The Impact of Maternal Deafness on Cradling Laterality with Deaf and Hearing Infants

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A recent article in the *Journal of Deaf Studies and Deaf Education* (Leigh, Brice, & Meadow-Orlans, 2004) explored attachment between deaf mothers and their 18-month-old children and reported relationship patterns similar to those for hearing dyads. The study reported here explores a marker of early mother–child relationships: cradling laterality. Results indicated that, overall, the cradling bias of deaf mothers is similar to that of hearing mothers, but that there are significant differences among deaf mothers related to the hearing status of their own parents and, in a complex way, to the hearing status of their children. Deaf mothers of deaf parents showed a strong leftward cradling bias with both hearing and deaf children, whereas deaf mothers of hearing parents showed a leftward cradling bias with hearing children and a rightward cradling bias with deaf children. Possible explanations for these patterns of behavior are discussed.

Childhood deafness may pose challenges to the mother–infant relationship that go beyond those of adapting to a deaf child’s perceptual needs. As part of a study of mother–infant communication, we interviewed 12 hearing mothers whose children were enrolled in an oral/aural early intervention program (Sieratzki & Woll, 2004, in preparation). All except 2 had experienced their child’s deafness as a significant trauma, reporting severe fear, grief, pain, and communication breakdown on learning of their child’s deafness at the 8-month hearing screening test. Of the other 2, one mother had learned of her baby’s deafness through neonatal screening and reported no negative impact; the other reported feeling only “a little sadness [about deafness as such] . . . due to almost having lost [the baby] to meningitis.”

Despite these traumatic experiences, all 12 mothers reported positively about their ability to establish communication subsequently and about their children’s general development. This is in line with reports that the impact of childhood deafness on a hearing mother is stressful but not necessarily negative if appropriate early intervention support is given (Pipp-Siegel, Sedey, & Yoshinaga-Itano, 2002; Yoshinaga-Itano, 1999). Attachment in hearing mothers and their deaf children has been found to be similar to that in hearing dyads (Lederberg & Prezbindowski, 2000).

In deaf mothers and their children, security of attachment has also been shown to be comparable to that of hearing dyads, although the concordance between mother and child in terms of attachment status was lower. The hearing status of a mother’s parents has not been found to affect the attachment relationship between a deaf mother and her child (Leigh, Brice, & Meadow-Orlans, 2004). In this article, we explore cradling laterality in deaf mothers as a manifestation of the early mother–infant relationship.

The Study of Cradling Laterality

After the trauma of birth, infants need reassurance, and mothers want nothing more than to provide it.
Cradling epitomizes this early relationship in which infants develop both trust in the mother and confidence in their ability to communicate their needs. Across cultures, about 70–80% of mothers cradle infants on the left side, with similar findings reported for mothers in North America, Europe, Africa, Asia, and South America (Salk, 1960, 1973; Bolton, 1978; Bruser, 1981; Saling & Cooke, 1984; de Chateau, 1987; Manning & Denman, 1994). This pattern has also been found in modern and historic artistic representations of mother–infant pairs (Finger, 1975).

Conventional wisdom links the use of the left arm for cradling to right handedness. However, this reasoning cannot account for the approximately 65% of left-handed mothers who cradle on the left and the approximately 25% of right-handed mothers who prefer to cradle an infant on their right side (Salk, 1960, 1973; Harris, Almerigi, & Kirsch, 2000). Close contact with the soothing maternal heartbeat is another intuitively appealing explanation for left cradling (Salk, 1960, 1973), but this also cannot account for those mothers who cradle on their right side, opposite the heartbeat (Sieratzki & Woll, 1996; Todd & Butterworth, 1998).

Psychological Explanations for the Left-Cradling Preference

Psychological studies have found that most females, regardless of parenting experience and even as young as 6 years, show a leftward cradling preference. In contrast, men who are not fathers show no significant side preference; most fathers are left cradlers (de Chateau, 1987). The leftward cradling bias (LWCB) even manifests itself when the object of cradling is not a real baby but an infant-size doll or when test subjects only imagine holding a child in their arms (Weiland & Sperber, 1970; Bogren, 1984; Harris et al., 2000). Parenting experience increases the bias for holding a doll on the left side (Bundy, 1979).

In one particularly interesting study, women were asked to hold a pillow against their chests. Initially, no side preference was noted. However, when asked to imagine that the pillow was a distressed infant, the majority of subjects held the pillow against their left side, suggesting that left-cradling helped reduce anxiety (Weiland & Sperber, 1970).

Right Hemisphere Specializations as Explanations for Left Cradling

Manning and Chamberlain (1990, 1991) were the first to suggest a relation between left cradling and specialized right hemisphere functions. They theorized that a mother has an advantage in monitoring the infant’s face through her left visual field (projecting to the right hemisphere), which is superior for recognizing emotional valences of facial expressions, especially those of crying infants (Best, Womer, & Queen, 1994). This theory has been recently revisited by Bourne and Todd (2004).

Going beyond the unilateral aspect of maternal monitoring proposed by Manning and Chamberlain, we have analyzed the left cradling bias in the context of early mother–infant socioaffective communication (Sieratzki & Woll, 1996, 2002). To connect with her child, the mother offers her feelings through touch, gesture, facial expression, and particularly sound. Although Salk (1960) believed that the maternal heartbeat leaves a psychobiological imprint on the fetus, there is overwhelming evidence that the mother’s voice is the one sound that really matters. Prenatally, the mother’s voice is transmitted through bone conduction, such that newborns recognize the intonation contours and specific frequencies (DeCasper & Spence, 1986; Fifer & Moon, 1994). The sounds of the mother’s voice compose a melody with no or little lexical content, which is remarkably similar across cultures (Fernald, Taeschner, Dunn, Papousek, De Boysson-Bardies, & Fukui, 1989; Cruttenden, 1994). The melody is tuned to the infant’s needs and responses; it is the emotional “heartbeat” the infant seeks.

As recognized long ago by Hughlings Jackson and in more recent research, the right hemisphere controls intonation and the affective intent of speech, that is, prosody (Snow, 2000; Borod, Bloom, Brickman, Nakhutina, & Curko, 2002). Perhaps surprisingly, 70% of left-handed people have the same brain lateralization for lexical and affective features of
language as right-handed people, with 15% showing mixed dominance (Kupfermann, 1991). Our theory suggested that the unique prosody of maternal infant-directed speech exemplifies the right hemisphere domination of early mother–infant interactions (Sieratzki & Woll, 1996). Left-sided cradling facilitates the flow of communication between mother and infant, channeling visual, vocal, and tactile signals to the maternal right hemisphere, which in turn tunes the melody of the maternal voice.

Support for our theory comes from functional magnetic resonance imaging (fMRI) studies of mothers responding to the sounds of infant cries (Lorberbaum et al., 2002) and from spectrographic studies of maternal infant-directed speech. Reissland (2000), for example, examined differences in the pitch of maternal vocalizations in relation to infant cradling laterality and found a significant difference, with low-pitched, soothing sounds (mean frequency 171.3 Hz) accompanying left cradling and high-pitched, arousing sounds (mean frequency 221.1 Hz) accompanying right cradling. As we had hypothesized (Sieratzki & Woll, 1996), the lullaby does not sound the same and does not feel the same with the baby on the other side.

Deaf Mothers’ Vocalizations to Their Infants

Maternal vocalizations to their infants originate from a deep-seated instinct: Even deaf mothers vocalize to deaf infants. Three studies provided detailed and unequivocal evidence of this aspect of the communicative behavior of deaf mothers.

Woll and Kyle (1989), as part of a larger study of deaf mother–child interaction, reported on 3 congenitally deaf mothers with congenitally deaf infants. Recordings were made in the home by a native-signing deaf researcher. All 3 mothers used British Sign Language (BSL) and spoken English with their children, although their preferred language for communication with adults was BSL. Utterances were coded as involving either speech or signs without speech. At infant age 3 months, 2 mothers produced 90% of all utterances with speech, gradually decreasing to less than 50% by infant ages 6 and 9 months. The third mother showed a stable percentage of around 50% from infant age 3 months onward. In subsequent interviews, the three mothers said that they were not aware of the extent of their use of vocalization, but that it was important for young deaf babies to learn to look at their mother’s face. In BSL and other sign languages, prosody is predominantly carried by facial expressions and is primarily mediated by the right hemisphere (Corina, Bellugi, & Reilly, 1999).

A study in the Netherlands investigated 6 children (3 deaf and 3 hearing) of deaf parents from age 12 months (van den Bogaerde, 2000). Maternal child-directed utterances were coded as speech only, sign only, or combined sign and speech. Combined sign-speech predominated with both deaf and hearing children, and the use of sign-only and speech-only utterances depended directly on the hearing status of the child.

Koester, Brooks, and Karkowski (1998) compared the vocal patterns of deaf and hearing mother–infant dyads during face-to-face interactions at the infant age of 9 months. Deaf mothers relied less than hearing mothers on vocalization and used more vigorous tactile contact during similar types of interaction.

To explore further the relation between right hemisphere specialization for emotional communication and cradling laterality (Sieratzki & Woll, 1996, 2002, 2003; Sieratzki, Roy, & Woll, 2002; Woll & Sieratzki, 2002), we have also undertaken a series of studies of mother–child dyads in which one or both participants have a sensory impairment. In this article, we report on our study of deaf mothers with deaf and hearing infants.

A number of hypotheses were explored: The absence of auditory perception may have an impact on cradling laterality. Alternatively, deaf mothers would show similar lateralization patterns to hearing mothers because of the multiple channels available for emotional communication. There might be a higher incidence of left cradling among right-handed deaf mothers who use sign language because of the need to keep the dominant signing hand free. There might be a higher incidence of left cradling in all deaf mothers because of the particular importance of visual interaction, the stronger emotional expressivity of the
left hemiface, and the higher sensitivity of the left visual field for emotional facial expressions.

Method

Participants

Data were obtained from 30 deaf mothers using a self-report questionnaire distributed through e-mail to a deaf parents e-group and at a Deaf community conference. The data are summarized in Table 1: There 24 participants who were profoundly deaf, and 6 severely deaf. The cause of deafness was genetic in 15, infectious in 4, from auditory trauma in 1, and unknown in 10. Of the participants, 24 were born deaf, 3 became deaf prior to 18 months of age, and 3 became deaf in later childhood. Eighteen had hearing parents, and 12 had deaf parents. In two cases (Participants 14 and 16), for which one parent was hearing and the other deaf, participants were assigned to the hearing status of their mother. Of the 18 participants with hearing parents, 12 had hearing children, and 6 had deaf children; of the 12 participants with deaf parents, 6 had hearing children, 4 had deaf children, and 2 had one hearing and one deaf child (Participants 19 and 21). For these last two cases, allocation to the hearing and deaf children groups was

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**Table 1** Individual Participant Data *

<table>
<thead>
<tr>
<th>Participants' deafness</th>
<th>Parent/child hearing status</th>
<th>Lateral bias</th>
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<tbody>
<tr>
<td></td>
<td>Own parents</td>
<td>Child (1)</td>
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<tr>
<td>Cause</td>
<td>Onset</td>
<td>Degree</td>
</tr>
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</tr>
<tr>
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<td>Birth</td>
<td>Profound</td>
</tr>
<tr>
<td>Trauma</td>
<td>18 mo</td>
<td>Profound</td>
</tr>
<tr>
<td>Rubella</td>
<td>Birth</td>
<td>Severe</td>
</tr>
<tr>
<td>Jaundice</td>
<td>Birth</td>
<td>Severe</td>
</tr>
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</tr>
<tr>
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<td>Profound</td>
</tr>
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* f = female  m = male  
R = right-handed  L = left-handed
made on the basis of the hearing status of the first-born child (one case to each group) because the cradling laterality observed in subsequent children always matched that of the first-born child. In total, 19 participants had hearing children, and 11 participants had deaf children.

Hand preference was determined for five nonsign activities and for signing: 5 of 30 participants (17%) were left handed, and 25 of 30 (83%) were right handed. All 5 sinistrals had hearing parents; the incidence of left handedness in this group was 5 of 18 (28%).

The high percentage of familial deafness in our participant group is not representative of the deaf population at large, although it is not uncommon in mother–child studies (Leigh et al., 2004). This distribution gave us the opportunity to assess better the impact of a mother’s own childhood experience of communication with her parents.

Procedure

The questionnaire had two sections. After completing the section on background information summarized above, the participants were asked to imagine themselves comfortably holding their babies, without feeding or doing any manual work. They were then asked to recall on which side they held the infant. Previous studies have found that mothers can reliably report their preferred cradling side without holding a baby (Bogren, 1984). Categorical variables were analyzed using Fisher's exact probability test.

Results

Results are summarized in Table 2: leftward cradling bias (LWCB) was reported by 22 of the 30 (73%) participants; this was 20 of the 25 (80%) right-handed participants, and 2 of the 5 (40%) of the left-handed participants (Table 2A).

The cradling bias was influenced by the hearing status of the participants’ parents: LWCB was reported by 10 of 18 (56%) participants with hearing parents versus 12 of 12 (100%) participants with deaf parents (Table 2B); this difference is significant (p < .01). The bias may possibly also be influenced by the hearing status of the participants’ children: LWCB was reported by 16 of 19 (84%) participants with hearing children versus 6 of 11 (55%) with deaf children (Table 2C), but this difference does not reach significance (p > .10).

Cross-tabulation showed that participants with hearing parents had an LWCB with hearing children (9 of 12), but not with deaf children (1 of 6) (Table 2D). This finding is significant (p < .05) but needs validation in a larger sample.

Discussion

The overall distribution of lateral cradling preference in this study is comparable to that found for hearing
It was hypothesized that right-handed deaf mothers who use sign language would have a higher incidence of left cradling. Indeed, one might predict a perfect correlation if this were the determining factor, but this was not supported by our findings. However, it should be noted that, in the earliest interactions, at the time when the cradling bias is established, deaf mothers do not for the most part communicate through sign language only (Woll & Kyle, 1989). Although utterances of deaf mothers to very young infants use the auditory modality, the dyadic interaction primarily takes place in the visual modality (Kyle & Ackerman, 1990). One could hypothesize that the predominance of emotional expressivity on the left hemiface (Zaidel, 1996) and higher sensitivity of the left visual field for emotional facial expressions, especially signs of infant distress (Best et al., 1994), would be factors that further increase the rate of LWCB in deaf mothers across all subgroups regardless of the hearing status of the mothers’ parents.

The unexpected finding of our study is the observation that the cradling bias of deaf mothers is indeed strongly related to the hearing status of their own parents and, in a complex way, to the hearing status of their children. Although our participant group was not large, it provides reasonable evidence that deaf mothers with deaf parents show a strong LWCB with both hearing and deaf children, whereas deaf mothers with hearing parents show an LWCB only with hearing children and a RWCB with deaf children. The difference in relation to parental hearing status remains significant ($p < .05$) even when results were controlled for left handedness (5 of 30 participants, all with hearing parents). A higher incidence of left handedness in nonfamilial deafness is in general agreement with previous population studies (Bonvilian, Orlansky, & Garland, 1982).

Why would having hearing parents and deaf children influence the cradling bias of deaf mothers? Following the suggestions of Bogren (1984) and de Chateau (1987) that an RWCB may hint at high maternal anxiety, one possible explanation could be that the RWCB of these mothers may reflect a basic experience of their childhood: the insecurity of their own hearing mothers on realizing that their child is deaf—in psychological terms, disappointing their own mothers for a second time.

Hearing mothers of deaf children use a more controlling style of interaction than hearing mothers of hearing children (see Woll & Gallaway, 1994, for a review). It is possible that deaf mothers with hearing parents replicate the same interaction style with their own deaf children. We have previously presented evidence suggesting a relation between cradling laterality and the predominant behavioral intent of the mother: acceptance and comforting on the left side, attention arousing and controlling on the right side (Sieratzki & Woll, 2002).

In our study, we found one other notable difference between deaf mothers with hearing parents and deaf mothers with deaf parents: the importance ascribed by deaf mothers with deaf parents to tactile interaction with infants. We would suggest that deaf mothers with deaf parents may have experienced greater responsivity by their mothers to their tactile needs as infants in comparison to deaf mothers with hearing mothers (Koester et al., 1998; Koester, Brooks, & Traci, 2000).

Our observations were based on a small sample, and further studies are planned to investigate whether cradling laterality has any significant relation to the quality of attachment between mother and child at a later age.

References


Received April 21, 2004; revisions received June 2, 2004; accepted June 7, 2004.