vocal labeling (11); vocal word; peripheral signing (12)</td>
<td></td>
</tr>
<tr>
<td>Hugo → Mother (10–13 months)</td>
<td>(G, rG) mutual gaze; pointing to object; (G, rG) vocally (until 17)</td>
<td>(D) object-point vocal question (until 15)</td>
<td>(R) vocal calls name (until 17); physical tap (17); peripheral wave (22); (R) wave (24)</td>
<td>peripheral signing; vocal words (until 17)</td>
<td>(M) peripheral signing; vocal words (36)</td>
</tr>
<tr>
<td>Hugo → Partners (15–24)</td>
<td>(G) looks up at, or towards, Mother mutual often locked gaze; pointing, looks at and gesture or vocal word even combined with sign (11); vocal mode not successful</td>
<td>(rD) gaze looking toward object; (D) looks at object followed by pointing (12); (D) complementary deictic and simplified vocal word (13)</td>
<td>(R) physical tap (22); (R, rR) physical tap (24); (rR) peripheral wave (24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partners → Hugo (28–40)</td>
<td>(G) mutual gaze; (G) vocal words (36)</td>
<td>(D) vocal word (36)</td>
<td>(R) physical-tap; (R, rR) peripheral wave; (R) vocal word (36)</td>
<td></td>
<td>(28)</td>
</tr>
<tr>
<td>Hugo → Gaze contact (13)</td>
<td>(G, rG) mutual gaze; (G, rG) pointing at focus</td>
<td>(D, rD) Points out</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
probably PETROL) Y-E-S, Y-E-S PETROL, break gaze IN(-reference-point-localisation-in-signing-space) PETROL FILL STATION-reference-point DRIVE (C:Hu → Ob) point/to-reference, ONE THINK-squeezes nose, flap hand (as in what is it called) (C:Hu → Ob) COUNTRY (C:Hu → Ob) reference-point /there (C:Hu → Ob) PETROL (C:Hu → Ob) RUN-OUT/ FINISH-reference-point. (mutual gaze) INSTEAD POUR-IN N-E-W. Hugo looks at the observer then down at the floor.

Episode 11: Hugo with Observer, at 40 months.

During what seemed to be reasoning, a self-test, about the probability of driving a remote-controlled car on petrol, he did no visual checks. Hugo renewed the interchange by (getting) mutual gaze, and in Episode 11, he had the interlocutor’s attention and did not need to use any redirecting expressions.

Parents primarily got attention with Hugo by mutual gaze that was followed by signs. Getting, directing, and maintaining attention by vocal initiation were re-observed at the 36-month session after not having been present for well over a year.

Summarizing 28 until 40 months. The twin’s interchange changed into conversations about the focus. Parents were observed to “check” for the toddlers’ attention; from when they were 28 months old, when attention remained, interchange went on. If the twins’ gaze had drifted away, the parents used either a physical tap or a peripheral wave to redirect attention or peripheral signing maintained the joint focus. Diana used checking at the 32-month session and Hugo at 36 months. Parents re-used vocal initiations with Hugo from the age of 36 months.

Diana received sounds through a cochlear implant from 35 months of age and some vocal speech sounds, simultaneously combined with signing, were observed while maintaining her hearing brother’s attention at focus.

By the end of the study, both twins initiated and continued interchanges using attention expressions in all five categories, increasingly combined with reestablishing expressions in a communicative flow with the partner.

Table 3 Continued

<table>
<thead>
<tr>
<th>Interchange age and contact</th>
<th>Hugo / Partners (28–40)</th>
<th>Gaze-contact</th>
<th>Get(G), reestablish(rG)</th>
<th>Direct(D), reestablish(rD)</th>
<th>Redirect(R), reestablish(rR)</th>
<th>Maintain(M), reestablish(rM)</th>
<th>Check</th>
</tr>
</thead>
<tbody>
<tr>
<td>(36)</td>
<td>(G, rG) mutual gaze; (G, rG) pointing at real objects</td>
<td>(D, rD) point out often simultaneously with directing vocal word</td>
<td>(R, rR) peripheral wave; (R) physical tap</td>
<td>(M, rM) peripheral signing when close to partner</td>
<td>(36)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The changes, according to the five attentional categories, are summarized in Tables for Diana and Partners (Table 2) and for Hugo and Partners (Table 3), respectively. In the Tables, the left and first column shows the initiatee, the twin’s age and the interchanging contact used. The next five columns show the attentional categories. In the columns initiating and reestablishing expressions are distinguished with the initial letter in brackets in front of the expression. Expressions are structured primarily in descending order of frequency or in accordance with age noted with numbers within brackets after the particular expression.

Discussion

The purpose of this case study was to longitudinally analyze and describe the changes of attentional expressions in interchanges between a pair of fraternal twins, one deaf and one hearing, from the age of 10 to 40 months, and their deaf caregivers.

One conclusion of the study is that interchange attentional expressions are used differently depending on the twins’ age in combination with modality and personality. For the first three years of her life, Diana was acquiring one language (SSL) in gestural-visual mode, whereas Hugo, from birth, also developed spoken Swedish, thus in vocal-aural modality.

The analyses of initiating and/or reestablishing joint attention in the five categories: getting mutual attention, maintaining focus on target, directing attention, redirecting attention toward you, and checking attentiveness revealed different uses depending on the modality. These categories involve various attentional expressions, some of which were used in more than one category. Pointing, for example, was used to get, direct, and maintain the interlocutor’s attention, and gaze was used in the getting, directing, and checking categories. The parents were observed using different expressions and of gradually introducing and extending them in how to initiate, reestablish, and continue interchanges.

In 10 until 13 months, the infants played with toys or moved around the room, in which Mother followed-in, as Tomasello and Farrar (1986) stated; furthermore, Mother extended and helped out in the activities. Mother constantly arranged and rearranged the visual space between them, previously reported by Mather et al. (2006) as sight triangle. Mother attentively waited for them to look at her, which resulted in getting eye-contact. The differences between getting and maintaining attention depended on whether the infant was looking at Mother or not. When Diana kept looking at the shared focus, Mother maintained the displaced communication, within the visual field and tactiley. This was sparsely observed in the interchanges with Hugo, when Mother instead maintained in vocal modality. Displaced signs by deaf mothers in the deaf child’s peripheral visual field and close to the target were also reported by Van den Bogaerde (2000) for 12- and 18-month-old children, whereas Harris et al. (1989) found this to be most frequent at the age of 16 months. With Hugo, Mother often used multiexpressions, vocative simultaneously as gestural expressions.

The 15 until 24 months were characterized by the twin’s initiating joint attention. Diana’s and Hugo’s initiations and activities were still the parents’ priority in which they followed-in and expanded. At the 15-month session, Hugo still frequently used vocal modality simultaneous combined with one or two other expressions. Two months later, Hugo’s multiexpressions had decreased, coinciding with the parents omitting vocal initiations. This also corresponded in time with the parents’ use of expressions redirecting the twins’ gaze (physical touch and tap and peripheral gestural wave). Essentially, this conforms to the behavior at the age of 18 months that Waxman and Spencer (1997) point out for deaf mothers’ increased use of redirecting expressions. At the following observation, the twins used redirecting expressions, which then increased over time. The appearance of directive strategies was also found in the study by Van den Bogaerde (2000) between the age span of 2 and 3 years of age.

Diana’s and Hugo’s expressions used for initiating and reestablishing attention seem closely connected to their conversion of gaze and intersubjectivity. The twins’ interchange by gaze changed within the episode from more or less locked eye-contact during the first months studied to eventually becoming more flexible gaze-contact. Gaze-contact developed in two intersubjective sides: one perceptive and one productive gaze-contact. First observed was the toddler’s gaze altering
between the interlocutor’s signing, face, and object at focus (including pointing). Eventually that gaze changed into a smooth flexible gaze-contact throughout the these months. As both Hugo’s and Diana’s eye movements changed, their gaze became directed toward the interlocutor’s face. The area around the mouth seemed to be the focus, whereas signing was perceived through their peripheral visual field. On the productive side, the twins made sure to have mutual gaze contact with the interlocutor before starting utterances. As mentioned previously, redirecting tap or wave expressions were observed from 22 months.

Finally, the 28 until 40 months characterized a more equal division of initiations between children and parents. At story-time, the parents continued the story-telling, expecting the twins to follow the progress. One conclusion is that this was possible since the twins were now using quick altering gaze shifts and signing was mainly perceived peripherally. This result broadly conforms with Van den Bogaerde’s (2000) finding that mothers, in order to make the linguistic content visible, took on that responsibility until the child was 30 months old.

During the interchange, the parents inserted visual checking by quick and short gazes of the interlocutor’s attendance. Each turn ended with a mutual gaze with the purpose of giving the floor to the next interchanging turn, a result that was also found, for 3-year-olds, in the bilingual bimodal twin study of Richmond-Welty and Siple (1999). Visual-contact with checking and final mutual gaze was observed in the twins’ sign language around the age of 3 years. Thereby, the twins showed a development of intersubjective consciousness for keeping the partner’s attention throughout an interchange. This also points toward the close connection of structural language development, where gaze is used linked to and in accordance with the linguistic content and for repeated checking of the interlocutor’s attentiveness. Baker and Cokely (1981) describe such visual behavior as commonly used by fluent signers.

In the present study, various modalities were used in the interactional complexity. The diverse conditions for how visual-gestural, kinesthetic-tactile, and aural-vocal modalities work are revealed by the parents use. The parents managed this by following—in the twins’ focuses often by simultaneously mixing in a symbol from the other modality. In this way, the parents both divided and engaged interchanges according to the twin’s personality and need, as Lytton and Gallagher (2002) reported. The parents gave both twins the opportunity to perceive at the same time that an interchange in another modality was going on with the other twin. This is a considerably more complex situation compared to the twin interactions that Thorpe et al. (2003) emphasized as complex twin interactions. Possibly, this divided communication with infants at the same age and/or the context of story-time made the tactile mode more often used than has been found in previous studies.

In the interview, the parents commented that vocal initiations and reestablishing expressions between Hugo and caregivers were used since Hugo, from early life, gave meaningful feedback on vocal utterances. This is probably what Van den Bogaerde (2000) considered to be adapting to the expectations of the hearing child to develop bilingualism. This continued until the parents discovered Hugo making unsuccessful vocal initiations with them. In the data, this occurred at the age of 17 months when Hugo increased and his parents decreased their vocal initiations. At the same age, the parents’ redirecting expressions increased. The data further give information about the parents withholding their vocal initiations until Hugo was 36 months old. At that age, Hugo inserted gaze checks in his signing, which matches in time with the parents reintroducing vocal attentional expressions. The correspondence of Hugo showing modality recognition and the parents reusing vocal attentional expression might be the reason. Thus, the use of vocal modality additionally seems to have not only intersubjective and bilingual-bimodal (signed and spoken languages)—but also timing aspects. These seem to be possible explanations of deaf parents’ use of vocal modality with their hearing child. This case, however, presents a considerably more complex picture of the deaf parents’ use of vocal mode with their hearing child than those described by Spencer et al. (2004) and Waxman and Spencer (1997). The Swedish bilingual approach, the official recognition of SSL as deaf peoples’ first language (Prop, 1981), has likely influenced confidence in deaf parents’ use of bilingualism with their children.
Significance and Its Relevance to Special Education

The uniqueness of the present study is that the child-parent interactions involved at least three, often four persons communicating in more than one modality and in divided interchanges. In comparison, most studies carried out so far consist of the one parent and child dyad. Therefore, this case provides a description of interactional complexity management, a situation not unlike, and having implications for arrangements of real-life settings such as preschool and early intervention services. As already discussed, the results also contain several processes appearing over time concerning important developmental changes. These findings can be supportive in promoting young children's potential for development, especially as most deaf children have hearing parents and processes of sign language acquisitions start later than when the parents are signers. An issue with clear relevance to special education is the importance of acquiring further knowledge about the natural development of both parallel and sequential language acquisitions in combinations of signed and spoken languages.

Conflicts of Interest

No conflicts of interest were reported.

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