A Comparison of the Vocal Patterns of Deaf and Hearing Mother-Infant Dyads during Face-to-Face Interactions

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This study was part of a longitudinal investigation of the impact of deafness on the cognitive, social, and communicative development of infants. The current study reports analyses of the vocalizations of deaf and hearing infants and their Deaf or hearing mothers during normal face-to-face interactions when the infants were 9 months old. Results indicate essentially no differences in the amount of positive or negative vocalizations emitted by infants in any of the four groups observed. However, there is a heightened use of vocal games by hearing mothers interacting with deaf infants, indicating that these mothers are incorporating several additional sensory modalities into their vocal expressions. This is interpreted as one way in which parents make their vocal communication more salient and accessible to an infant with a hearing loss. Deaf mothers are also highly active and engaged with their infants, but have been found to rely more extensively on vigorous tactile contact rather than auditory input during these same interactions.

Vocal exchanges play an important role in interactions between parents and their offspring, even before infants are old enough to imitate the sounds of language. Cooing, laughing, and babbling all function as signals that elicit responses from caregivers and influence turn-taking patterns between the partners. Although language development presents one of the most difficult developmental problems for the deaf child with hearing parents, several authors have asserted that deaf children exposed early to sign communication follow a trajectory and timetable in relation to language acquisition similar to that of hearing children (Goldin-Meadow & Mylander, 1990; Schilling & Dejesus, 1993).

According to Marschark, “The relative availability of language also affects the quality and quantity of interpersonal interactions that form the social-cognitive matrix of development. . . . Lack of a coherent parent-child communicative channel is, by definition, atypical; subsequent atypical development should not be surprising” (1993, p. 23). Thus, the risk for a deaf child with hearing parents is not just related to language production, but may also extend to socio-emotional realms such as affect regulation, social cognition, and self-esteem. It is therefore important to examine ways in which both Deaf and hearing parents naturally com-
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pensate for a child's hearing loss during their normal interactions.

Both hearing and deaf infants produce vocal sounds such as cooing when they are alone, and these sounds also become part of the earliest dialogues when other humans are present. Parents respond to early vocalizations as if their baby is participating as a conversational partner. In the case of hearing parents, this involves listening to the infant, imitating or responding with efforts to elicit another infant sound, pausing to give the infant a turn, and so forth (Mayer & Tronick, 1985). Hearing parents thus provide feedback and reinforcement by imitating infant vocalization patterns, offering a "modeling/imitative frame" for the further development of conversational skills (Papoušek & Papoušek, 1991). However, it has not yet been documented whether Deaf parents with hearing infants might in fact provide similar responses, such as by imitating mouth shapes or movements when they observe their infant vocalizing. As Mechthild Papoušek asserts:

In concert with the interactional context, infant noncry vocalizations provide the parent with significant cues: They may function as feedback responses to preceding parental stimulation, as signals which characterize concurrent nonvocal infant behaviors, or as elicitors of differential forms of intuitive didactic caregiving (1989, p. 521).

Hearing infants have many opportunities to broaden their vocal repertoire, to respond to parental linguistic feedback, and to learn how to control relevant aspects of sound production such as tone of voice, melodic contours, volume, temporal patterns, and consonant-like sounds (Papoušek & Papoušek, 1991). Parents respond in kind, utilizing the infant's newfound vocal control to offer a new strategy: associating infant sounds with inferred meaning, hearing parents treat them as the infant's first "protowords" and further reward their production. In fact, to complement the idea of a Language Acquisition Device (Chomsky, 1965), Bruner (1975) proposed that parents also possess a "language acquisition support device," which provides a necessary counterpart to the infant's natural propensity to learn language. Similar intuitive support of the child's emerging linguistic skills has been shown in Deaf parents' adaptations when using infant-directed sign communication (Erting, Prezioso, & Hynes, 1990; Kantor, 1982; Masataka, 1992).

Vocalizations by parents not only shape the infant's emerging language skills but also provide affective information and assist infants in identifying significant figures in their social environment. According to Fernald, the exaggerated pitch typical of "motherese" is evident in a wide variety of languages and cultures and may represent a "universal human caretaking behavior" (1984, p. 5). Fernald argues that the characteristics of motherese are particularly salient for human infants and play an important role in the development of meaning, although such meanings for the prelinguistic infant are primarily affective.

In the case of a Deaf infant or parent, accessibility to vocal input is dramatically altered. Only recently has early identification of deaf infants provided opportunities for researchers to explore this relationship in larger samples and eventually to understand better the role of vocalizations in interactions when at least one member of the parent-infant dyad is Deaf. Marschark points out that "(o)bservation of the vocal babbling of deaf infants could help to decipher the extent of the innate endowment or potential for oral language ... as well as the importance of auditory feedback from the self and others as a precursor of normal phonological development (1993, p. 76).

Kirkman and Cross observed that hearing parents' first real encounter with their child's deafness shakes the parents' confidence in their ability to communicate effectively. "The diagnosis of deafness forces hearing parents abruptly to confront basic differences between themselves and their child, with the knowledge that there is a fundamental way in which they cannot share that child's experience" (1986, p. 54). Gregory (1995) reported that hearing parents sometimes felt there was no point in even speaking to a child who could not hear them, or that this spoken communication was difficult and even impractical. However, there is little subsequent evidence about the relationship between the actual quantity or nature of Deaf or hearing parents' vocalizations and their infants' ability to communicate effectively.

Regarding the lack of both contingent responding
ily backgrounds. In each case, both parents in the family had the same hearing status. The deaf infants in this study represent a small minority of the deaf population due to the fact that their hearing losses were suspected and diagnosed very early in life (in most cases, prior to infant age 6 months). Children with evident developmental delays or physical handicaps were not included in the sample.

Deaf Infants in Groups 1 (DIDP) and 2 (DIHP) had bilateral hearing losses ranging from mild to profound. Of those infants with Deaf mothers, 11 had severe-profound or profound hearing loss; one had moderately severe hearing loss; and there were four infants for whom exact hearing levels were not yet available. In the DIHP group, 10 had severe-profound or profound hearing loss; 5 had moderately severe or severe hearing loss; and 2 had mild to moderate hearing loss.

Hearing aids. For most of the deaf infants with hearing mothers, use of hearing aids had begun quite early (average age 6.95 months for initial fitting). However, the degree to which the hearing aids were actually utilized varied considerably, depending primarily on the infant's acceptance of or resistance to them. This variability occurred both within and between subjects, as some infants who normally wore the hearing aids may have protested on the day of observation, resulting in the mother removing them for the videotaping session. Nevertheless, the majority of deaf infants in this group (with hearing mothers) were reportedly wearing hearing aids during most of their waking hours. (It should be noted that the Deaf parents did not deem it necessary to have their deaf babies fitted with hearing aids at this early age, since they were emphasizing the acquisition of ASL as the child's first language.)

Early intervention. By age 9 months, virtually all of the deaf infants with hearing parents were participating in some kind of early intervention program; the one exception was an infant who was on a waiting list but was admitted to a program soon after. Services received represented a broad array of educational philosophies, including home- and center-based programs; auditory-verbal, Oral, and Total Communication training; and those provided by public or community agencies, residential schools for the Deaf, universities, and private therapists.

Data Collection

During the 9-month observation reported here, each mother-infant pair was videotaped in normal face-to-face interaction. For this purpose, the baby was placed in an infant seat on a table directly in front of and facing the mother; no toys or other objects were used during this procedure. The mother was instructed to interact with her infant just as she would do at home when she had a few minutes to spend with the baby; the first of these three minutes was considered "warm-up" time, so that only the second and third minutes were coded.

Each face-to-face interaction session was videotaped from behind one-way mirrors using two cameras and a special effects generator to produce a split-screen image. Videotapes were then coded by using a remote-controlled videocassette recorder linked to a personal computer equipped with data-acquisition and recording programs. Each change (e.g., onset of a new type of vocalization) was coded via the PC keyboard, and the time of occurrence was simultaneously entered directly from the videotape control pulse. This coding also indicated termination of a vocal utterance, which, if not followed by another vocal event, was then coded as the onset of silence. The result was a time-based, sequential record of both mothers' and infants' vocal behaviors, which was then processed through computer programs that transformed the data into durations and frequencies.

Both durations and frequencies of vocalizations are reported here, as they may have different meanings or effects on the interactional dialogue (see also Rea, Bonvillian, & Richards, 1988). For example, brief pauses (silences) may occur frequently and may be partially in response to the infant's fleeting glances elsewhere; this does not necessarily have a substantial impact on the overall amount of time she spends vocalizing, however. In other words, a high frequency of vocal pauses does not always result in a high proportion of the face-to-face interaction time being silent. Perhaps a better illustration of this comes from analyses of tactile contact with these dyads: in that case, longer durations of continuous touch mean fewer new initiations of this behavior, or lower frequency counts. The subjective effect for the infant is equivalent to the difference between slow, soothing strokes by the mother and the more stac-
cato-like, punctuated tactile contact that occurs with shorter durations.

Coding of Vocal Behavior

Members of the scientific community have not yet agreed upon the best methods for analyzing preverbal infant vocalizations. Some studies emphasize “objective” measures such as spectrographic and acoustical analyses, relying primarily on isolated infant sounds. However, to understand the role of human vocal communication in infancy, one must also address issues of reciprocal parent-infant vocal feedback within the interactional context. According to M. Papoušek, “Global categorizations of presyllabic vocalizations into comfort/discomfort, nondistress/distress, or positive/negative sounds have a long tradition in the linguistic literature . . . and are still commonly applied in studies of parent-infant communication” (1989, p. 509). For example, Lenneberg, Rebelsky, and Nichols (1965) examined the vocalizations of one deaf and three hearing infants with Deaf parents, compared to a group of hearing/hearing dyads, and used categories of crying, fussing, vegetative, cooing and “neutral” sounds.

The present analyses relied on global categories that incorporated parent or infant affect as well as vocal utterances, as indicated below. Mother and infant vocalizations were coded separately, using the following behavioral categories:

**Infant Vocal Behaviors**

1. laugh
2. positive, nonfussy vocalizations, including cooing, babbling, playing with sounds (e.g., “raspberries”), etc.
3. fussy vocalizations, not full-blown cry
4. cry, prolonged, rhythmic, and spasmodic (in contrast to intermittent protest sounds of no. 3
5. quiet
6. none of the above or uncodeable

(For purposes of statistical analyses, the first two infant vocal behaviors were combined to create the variable “Infant Positive Vocalizations,” and behaviors 3 and 4 (fussy and cry) were combined to create “Infant Negative Vocalizations.”)

**Maternal Vocal Behaviors**

1. laugh
2. vocal play (game routines such as “Pat-a-Cake,” songs and nursery rhymes, clicking sounds, tongue play, “raspberries,” etc.)
3. talk to infant (vocal babbltalk or “motherese,” questions, commentary about infant behavior, events or surroundings)
4. imitation of baby-like sounds (e.g., cooing, babbling)
5. quiet
6. none of the above or uncodeable

(Maternal laughter was observed so infrequently that it was not included in the statistical analyses; the remaining maternal vocalizations were analyzed as Vocal Games, Talk, Imitate, and Quiet.) It should be noted that durations reflect proportion of the total interaction time, rather than seconds. However, due to the omission of a few categories such as “uncodable” vocalizations, the numbers reported in Tables 1–4 do not add up to 100%.

Coding Reliability

Coders were trained to a minimum of 80% interrater reliability prior to actual coding. Similar to some other research in which the vocal behaviors of mothers and infants were examined (e.g., Rome-Flanders & Ricard, 1992; Spencer & Gutfreund, 1990a), simple percent agreements were then calculated for infant and mother vocalizations separately (three tapes each), across three coders. This resulted in the following mean interrater reliability scores: maternal vocalizations = 88%; infant vocalizations = 90.75%.

Results

Dyadic Group Effects

One-way analyses of variance (ANOVAs) were conducted on the mean frequencies for all variables by each group of Deaf or hearing mothers and infants (as shown in Tables 1 and 2). Infant vocalizations were not significantly different when analyzed by groups based on mother and infant hearing status However, these analyses reveal a significant Group effect for frequency
Table 1  Mean frequencies and durations of maternal vocalizations by group (standard deviations)

<table>
<thead>
<tr>
<th></th>
<th>DIDP</th>
<th>DIHP</th>
<th>HIDP</th>
<th>HIHP</th>
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</thead>
<tbody>
<tr>
<td><strong>Frequencies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vocal game*</td>
<td>1.50 (2.92)</td>
<td>4.71 (3.24)</td>
<td>3.25 (2.86)</td>
<td>2.88 (2.00)</td>
</tr>
<tr>
<td>Imitation</td>
<td>0.12 (0.33)</td>
<td>1.41 (1.87)</td>
<td>1.00 (1.59)</td>
<td>1.47 (2.81)</td>
</tr>
<tr>
<td>Talk/narrate**</td>
<td>2.41 (3.37)</td>
<td>6.24 (3.05)</td>
<td>3.69 (3.42)</td>
<td>7.82 (3.68)</td>
</tr>
<tr>
<td>Quiet*</td>
<td>5.06 (5.71)</td>
<td>8.59 (5.58)</td>
<td>9.88 (4.92)</td>
<td>10.12 (6.12)</td>
</tr>
<tr>
<td><strong>Durations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vocal game**</td>
<td>3.76 (6.97)</td>
<td>25.23 (21.58)</td>
<td>15.90 (19.10)</td>
<td>17.26 (16.57)</td>
</tr>
<tr>
<td>Imitation</td>
<td>0.13 (0.37)</td>
<td>2.89 (4.93)</td>
<td>4.17 (9.49)</td>
<td>2.35 (4.23)</td>
</tr>
<tr>
<td>Talk/narrate**</td>
<td>10.44 (15.27)</td>
<td>44.09 (19.67)</td>
<td>8.82 (12.11)</td>
<td>35.36 (16.12)</td>
</tr>
<tr>
<td>Quiet**</td>
<td>42.60 (34.49)</td>
<td>24.77 (19.21)</td>
<td>57.67 (25.77)</td>
<td>33.25 (20.31)</td>
</tr>
</tbody>
</table>

DIDP (n = 16): deaf infant, deaf parent; DIHP (n = 17): deaf infant, hearing parent; HIDP (n = 16): hearing infant, deaf parent; HIHP (n = 17): hearing infant, hearing parent.

*Durations indicate proportion of interaction time.

*p < .05.

**p < .001.

***p < .0001.

Table 2  Mean frequencies and durations of infant vocalizations by group (standard deviations)

<table>
<thead>
<tr>
<th></th>
<th>DIDP</th>
<th>DIHP</th>
<th>HIDP</th>
<th>HIHP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequencies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>2.12 (2.89)</td>
<td>2.18 (2.94)</td>
<td>1.25 (2.21)</td>
<td>1.59 (2.32)</td>
</tr>
<tr>
<td>Positive</td>
<td>4.12 (3.94)</td>
<td>3.12 (3.08)</td>
<td>4.06 (2.86)</td>
<td>3.82 (3.94)</td>
</tr>
<tr>
<td>Quiet</td>
<td>6.29 (4.12)</td>
<td>5.00 (3.39)</td>
<td>5.31 (3.50)</td>
<td>5.35 (4.05)</td>
</tr>
<tr>
<td><strong>Durations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>15.90 (20.70)</td>
<td>17.58 (23.74)</td>
<td>4.29 (6.79)</td>
<td>12.86 (24.10)</td>
</tr>
<tr>
<td>Positive</td>
<td>18.86 (19.43)</td>
<td>10.85 (11.90)</td>
<td>20.56 (14.46)</td>
<td>17.88 (19.54)</td>
</tr>
<tr>
<td>Quiet</td>
<td>54.09 (24.27)</td>
<td>43.50 (30.02)</td>
<td>57.95 (20.04)</td>
<td>57.45 (26.37)</td>
</tr>
</tbody>
</table>

*Durations indicate proportion of interaction time.

Tukey's HSD post hoc analyses were conducted to determine specific group differences for frequency of mothers' use of vocal games, \(F(3, 63) = 3.92, p \leq .05\); frequency of talk/narrate to the infant, \(F(3, 63) = 8.79, p = .0001\); and frequency of onset of silence, \(F(3, 63) = 2.92, p \leq .05\).

Tukey's HSD post hoc analyses were conducted to compare mean frequencies and durations of maternal vocalizations by group. These analyses indicate that mothers in the deaf infant/hearing parent dyads engaged in significantly more frequent vocal games during interactions with their infants than did mothers in the deaf infant/Deaf parent dyads. By contrast, hearing mothers with hearing babies engaged in vocal talk/narrate more frequently than did either group of Deaf mothers. Of the mothers with deaf infants, those who are themselves hearing talked to their babies significantly more frequently than did those who are Deaf. Post hoc analysis reveals a significant difference between deaf/Deaf (DIDP) and hearing/hearing dyads (HIHP) in frequency of episodes of maternal silence.

One-way ANOVAs were also conducted to compare mean durations for all variables by each group of Deaf or hearing mother-infant dyads, as shown in Tables 1 and 2. These analyses reveal significant Group effects for the amount of time mothers in each group spent engaged in vocal games, \(F(3, 63) = 4.65, p \leq .01\); the amount of time spent in talking to their infant, \(F(3, 63) = 20.39, p = .0001\); and the amount of time they remained silent, \(F(3, 63) = 4.94, p \leq .01\). Other comparisons of mean durations (including those of all infant vocalizations) resulted in nonsignificant differences.
Table 3  Mother and infant vocalizations: comparison of deaf and hearing mothers, regardless of infant hearing status (standard deviations)

<table>
<thead>
<tr>
<th></th>
<th>Deaf (n = 32)</th>
<th>Hearing (n = 34)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequencies</td>
<td>Durations*</td>
</tr>
<tr>
<td>Maternal vocalizations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Game</td>
<td>2.33 (2.94)</td>
<td>9.65 (15.27)</td>
</tr>
<tr>
<td>Imitation</td>
<td>0.55 (1.20)</td>
<td>2.09 (6.82)</td>
</tr>
<tr>
<td>Talk/narrate</td>
<td>3.03 (3.40)</td>
<td>9.65 (13.64)</td>
</tr>
<tr>
<td>Quiet</td>
<td>7.39 (5.80)</td>
<td>49.91 (31.06)</td>
</tr>
<tr>
<td>Infant vocalizations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>1.70 (2.53)</td>
<td>10.27 (16.45)</td>
</tr>
<tr>
<td>Positive</td>
<td>4.09 (3.40)</td>
<td>19.68 (16.96)</td>
</tr>
<tr>
<td>Quiet</td>
<td>5.82 (3.80)</td>
<td>55.96 (22.06)</td>
</tr>
</tbody>
</table>

Asterisks indicate significant differences between Deaf and hearing mothers on each variable.

*Durations indicate proportion of interaction time

* p < .05.

** p < .01.

*** p < .001.

Tukey's HSD post hoc analysis was again applied to determine which groups differed on the three variables of vocal games, talk/narrate, and quiet. The analysis of maternal vocal games reveals a significantly longer duration for the deaf infant/hearing parent group (DIHP) than for the deaf infants with Deaf parents (DIDP). The analysis of maternal talking, as would be expected, reveals a significantly longer duration for both groups with hearing mothers (HIHP and DIHP) than for those with Deaf mothers (HIDP and DIDP). Hearing mothers with hearing infants were not significantly different from those with deaf infants in terms of overall duration of talking/narrating to the baby. However, Deaf mothers with hearing babies remained quiet for significantly more of the interaction time than did hearing mothers in either the DIHP or the HIHP group.

Effects of Maternal Hearing Status

T tests were also conducted on all variables by mothers' hearing status; that is, all Deaf mothers were grouped together and compared to all hearing mothers (regardless of infant hearing status), as can be seen in Table 3. Results indicate that hearing mothers engaged in longer durations, t(65) = 2.71, p < .01, and more frequent vocal games, t(65) = 2.08, p < .05, as compared to Deaf mothers. Mean durations of silence were longer for Deaf mothers than for hearing mothers during interactions with their infants, t(65) = 3.28, p < .01. However, the reverse is true for maternal talk/narrate: in this case, hearing mothers spent more time talking to both deaf and hearing infants, t(65) = 7.62, p < .001, and initiated these bouts of spoken language more frequently than did Deaf mothers, as expected, t(65) = 4.79, p < .001. Finally, hearing mothers imitated their infant's vocalization patterns more frequently than did Deaf mothers, again as would be expected, although the difference here only approached significance, t(65) = 1.95, p < .06.

Effects of Infant Hearing Status

All variables were also compared according to infant hearing status by combining all deaf and all hearing infants into two groups, as shown in Table 4. T tests show only a significant difference between groups for frequency of mother-initiated silence, t(65) = 2.29, p ≤ .05. This indicates a significantly higher frequency of maternal silence when mothers were interacting with hearing than with deaf infants. No other variables differed significantly when deaf babies were compared to hearing babies regardless of mothers' hearing status.
Table 4  Mother and infant vocalizations: comparison of deaf and hearing infants, regardless of maternal hearing status (standard deviations)

<table>
<thead>
<tr>
<th></th>
<th>Deaf (n = 33)</th>
<th>Hearing (n = 33)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequencies</td>
<td>Durations*</td>
</tr>
<tr>
<td>Maternal vocalizations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Game</td>
<td>3.09 (3.41)</td>
<td>14.49 (19.19)</td>
</tr>
<tr>
<td>Imitation</td>
<td>0.76 (1.48)</td>
<td>1.51 (3.71)</td>
</tr>
<tr>
<td>Talk/Narrate</td>
<td>4.32 (3.72)</td>
<td>27.26 (24.34)</td>
</tr>
<tr>
<td>Quiet</td>
<td>6.82* (5.84)</td>
<td>33.69 (28.94)</td>
</tr>
<tr>
<td>Infant vocalizations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>2.15 (2.83)</td>
<td>16.74 (21.95)</td>
</tr>
<tr>
<td>Positive</td>
<td>3.62 (3.52)</td>
<td>14.85 (16.38)</td>
</tr>
<tr>
<td>Quiet</td>
<td>5.65 (3.77)</td>
<td>48.79 (27.41)</td>
</tr>
</tbody>
</table>

Asterisks indicate significant differences between Deaf and hearing mothers on this variable.

*Durations indicate proportion of interaction time.

* p < .05.

Differences Attributable to Gender of Infant

Finally, gender differences were examined by applying t tests to frequencies and durations of all variables. There was a significant difference between male and female infants for frequency of infant bouts of silence, t(65) = 2.27, p < .05, indicating that female infants were silent more often than were male infants when the hearing status of both infant and mother was disregarded. Gender differences for all other variables were nonsignificant.

Discussion

As Papoušek and Papoušek note, "Researchers can easily feel helpless when listening to the vocal communication between preverbal infants and caregivers; much of it seems to be incidental, unpredictable, nonsensical, and is very difficult to assess with linguistic or phonetic measures" (1986, p. 21). They also note, however, that parents themselves are particularly keen observers of their infants' communicative and affective behaviors and that parents typically respond expressively and contingently to behaviors perceived as communicative attempts on the part of the infant.

Von Bertalanffy's general systems theory (1968) is also of particular relevance to the study of parent-infant vocalizations, as it emphasizes the importance of recognizing the mutual interdependence between communicating partners. Accordingly, both infant and caregiver must be viewed as part of a variable and dynamic system, one in which not only every utterance but also every pause has potential meaning.

The Papoušeks offer an example to illustrate this phenomenon: "The infant may only incidentally produce a consonant-like sound and yet, the parent tends to support further elaboration and improvement of the novel capacity, displaying abundant, phonologically correct and expressive examples and rewarding the infant for every imitation" (1986, p. 23). It is not at all uncommon to observe parents imitating the vocal expressions of their deaf infants in precisely this way, although in the case of a Deaf parent linguistic imitations also occur frequently in the visual-gestural modality.

Infant Vocalizations

In the present study, it appears that there are essentially no differences in the amount of positive or negative vocalizations emitted by 9-month-old infants in any of the four groups. This is consistent with findings reported by Rea et al. (1988), who studied 16 hearing babies with either Deaf or hearing mothers. Those authors also found no significant differences in frequency or duration of vocalizations by their group of 9- to 10-month-old infants.
Maternal Vocalizations

Previous research has shown that parents intuitively engage in many behaviors unique to their interactions with infants—behaviors that appear designed to meet the perceptual and cognitive needs of the less competent partner (Koester, 1992; Koester, Papousek, & Papousek, 1987). Our finding regarding the heightened use of vocal games by hearing mothers with deaf infants is consistent with this view, in that it demonstrates one way in which parents make their vocal communication more salient and accessible to an infant with a hearing loss. Vocal games, as coded here, very often involve animated visual and sometimes even tactile cues, and thus represent an important compensatory adaptation when interacting with a deaf baby. That is, the vocalization itself is augmented by exaggerated play with sounds, usually accompanied by a visual component such as in “Peek-a-Boo” games, as well as animated facial expressions as seen in the “play face” or a greeting response when eye contact is achieved. Therefore, vocal games are typically multimodal events and therefore more easily perceived by the deaf infant. Our finding that hearing mothers are already using such strategies with their 9-month-old deaf infants is encouraging and could be partially attributable to the effectiveness of their experiences with early intervention programs.

It is certainly not surprising that Deaf mothers spend more time in a “quiet” state when interacting with their infants, at least when this is defined only in terms of a lack of vocal utterances. The important question, however, is what else the Deaf mother is doing, presumably in nonvocal modalities, during this time. As reported elsewhere (Brooks, Gage, Koester, Traci, & Wetterling, 1995), it is clear that the Deaf mothers are highly active and engaged with their infants, relying extensively on vigorous tactile contact during these interactions. In addition, anecdotal data from this sample indicate that these mothers respond to the infant’s hand and arm movements in much the same way that hearing parents respond to an infant’s early vocal sounds: by imitating, providing models, and gradually shaping these into word approximations.

Swisher (1992) reports that Deaf mothers utilize several strategies that seem designed to maximize visual attention by their infants during communication; among these is maternal waiting for visual attention from the child prior to signing. On a similar theme, Spencer, Bodner-Johnson, and Gutfreund (1992) found that Deaf mothers of deaf infants waited approximately 70% of the time when the child interrupted eye gaze, whereas hearing mothers of deaf babies waited only 16% of the time. The importance of parents’ tendencies to wait, particularly when interacting with a deaf child, lies in the infant’s need to explore the environment before re-engaging in face-to-face interaction. In terms of the present study, such “waiting” may be seen in the variable of maternal silence (although as mentioned earlier, other behaviors may undoubtedly be occurring during these periods of nonvocalization).

In the case of the Deaf mothers observed in this sample, the primary language input is visual-gestural, or ASL. Therefore, the fact that the hearing mothers “talk” more, or imitate their infant’s vocalizations, may be of no more significance than the fact that the Deaf mothers sign more to their babies, as long as both are providing adequate linguistic input to support the child’s first language acquisition.

Conclusions

In this study we have made an effort to add to the small body of literature describing the early social and communicative experiences of deaf infants, particularly during interactions with their primary caregivers. This is an important initial step, based on microanalyses of observations of a unique sample consisting of both Deaf and hearing mothers and infants. Results reveal few differences in the quantity of positive/negative vocalizations by deaf and hearing 9-month-olds. Future research is needed, however, to expand upon this by providing a clearer picture of the contingencies inherent in (or absent from) these vocalizations. That is, are deaf infants as adept as hearing infants seem to be at taking turns, at participating in a “dialogue,” or at responding to a partner’s social cues and games with sounds of pleasure or distress? Or do these signals and responses occur in other modalities, to which hearing parents must become attuned in order to engage in smooth and synchronous interactions with a deaf child?

Similarly, do Deaf mothers with hearing babies ob-
serve the infant’s mouth and facial cues to determine when the baby is vocalizing (and whether it is a pleasant or fussy utterance), in order to respond contingently and appropriately? In this regard, do they resemble Deaf mothers with deaf infants, or are they more similar to hearing mothers? Further efforts to unravel these and many remaining questions should be more feasible given improved early diagnostic tools and heightened awareness of the importance of the prelinguistic phase of the child’s affective and communicative development.

References


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