

Child-DIRECTED SIGNING IN ASL AND CHILDREN'S DEVELOPMENT OF JOINT ATTENTION¹

Ginger Pizer

Richard P. Meier

Departments of Linguistics and Psychology

University of Texas at Austin

1. INTRODUCTION

In this paper, we present an analysis of the signing that three deaf mothers directed to their deaf children, when those children were between 9 and 24 months of age. Researchers looking at child-directed signing in a number of sign languages have provided a quite consistent description of the ways that deaf parents modify their signs when addressing their young children (e.g., Erting, Prezioso, & O'Grady Hines (1990) and Spencer, Bodner-Johnson, & Gutfreund (1992) for American Sign Language; Mohay, Milton, Hindmarsh, & Ganley (1998) for Australian Sign Language; Harris, Clibbens, Chasin, & Tibbitts (1989) for British Sign Language; Masataka (1992) for Japanese Sign Language; van den Bogaerde (2000) for Sign Language of the Netherlands, among others). They have noted that these modifications are well-suited to ensuring that their signs are visible to their children, and that deaf parents are skilled at producing visually accessible sign language input to their children.

Following on this previous research, our own analysis has three goals:

1. To describe the language input that these three children received from their mothers, focusing on the ways that the mothers modified their sign production when addressing their children and on the ways that this signing changed as the children grew older.
2. To investigate the degree to which the mothers' sign modifications are related to the child's gaze or visual attention. Signing children must use vision both to access their parents' signs and to see the objects that their parents' language refers to. This may often require the child to shift visual attention between signs and their referents. Signing parents' modifications of their signs may indicate their

¹ This research is supported in part by NSF grant #BCS-0447018 to Catharine H. Echols (PI) and Richard P. Meier (co-PI). Thanks also to Jill Arechiga, Perry Connolly, Emilie Destruel, Elena Liskova, Chaleece Sandberg, Kate Shaw, Aaron Shield, and Amelia Zeringue for their help with this project.

sensitivity to the attentional demands that signing places on their child. As children grow older, and they become more skilled at shifting their attention as required, we would expect parental sign modifications for this purpose to decrease in frequency.

3. To investigate whether the phonological characteristics of particular signs are related to the ways that they are modified in child-directed signing.

2. Methods

To address the above research questions, we looked at three to four sessions of videotaped interaction between mothers and children for each of three mother-child dyads. Table 1 shows the pseudonyms of the three children we looked at and their ages at the sessions we analyzed. All three deaf girls have deaf parents and are acquiring ASL as a first language in the home. Each child has at least one deaf grandparent and therefore has access to a native signing model in at least one of her parents. Katie and Suzie’s mothers had hearing parents, and Noel’s mother had deaf parents.

Katie	Noel	Suzie
9 mos.	9 mos. 2 weeks	9 mos.
13 mos.	13 mos. 2 weeks	13 mos., 2 weeks
18 mos.	17 mos.	15 mos.
23 mos., 3 weeks	23 mos., 2 weeks	

Table 1: Children’s Ages at Videotaping Sessions

We analyzed 10 minutes of tape from each session. These 10 minutes were not necessarily continuous, in that we disregarded periods of one minute or more when there was no attention or interaction between mother and child; for example, a stretch of time when the mother was chatting with the researcher while the child drank from a bottle, or periods when either the mother or the child was out of view of the camera.

We transcribed all sign productions in the 10-minute section. We then coded all signs for their place of articulation and for whether they had been modified in some way from their citation form. Based on previous researchers’ studies of child-directed signing, the types of modifications that we coded were: *displacement* (the sign is produced away from its normal position); *repetition* (the cyclicity of the sign is increased); *signing on the child’s body* (producing a sign such that the child’s body is

used for its place of articulation); *molding* (moving the child's hands to make the child produce the sign); *lengthening* (the sign is produced slowly or held, increasing the sign's duration); and *enlargement* (the movement excursion of the sign is increased). An additional modification we coded for was whether the mother was noticeably leaning in toward the child, rather than sitting or standing upright. Unlike the other modifications, which applied to individual signs, leaning-in generally occurred across an entire utterance or more.

All maternal signs were also coded for whether the child had visual access to them. In a separate coding pass, we coded the child's eye gaze, or where she was looking at any point in the interaction. It is important to note that even when a child was not focusing on her mother's face or hands, it may still have been possible for her to have visual access to signs, as long as the signs were produced somewhere within her visual field. Finally, we coded the attention-getting cues produced by the mother, such as touching or waving at the child, along with whether those cues were successful in gaining the child's attention. In this category of attention-getting cues, we included only those designed to draw attention to the mother, rather than cues, such as points, that the mother used to draw attention to an object or another person. While the latter category is important to the larger question of the development of the child's attention, our focus in the current project was on investigating connections between the child's attention and her access to the mother's signing.²

3. Results

3.1. QUANTITY OF MOTHERS' SIGNING

Our first analysis concerning the mothers' sign production examined the quantity of maternal signing. How much sign vocabulary did the mothers address to their children? Figures 1 and 2 show the number of lexical sign types and tokens produced by each of the mothers at each coded session. These numbers include all signs except points (and body part signs that resemble pointing). Most pointing signs cannot be said to have a citation form in the same way as lexical signs do and thus cannot readily be included in an investigation of how signs addressed to children may be modified from their citation form. Moreover, pointing signs can be very difficult to discriminate from pointing gestures.³ This exclusion

² We would like to thank Beppie van den Bogaerde for bringing up the importance of pointing in mothers' directing of their children's attention. We intend to analyze the mothers' use of cues that draw the children's attention to objects in a later stage of this project.

³ For similar reasons, Anderson and Reilly (2002) excluded pointing signs from the ASL version of the MacArthur Communicative Development Inventory.

of points from the count of sign types and tokens means that these numbers cannot be directly compared to similar counts of child-addressed speech, which would include pronouns and words for body parts.⁴

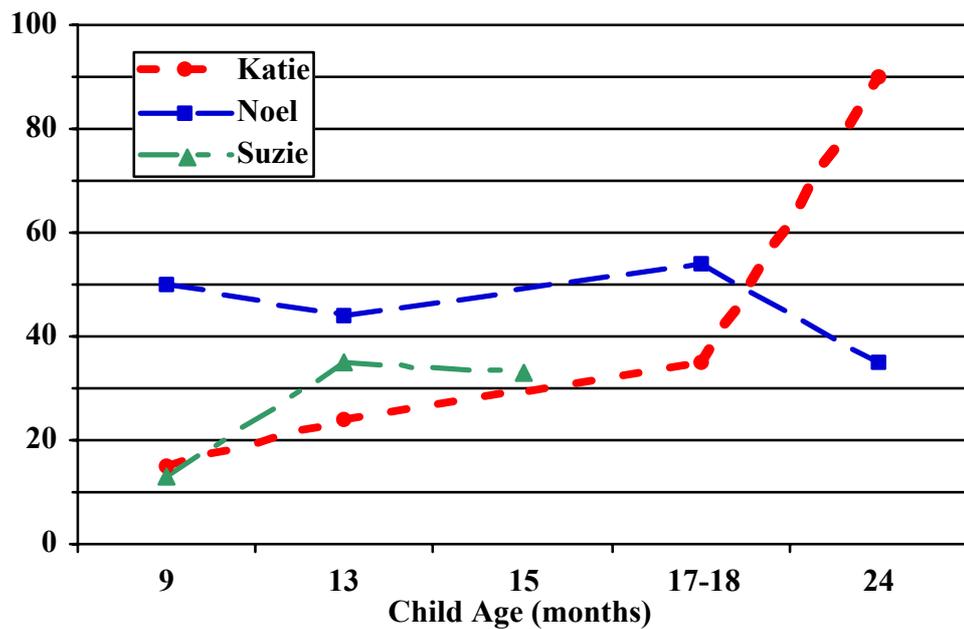


Figure 1: Number of Sign Types in Maternal Signing

⁴ A comparison of our data with that from other studies of child-addressed sign and speech would also require a count of the mothers' utterances, rather than only sign tokens. Because utterance boundaries are not always obvious, we are still in the process of developing clear criteria for utterance boundaries that will allow such a count.

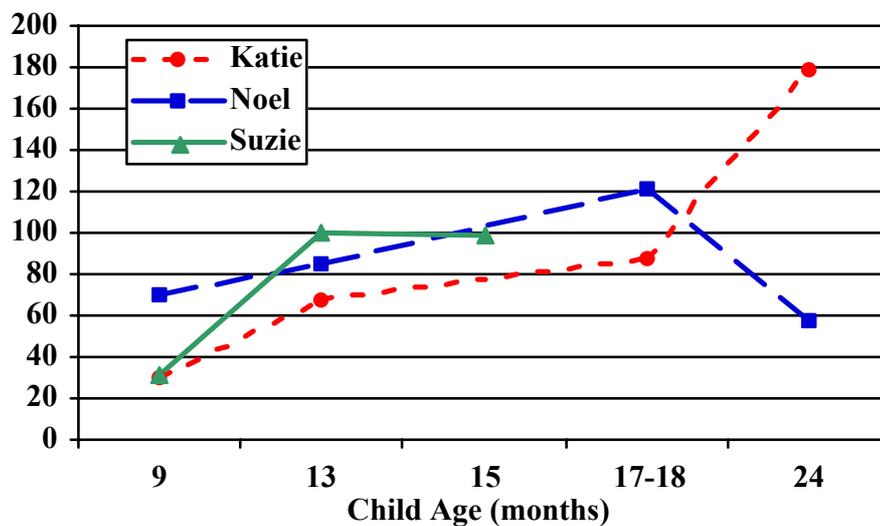


Figure 2: Number of Sign Tokens in Maternal Signing

We can see from Figures 1 and 2 that both the number of sign types and the number of sign tokens tended to increase with the children's age: with the exception of Noel's 24-month session, the children received a larger quantity of more varied linguistic input as they got older.

3.2. FREQUENCY of SIGN MODIFICATION

The modification of signs in child-directed signing appears to be quite frequent throughout the timeframe studied. In all sessions except one, at least 20% of the signs addressed to the children were visibly modified. Figures 3 and 4 show the percentage of the sign tokens that were modified. As mentioned above, the mother's leaning in toward the child is somewhat different from other kinds of sign modifications, in that it operates on the level of the utterance (i.e., over a span of signs) rather than on the level of the individual sign. We found leaning important to look at, because it is clearly one way for the mother to get her signs into the child's line of sight, if the child is not looking at her before she starts to sign. However, counting every sign within an utterance produced with a lean as modified could drive up the numbers of sign modifications. We therefore calculated sign modification frequency twice: once counting signs produced with a lean in toward the child as modified, as shown in Figure 3, and once not, as shown in Figure 4.

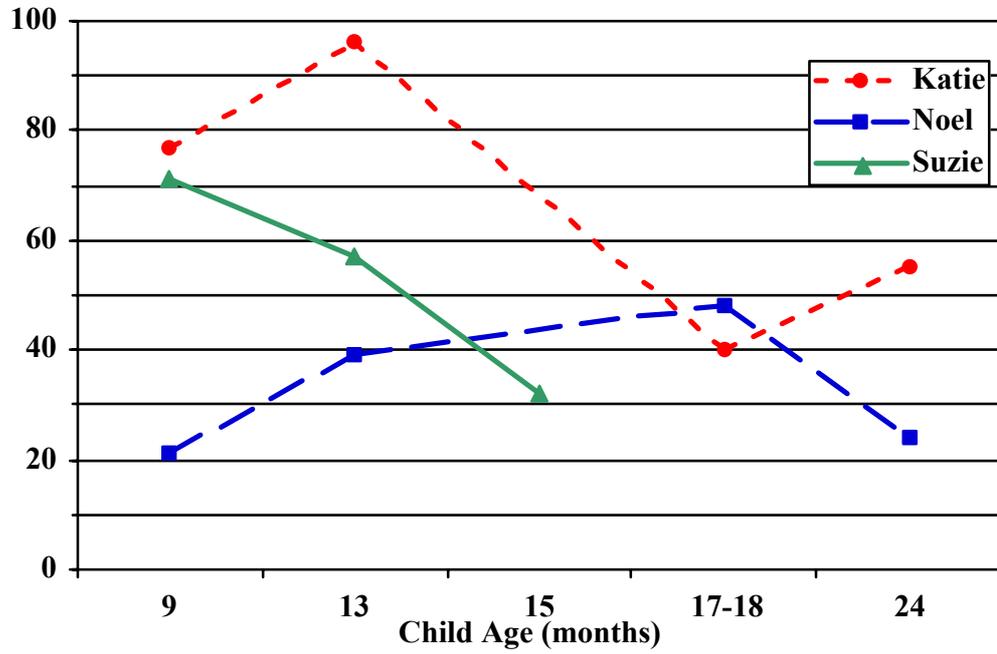


Figure 3: Percentage of Maternal Sign Tokens Modified (Including Leaning)

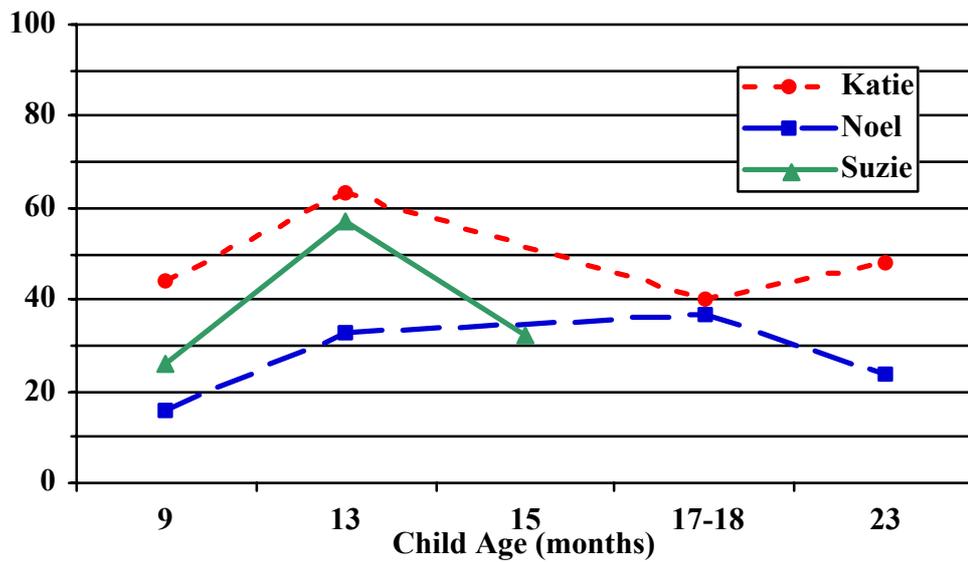


Figure 4: Percentage of Maternal Sign Tokens Modified (Excluding Leaning)

If we look at the percentage of signs that are modified excluding leaning, there does not appear to have been a clear decline in modified signs as the children got older. However, at least for Katie and Suzie, if we include leaning, the percentage of modified signs did seem to decline with age. Unlike the other two mothers, Noel's mother seemed to maintain a relatively stable frequency of sign modification across the period studied.

3.3. ATTENTION-GETTING CUES

We have limited evidence from the success rate of the mothers' attention-getting cues (e.g., touches, waves) that the children got better at paying attention to their mothers as they got older, as shown in Figure 5. For Katie, at 9 months and 13 months, only about a third of the attention-getting cues addressed to her were successful. For example, in one instance at 9 months, Katie's mother tapped repeatedly on Katie's leg, arm, and face, but only succeeded in getting her attention by taking away her toy and holding it up to her face. In contrast, at 18 and 23 months, about 80 percent of the attention-getting cues led to Katie looking at her mother. This finding is consistent with previous research showing a marked increase in children's ability to maintain joint attention with their mothers around 18 months of age (e.g., Bakeman & Adamson 1984).

Similarly, the success rate of attention-getting cues addressed to Suzie increased from 28% at 9 months to 68% at 15 months, her last session. In contrast, the success rate of attention-getting cues addressed to Noel remained quite high and relatively steady across all sessions, increasing only from 60% at 9 months to 71% at 23 months. This difference may be the result of a different attention-getting strategy by Noel's mother. While the other two mothers produced around 20 attention-getting cues at almost every session, Noel's mother produced only about five per session when Noel was 9 and 13 months old, increasing the number to over 20 during the two later sessions. It appears likely that early on, Noel's mother accommodated her child's limited skill in shifting attention by not trying to redirect Noel's attention very often.

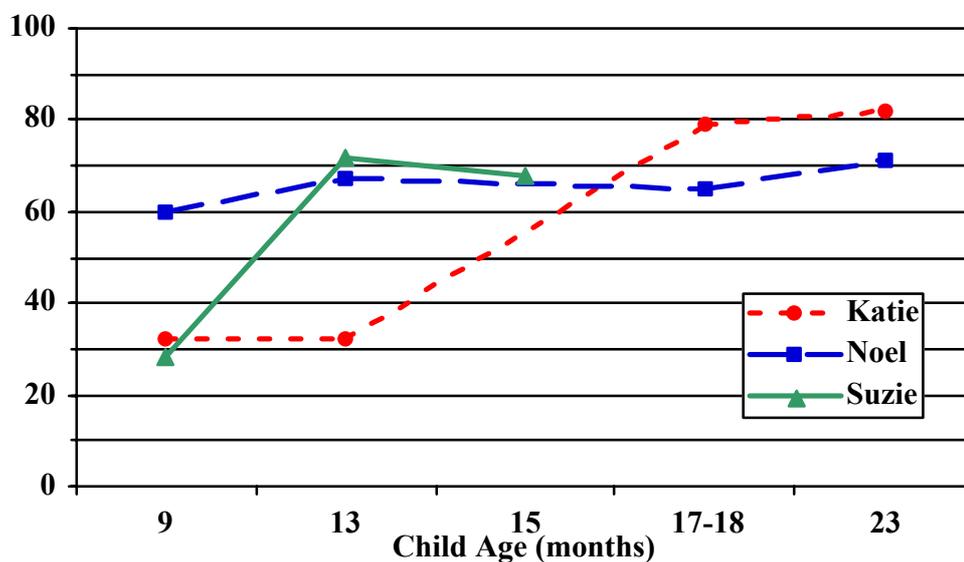


Figure 5: Success Rate of Attention-Getting Cues

In the following sections, we look at the different kinds of sign modifications individually, investigating whether the children’s attentional development can be seen to influence the frequency of the mother’s sign modifications. Some of the sign modifications do appear to be related to the child’s attention, but others do not.

3.4. DISPLACEMENT AND LEANING

Displacement, or moving a sign away from its normal position, would be expected to be related to the child’s attention, in that it is a way for the mother to place a sign within the child’s visual field without the child having to change her gaze. Previous research by Harris et al. (1989) found a decline in the number of displaced signs in child-directed signing around the age of 18 months, right when children’s ability to maintain joint attention increases, as mentioned above. In our data, it is clear that displacement sometimes functioned to move a sign into the view of a child who had previously not been paying attention, as we can see in Figure 6 where Katie is focused on the toy tower. Here her mother is shown signing WAIT with her hands interposed between Katie’s face and the tower, telling Katie to wait before knocking the tower over.



Figure 6: Katie's mother displacing the sign WAIT

The percentage of maternal sign tokens that were displaced is quite low throughout the period studied, as is shown in Figure 7. For all children at all sessions, the total number of displaced signs per session ranged from zero to 24. There seems to be a peak in displacement frequency at 13 months for Katie and Suzie. However, the age-related pattern is not entirely clear, since Noel's mother displaced more signs when she was 17 months old than when she was 13 months old. When Katie was almost 24 months old, 7% of the signs that her mother addressed to her were still displaced from their normal position, which is a higher rate of displacement than at 9 and 18 months. Assuming that the ability to shift attention appropriately increases with age, it is not obvious from these data what role the child's attention plays in displacement.

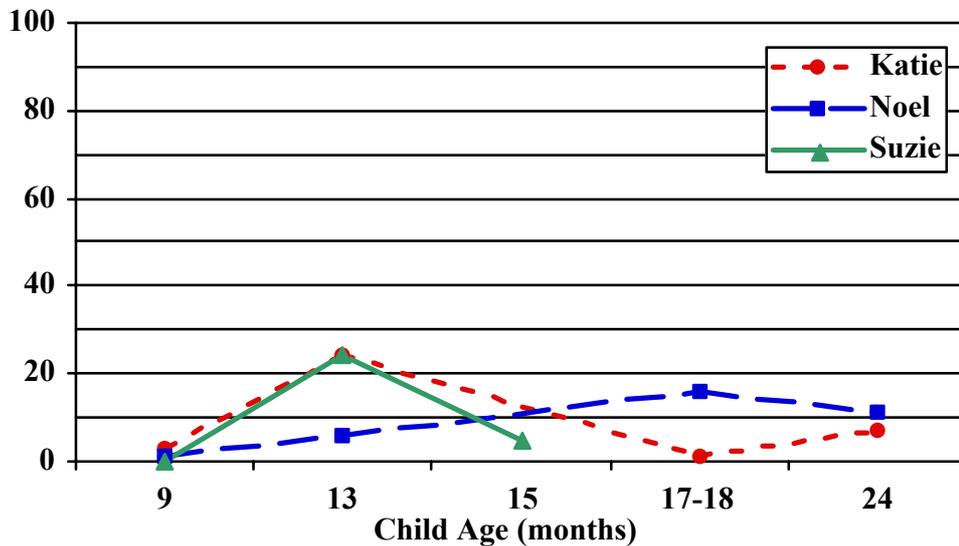


Figure 7: Percentage of Maternal Sign Tokens Displaced

At almost 24 months, unlike at younger ages, Katie was already looking at her mother’s hands or face before the onset of almost half of the displaced signs. It appears that these particular displacements, like some others from the other mothers, were motivated, not by the child’s unwillingness to shift gaze, but instead by the mother and child being in an awkward position in relation to each other. For example, if the mother was standing, she might therefore reach down to sign; or if the mother was behind the child, she might reach around her. This kind of displacement is likely also true for adult signers, for example, if a passenger in a car is signing to the driver. To get a clearer understanding of the causes of displacement, we would need to separate those displacements motivated by the relative positions of signer and addressee from those motivated by the addressee’s lack of visual attention to the signer.

In our investigation of what kinds of signs could be displaced, we discovered that only signs specified to be produced in neutral space or specified for contact on the non-dominant hand were ever displaced. No signs specified for contact at any other location were displaced, and no signs specified for a location near the body were displaced. This categorical finding may indicate the importance of place of articulation for sign recognition. The finding may also have implications for the phonetic analysis of signs in neutral space and on the non-dominant hand, in that the precise physical location of the hands in relation to the rest of the body appears to be flexible. The specification of contact versus

no contact does not appear to be the deciding factor, in that signs specified for proximity to the body (e.g., BEAUTIFUL, made with a circular, open-to-close movement of a 5-hand in front of the face) occurred in the data and were never displaced.

The mother's leaning in toward the child is similar to displacement, in that she moves herself and her signs into the child's visual field. This role of leaning is evident in the picture below, in which Katie's mother produces the sign DUCK, a sign made with an open-and-close motion of a flattened B-hand at the chin.



Figure 8: Katie's mother leaning over while signing DUCK

Although the type of extreme leaning shown here does seem to decrease as the children get older, our data do not give us a clear age-graded pattern. Like displacement, the frequency of leaning may have as much to do with how the mother and child are positioned relative to each other as with how attentive the child is to the mother. Unlike displacement, leaning may affect signs specified for contact on the head or body, as in this example, as well as signs without such contact.

3.5. REPETITION AND LENGTHENING

The next types of sign modification that we will address are repetition and lengthening. Signs were coded as being repeated if they contained 4 or more cycles. In addition, signs for which the citation

form is specified for a single movement (e.g., BLACK) were coded as repeated if the mother's production contained more than one cycle. We encountered several examples of this type of repetition, but none had four or more cycles, so there may be a phonologically-based pattern by which cyclic signs are more prone to modification by repetition than are non-cyclic signs.

Our question about repetition at the beginning of this study was whether it might be related to the child's attention. It would be plausible to think that a parent might continue repeating a sign until the child looked at it; however, this hypothesis does not seem to hold. For all three children at all ages, much of the time that the mothers repeated a sign, the child was already looking at the parent's face or hands at the beginning of the sign's production. The percentage of repeated signs for which the child was already focused on the mother before she initiated the repeated sign ranged from just under 20% to 100%, with most sessions in a middle ground between 30% and 60%, and no clear age-graded pattern.

Like repeated signs, lengthened⁵ signs could plausibly be motivated by a lack of attention from the child. We therefore performed a similar analysis of lengthening and eye gaze. The same generalization holds for lengthened signs as for repeated signs: for most sessions, in more than half the instances that the mother lengthened a sign, the child was already looking at her at the onset of the sign. This result is inconsistent with Holzrichter and Meier (2000), who found increased duration in child-directed signing to be associated with a lack of eye contact with the child.

These findings for repeated and lengthened signs do not preclude an effect of the child's attention on these parental sign modifications, but they do indicate that there must be some other factors at play. We suggest that one place to look would be at prosodic or discourse factors; for example, whether the sign is utterance-final, particularly in a question, or whether the parent is repeating or holding a sign in order to elicit an imitation of that same sign by the child. A preliminary analysis of these discourse factors shows them to have a strong effect for at least some of the mothers. Strikingly, Suzie's mother appears to have used lengthening exclusively with signs that terminated questions. When Suzie was 9 months old, her mother produced no lengthened signs; at each of the following two sessions, when Suzie was 13 and 15 months old, her mother lengthened seven signs, all of them at the end of a question. The two other mothers also used sign lengthening in this way, but they produced lengthened signs in other discourse contexts as well.

As the children got older, repetition and lengthening were increasingly used to elicit the child's imitation of the mother's sign, especially for Katie. At almost 24 months, over 80% of Katie's

⁵ Coding for length was impressionistic, rather than being tied to a particular length of time.

mother's lengthened signs and about 60% of her repeated signs were followed by Katie imitating the sign. For example, in one instance while Katie and her mother were reading a book, two such elicitations occurred, one immediately after the other. The mother first pointed to the book and produced the sign MOTHER (a 5-handshape with the thumb tapping the chin) with seven cycles, repeating the sign until Katie imitated it. Katie's mother then pointed to a different picture in the book and made the sign BOY (an open-close movement of a B-hand at the forehead) with nine cycles, which Katie then imitated. In these and other instances, sign repetition appears to be part of a book-reading routine regularly practiced by Katie and her mother. Further research is needed to more fully determine the discourse functions of lengthening and repetition in child-addressed signing.

3.6. Signing on the Child

Another category of modified signs that has been noted in previous research are signs that the mother produces on the child's body. In our data, signs on the child's body were not particularly frequent, but they were present in the signing of all three mothers. There were 29 tokens across all sessions, at a range of ages for the children. Not surprisingly, 24 of the 29 tokens were produced when the child was seated on the mother's lap, and all of these sign types were specified for contact with—or proximity to—the head or torso. Given the child's position on the mother's lap, it is not clear how else the mother could have produced these signs in a way that the child would have had access to them, unless for signs on the head she had leaned forward significantly, bringing her head into the child's visual field. In fact, we saw an example of such leaning, alternating with a sign on the child, when Noel was 13 months old. In this example, Noel was sitting on her mother's lap as they looked at a book. Noel's mother first signed FATHER (made with a 5-handshape with the thumb tapping the forehead), alternating between Noel's forehead and her own, and then signed MOTHER, alternating between Noel's chin and her own.

Signs produced on the child give the child tactile information about sign location. Spencer and Harris (2006) presented results from a number of studies showing this sign modification to be used most commonly with “younger deaf infants, usually while the infant also has access to visual information from the mother's facial expressions” (p. 78). These generalizations do not hold for our data, as 10 of our 29 tokens occurred when the children were 17 or 18 months old, and, as previously noted, 24 occurred with the child on the mother's lap. However, it is true that the five tokens of signs produced on the child in a face-to-face or side-by-side position were at somewhat younger ages: 13 or 15 months. It is possible that, at younger ages, a mother may be more likely to produce signs on the

child's body when the child can see her; this way the child gets both visual and tactile information about the sign. When the child is older, signs on the child's body may likely be limited to times when the child is on the mother's lap; in this position, the mother is constrained in how to form signs that contact the head or torso. However, we would need more data before we could be confident in this generalization.

3.7. Molding

Signing on the child's body can be seen as a somewhat more intrusive modification than some of the other categories we have talked about; it is certainly not something adult signers would generally do with other adults. Another, similarly intrusive category of sign modifications is molding—when the mother moved the child's hands to make the sign. Molding was less common than signing on the child's body: there were just 13 tokens from two mothers. One tentative observation from these limited data is that earlier tokens may involve molding of movement, while later tokens may involve molding of handshape. For example, when Noel was 17 months old, her mother molded the sign BLUE (made with a B-handshape in neutral space and repeated forearm rotation) by twisting Noel's forearm back and forth. Examples of molding at a later age took place as Katie, almost 24 months old, and her mother recited the manual alphabet. As the two went through the alphabet, Katie's mother molded Katie's handshape for six letters.

This change in what is molded, from molding movement early on to molding handshapes later on, could reflect a change in the mother's expectation of how the child will sign. As we know from the literature on child sign language acquisition, children have trouble with handshapes early on (see Meier 2006 for a review), and a realistic mother probably should not expect accurate handshapes from her one-year-old. However, by the time Katie was almost two years old and learning to produce the manual alphabet, in which the handshape carries almost the entire meaning, she was expected to start getting the handshapes right.

4. Conclusion

This study has replicated a number of others on various sign languages in describing the kinds of modifications that parents make in child-directed signing. We have found some evidence of an increase in the quantity of parental signing as the child gets older; it is not entirely clear from our data whether sign modifications decrease in frequency by the time the child is two years old. With regard to our

question of the role of attention and gaze, our findings are mainly negative; specifically, repetition and lengthening may have as much to do with prosodic and discourse factors as with the child's ability to shift attention when required, and displacement and leaning, while showing more effects of child gaze, may be strongly affected by the mother's and child's relative positions.

We did find some regularities as far as the kinds of signs that can undergo particular kinds of modifications. Extreme cyclicity (repeating 4 or more times) appears to be limited to signs that are specified for repeated movement in the adult language, and displacement appears to be limited to signs not specified for contact or proximity to the head or torso. In contrast, signs produced on the child's body are always signs specified for contact or proximity to the body. While this latter restriction is true by definition, the others are not inherently necessary. It is physically possible to move a sign specified for contact away from its place of articulation or to repeat a single-movement sign multiple times in a cyclic manner. While attending to the child's gaze and level of comprehension, it looks as if parents are also attending to the phonological characteristics of individual signs as they choose how to modify their signing when addressing their young children.

REFERENCES

- Anderson, D. & Reilly, J. (2002). The MacArthur Communicative Development Inventory: Normative data for American Sign Language. *Journal of Deaf Studies and Deaf Education*, 7, 83-106.
- Bakeman, R. & Adamson, L. B. (1984). Coordinating attention to people and objects in mother-infant and peer-infant interaction. *Child Development*, 55, 1278-1289.
- Erting, C. J., Prezioso, C., & O'Grady Hynes, M. (1990). The interactional context of mother-infant communication. In V. Volterra & C. J. Erting (Eds.), *From gesture to language in hearing and deaf children* (pp. 97-106). Berlin: Springer-Verlag.
- Harris, M., Clibbens, J., Chasin, J., & Tibbitts, R. (1989). The social context of early sign language development. *First Language*, 9, 81-97.
- Holzrichter, A. S. & Meier, R. P. (2000). Child-directed signing in American Sign Language. In C. Chamberlain, J. P. Morford, & R. I. Mayberry (Eds.) *Language acquisition by eye* (pp. 25-40). Mahwah, NJ: Lawrence Erlbaum Associates.
- Masataka, N. (1992). Motherese in a signed language. *Infant Behavior and Development*, 15, 453-460.

- Meier, R. P. (2006). The form of early signs: Explaining signing children's articulatory development. In B. Schick, M. Marschark, & P. E. Spencer (Eds.), *Advances in the sign language development of deaf children* (pp. 202-230). Oxford: Oxford University Press.
- Mohay, H. , Milton, L., Hindmarsh, G., & Ganley, K. (1998). Deaf mothers as language models for hearing families with deaf children. In A. Weisel (Ed.), *Issues unresolved: New perspectives on language and deafness* (pp. 76-87). Washington, DC: Gallaudet University Press.
- Spencer, P., Bodner-Johnson, B., & Gutfreund, M. (1992). Interacting with infants with a hearing loss: What can we learn from mothers who are deaf? *Journal of Early Intervention*, 16, 64-78.
- Spencer, P. E. & Harris, M. (2006). Patterns and effects of language input to deaf infants and toddlers from deaf and hearing mothers. In B. Schick, M. Marschark, & P. E. Spencer (Eds.), *Advances in the sign language development of deaf children* (pp. 71-101). Oxford: Oxford University Press.
- Van den Bogaerde, B. (2000). *Input and interaction in deaf families*. Doctoral Dissertation, University of Amsterdam. LOT series No. 35. Utrecht: LOT. http://www.lotschool.nl/LOT_Dissertations/dissertations.htm