(2011) *Proceedings of the 35th Annual Boston University Conference on Language Development* ed. N. Danis, K. Mesh, & H. Sung, pp. 391-404. Somerville, MA: Cascadilla Press.

The Development of Eye Gaze Control for Linguistic Input in Deaf Children

Amy M. Lieberman, Marla Hatrak, and Rachel I. Mayberry

1. Introduction

1.1 Deafness, eye gaze, and language input

Communication through sign language such as American Sign Language (ASL) requires constant visual attention, or eye gaze, as all information is received through the visual channel. For deaf adults, this is achieved by maintaining eye contact with the interaction partner. However, for children, whose early interactions are often focused around toys, books, and other objects, the task of obtaining and maintaining visual attention is more complicated, and requires more active work and monitoring by the individuals involved in an interaction. Thus deaf children need to understand how to establish eye gaze with their interlocutors before any meaningful language can be perceived. In other words, deaf children must learn to "look for language" in a way that hearing children do not. Furthermore, among deaf children, using eye gaze as a measure of attention, it is possible to observe and measure visual attention as it develops. This unique situation provides a window into children's cognitive control of attention from an early age.

A long history of research on the social nature of language acquisition (e.g. Tomasello, 1988) has shown that providing language input that is directly relevant to the child's current focus of attention has a facilitative effect on language acquisition. In spoken language, it is possible for a child to be looking at an object while simultaneously receiving linguistic input about that object from the mother. In sign language, however, the child must have visual access to both the object and the signer in order to receive linguistic information and information about the non-linguistic context at the same time. This shared focus on objects and people is referred to as joint attention (Harris, 1992).

---

* All authors at University of California, San Diego. Correspondence should be addressed to Amy M. Lieberman, Department of Linguistics, University of California, San Diego, 9500 Gilman Drive, La Jolla, CA, 92093-0108 (email: alieberman@ucsd.edu). The authors thank Reyna Lindert, Jenny Kan, and the families who participated in this research. This project was funded by NSF Visual Language and Visual Learning Science of Learning Center (SBE 0541953) and the UCSD Division of Social Sciences.

Deaf mothers interacting with their deaf children have been shown to use a range of strategies to establish and maintain joint attention during sign language interaction, starting in infancy (Maestas y Moores, 1980) and throughout the early years, using strategies such as establishing eye gaze with their infants while signing, and making their signs accessible to the infant by providing tactile input on the infant's body or by leaning into the infant's visual field when signing (Holzrichter & Meier, 2000). The types of strategies used are not static, but change over the first few years of life in response to the children's developing abilities (Harris, Clibbens, Chasin, & Tibbitts, 1989, Waxman & Spencer, 1997). As children grow older, deaf mothers tend to use less explicit strategies, such as displacing signs or attracting the infants' attention before signing, and instead rely more upon the deaf child's developing ability to alternate his or her attention between the mother and the non-linguistic context, e.g. by waiting for the child to look up, or beginning to sign with the assumption that the child will look up at the mother shortly after (Baker & van den Bogaerde, 1996). Harris et al. (1989) refer to this ability as the development of an "attentional switching strategy," in which children can momentarily break off from an activity, look up at the mother, and then resume their activity. In Harris et al.'s study, children's productive language at 24 months was also measured. The children who produced the highest number of words also showed the most sophisticated ability to switch attention between the mother and their current activity. Thus the mother's careful monitoring and scaffolding of the child's development is thought to facilitate early lexical development (Harris, 1992).

1.2 Joint book reading

The type of joint attention described above, as well as the strategies used by deaf mothers to achieve it, refers to any object on which the child is focusing. Among hearing children, book reading is perhaps the most widely studied type of joint attention in early childhood given the established links between the frequency and quality of caregiver-child book reading and children's language and literacy outcomes (see Bus, Ijzendoorn, & Pellegrini, 1995 and Scarborough & Dobrich, 1994 for reviews). Joint book reading has been linked to a myriad of skills in later childhood, including children's vocabulary growth (Ninio, 1983; Whitehurst et al., 1988), learning the meaning of new words (Isbell et al., 2004), emergent literacy (De Temple & Snow, 2003) and concepts of print (Snow & Ninio, 1986).

Joint book reading in deaf dyads presents a unique set of challenges requiring adaptation on the part of both the mother and the child. Beyond the demands of providing input that is relevant to the child's attention, parents presenting a book in sign language must also translate passages from the language of the written text (e.g. English) to the particular sign language being used (e.g. ASL). Not surprisingly, deaf parents have been shown to use specific strategies to set up a visual literacy environment for their deaf children (Andrews & Taylor, 1987; Lartz & Lestina, 1995; Schleper, 1995). For example,

instead of signing in the normal signing space, deaf parents will often sign directly on the book, allowing the child to connect the pictured information with verbal information without having to shift their gaze from the book to the adult signing (Lartz & Lestina, 1993). Parents may even use the book as part of the sign (Schleper, 1995).

Deaf parents have also been shown to use ASL in ways which keep their children engaged in the book reading event, by varying their signing style the way hearing parents might use different pitch, tone or intensity of voice when reading in order to illustrate the characters or events of a story. For example, a deaf parent might use small signs and small signing space to depict someone who is timid, or use big exaggerated signs to show a "loud" character (Schleper, 1995). Parents will also use a device called role shifting, in which the head or entire torso is shifted slightly before signing to indicate that the signer is taking on the role of a different character (Lartz & Lestina, 1995). Furthermore, in addition to (or sometimes instead of) giving a word-for-word translation of the written text, parents will often translate whole passages into ASL (Akamatsu & Andrews, 1993). All of these strategies serve to structure the environment in terms of visual literacy events to the advantage of the child's visual system. Using this array of approaches to achieving joint attention and creating an engaging interaction, there is evidence that joint book reading predicts linguistic skills in deaf children, as is known to be the case among hearing children (Aram et al., 2006).

1.3 Current study

While it is established that parents make adaptations in their signing style, much less is known about what deaf children bring to this visually demanding and complex task. Harris et al. (1989) refer to the development of an attentional switching strategy, but as yet there is no clear understanding of how children develop such a strategy, and how children's control of their own visual attention may be linked to vocabulary development by creating interactions in which input can be perceived. In the current study, we focus specifically on deaf children's cognitive control of eye gaze. We approach this question by analyzing deaf children's eye gaze behavior during book reading with their deaf mothers. We compared interactions focused around books to those focused around toys, in order to determine whether observed eye gaze patterns were unique to book reading or were more general features of interaction in sign language. We further compared deaf children's eye gaze to a control group of hearing children to verify which patterns of gaze are unique to signed communication.

Specific guiding questions for the current study were as follows:

- How do children learn to control eye gaze in order to perceive both language input and relevant non-linguistic material?
- Are there changes in eye gaze patterns with development?
- Do eye gaze patterns relate to language ability?
- Are eye gaze patterns unique to book-reading and/or deafness?

2. Methods

2.1 Participants

Four deaf mother-deaf child dyads participated in the study. The children in the mother-child dyads each had at least one deaf parent, were identified as deaf at birth, had hearing losses ranging from moderate to profound, and had at least one deaf sibling. Two of the children in the current study were siblings. All the mothers reported that ASL was the primary language used in the home. All of the children also attended a center-based early intervention program at a residential school for the deaf, in which ASL was the primary mode of instruction. Table 1 shows characteristics of the deaf participants.

Table 1: Subject characteristics for the children in the deaf dyads

Dyad #	Child's Gender	Hearing Loss	Age
C1	F	Profound	1;9
C2	F	Moderate-Severe	2;1
C3	F	Severe-Profound	3;6
C4	M	Profound	3;7

The control group of hearing participants was obtained from the CHILDES database, specifically from the Providence corpus (Demuth, Culbertson, & Alter, 2006). The children in this corpus were videotaped during naturalistic interaction in their homes, and most were followed for several years on at least a monthly basis. From this vast corpus, we identified sessions such that the ages of the children would be matched as closely as possible to the deaf children in the current study. An additional requirement was that the videotaped interaction contain at least five minutes of continuous book reading interaction, in which the parent was reading either a single book or a set of books to the child. Finally, in order to be included, the child's eye gaze throughout the book reading session had to be easily observable from the videotape. Following these criteria, the final sample of hearing dyads was obtained. Their characteristics are listed in Table 2.

Table 2: Characteristics of hearing control group participants

Child's name	Child's gender	Age
Naima	F	1;10
Violet	F	1;11

William	M	3;4
Lily	F	3;6

2.2 Data collection

Mother-child interaction

Mothers and children were videotaped in their homes reading from a set of books and engaging in free play around a variety of toys and objects provided by the experimenters. In the book reading sessions, the mothers were instructed to read the books with their children as they typically would. The books were selected to match the general age-level and interests of the children, and included these titles: *Taking Care of Mom* (Mayer & Mayer, 1993)*; Spot Goes to the Farm* (Hill, 1987); and *A Mother for Choco* (Kasza, 1996). The free play activities were similarly selected by the experimenter to engage the children's interest and promote interaction between mother and child.

In each session, two cameras were placed in the room in order to capture head-on views of both the mother and the child. The book reading sessions ranged from approximately 8 minutes to over 30 minutes, and the free play sessions ranged from approximately 15 to 30 minutes. The time was not controlled by the experimenter, but instead was determined by the amount of time that the child remained engaged in the sessions.

Vocabulary measure

For three of the four subjects, ASL vocabulary level was assessed using the MacArthur Communicative Developmental Inventory for ASL (ASL-CDI) (Anderson & Reilly, 2002). The ASL-CDI is a parent report measure consisting of lists of sign glosses organized into semantic categories targeted. There are 535 items on the ASL-CDI. Given that the parents of the children were themselves skilled ASL signers, this was found to be a reliable measure of the children's vocabulary level.

2.3 Coding and analysis

Deaf dyads

From the videotaped sessions, a five-minute segment of book-reading and a five-minute segment of free play were identified for each child. The book-reading segments were obtained by identifying the onset of the first observed interaction around one of the provided books that lasted for at least five minutes. From this interaction, the first five minutes during which both the mother's and child's eyes and hands were clearly visible were extracted for further coding.

In order to obtain the free-play sample, the videotapes were reviewed to identify a sustained interaction that lasted for at least five minutes, that centered around a single toy or set of toys. For example, one set of toys consisted of a picnic set, including plates, napkins, and pretend food. Another toy was a

school bus and a set of toy figures that could be taken in and out of the bus. As with the book reading episodes, the first five-minute segment of sustained play during which both the mother's and child's eyes and hands were clearly visible were extracted for coding.

Hearing dyads

From the videotaped interactions, a five-minute segment of book-reading was identified for each child, beginning at the onset of book-reading in which the child's eye gaze was clearly visible.

Coding

The identified segments were coded using the linguistic annotation system ELAN (Crasborn, Sloetjes, Auer & Wittenburg, 2006). In the ELAN interface, transcription and coding are entered into a hierarchy of tiers, and annotations are time-linked to the video file. ELAN was used to complete a frame-by-frame analysis of each interaction.

For the deaf dyads, all signed utterances and non-linguistic activity were transcribed by a deaf native-user of ASL or by a hearing, highly skilled user of ASL. One coder served as a primary coder and then all data were reviewed by the second coder. Any disagreements were discussed together until agreement was reached. Specific features coded for the child included: ASL signs and gestures, locus of eye gaze, all shifts in gaze between the mother, book, or away, and co-occuring maternal behavior that could serve to prompt the gaze shift. For the mothers, we coded locus of eye gaze, ASL signs and gestures, and specific attention-getting devices.

For the hearing dyads, only the child's locus of eye gaze and gaze shifts between the mother and the book were coded.

3. Results

3.1 Deaf dyads

Child eye gaze

The first set of analyses concerned the child's locus of gaze during the five minute book reading session. Specifically, we measured the proportion of the child's gaze to either the mother, the book, or off-task, (i.e. to a non-related toy or a person other than the mother), for each of the four children. Table 3 shows the percent of time across the interaction spent looking to each location for each child. Although there was a substantial amount of individual variation, overall children were on-task (i.e. looking at either the mother or the book) over 90% of the time, suggesting that they were attending to and engaged in the interaction. Further, gaze was divided between the book and mother in different proportions across children, with two children directing gaze more frequently to the mother than the book, and two directing gaze more frequently to the book than the mother.

Table 3. Average and range of proportion of time spent looking by child to each location across five minute book reading interaction

Child (age)	BOOK	MOTHER	AWAY
C1 (1;9)	38%	46%	15%
C2 (2;1)	81%	11%	8%
C3 (3;6)	31%	63%	6%
C4 (3;7)	63%	36%	1%
MEAN	**53%**	**39%**	**8%**

Child gaze-shifts

In order to analyze children's ability to attend to both the mother and the book simultaneously, we calculated the frequency of gaze shifts both "up" (from the book to the mother) and "down" (from the mother to the book). This included all gaze shifts that were thought to be meaningful to the child's cognitive control of attention. Thus, we did not include gaze shifts to or from other objects or people in the room, as those shifts were considered off-task. Table 4 shows total gaze shifts across the five minute book-reading interaction.

Table 4. Total gaze shifts between the book and mother

Child	Total gaze shifts	ASL-CDI score (total signs, out of 535)
C1 (1;9)	67	n/a
C2 (2;1)	36	238
C3 (3;6)	112	526
C4 (3;7)	105	457

Gaze shifts and vocabulary

For three of the four children, we obtained scores on the ASL-CDI vocabulary checklist. Table 4 shows CDI scores for these children. Although a statistical correlation cannot be drawn, the association between total gaze shifts and vocabulary score suggests that these two measures increase together.

What motivates gaze shifts

Given the high number of gaze shifts between the book and the mother, we next looked to see what was motivating children's gaze shifts. For this analysis, we looked at the events and actions immediately preceding each gaze shift, including maternal gaze shift, maternal utterance onset and offset, maternal attention getters and points, and child signs and points. Behaviors were then grouped into five categories which served to prompt a gaze shift in the child:

1) Linguistic prompt: This occurs when a gaze shift to the mother is immediately preceded by the mother's utterance onset, or when a gaze shift to the book is immediately preceded by the mother's end of utterance.
2) Gaze based prompt: This occurs when a gaze shift to the mother or the book is immediately preceded by the mother's own gaze shift.
3) Physical prompt: This occurs when a gaze shift to the mother is immediately preceded by an attention-getting device by the mother (e.g. a tap or a wave), or when a gaze shift to the book is immediately preceded by the mother's point on the book.
4) Child directed shift: This occurred when a gaze shift was either immediately preceded by or co-occurred with the child's own sign or point, without an accompanying prompt from the mother.
5) Mid-utterance/no prompt: This occurred when a gaze shift occurred in the middle of a maternal utterance without any observable prompt.

The results for each dyad were combined to analyze the total distribution of prompts across children, as shown in Figure 1. Overall, child-driven gaze shifts accounted for 10% of all shifts, and mid-utterance shifts accounted for 20% of shifts. The remaining 70% of gaze shifts were preceded by a specific maternal behavior which served to prompt the child's shift in gaze.

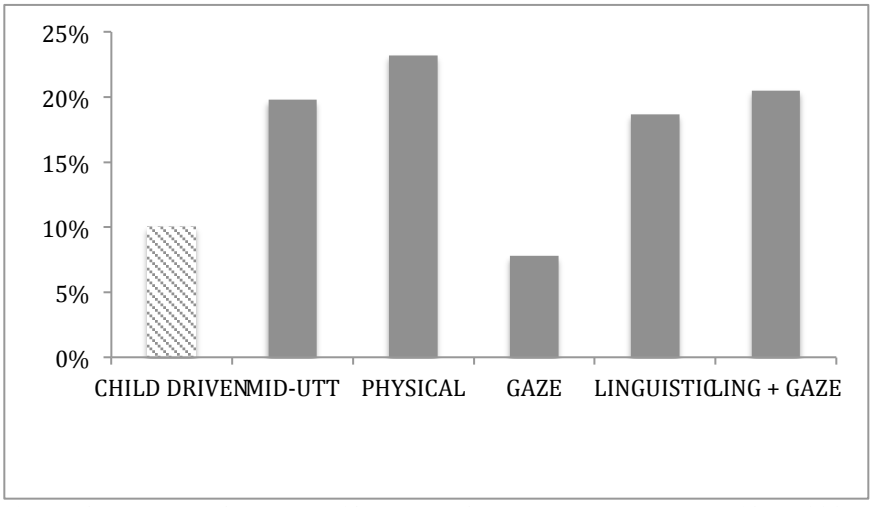

Figure 1. Prompts for gaze shifts across four dyads (total gaze shifts = 320)

Free play interactions

Children's eye gaze during book reading was compared to gaze during free play. Free play episodes were coded for locus of eye gaze and shifts in gaze between the mother and the toys. Table 5 shows total gaze shifts as well as distribution of gaze across the five minute free play interaction. Results show that, as with book-reading interactions, children's gaze is divided between the toys and the mother. In the free play interaction, each child looked for a greater proportion of time to the toys than to the mother, which was likely due to the engaging nature of the toys, as well as fewer utterances by the mother in these interactions.

Table 5. Percentage of time looking and total gaze shifts by child

Child	TOYS	MOTHER	AWAY	Total gaze shifts
C1 (1;9)	68%	31%	11%	65
C2 (2;1)	78%	20%	3%	57
C3 (3;6)	57%	32%	10%	99
C4 (3;7)	71%	26%	3%	77
MEAN	**69%**	**27%**	**4%**	**75**

3.2 Hearing dyads

In order to better understand the gaze shifting behavior of deaf children, we obtained a control group of hearing children engaged in book reading interactions with their (hearing) parents. Hearing children's locus of gaze and total number of gaze shifts were coded for the five minute book reading episode. As can be seen in Table 6, in contrast to deaf children's gaze behavior, all of the hearing children spent the vast majority of the time looking at the book, and almost no time looking at the parent. The one exception was Lily, who spent 39% of the time looking away, which was likely due to the child holding a piece of food during the interaction which she occasionally looked toward. However, across all four children, there was almost no time spent looking to the parent. Next, we looked at the total number of gaze shifts between the book and the parent for each hearing child. Total gaze shifts ranged from 0 to 12, confirming that children's gaze was largely fixated on the book itself, with very few gaze shifts to the parent.

Table 6. Proportion of time spent looking by hearing children to each location across five minute interaction

	BOOK	PARENT	AWAY	Total gaze shifts
Naima (1;10)	99%	0%	1%	0
Violet (1;11)	93%	4%	3%	12
William (3;4)	94%	1%	5%	4
Lily (3;6)	60%	1%	39%	4
MEAN	**87%**	**1%**	**12%**	**5**

4. Summary and Discussion

In this study, we sought to examine deaf children's eye gaze behavior as a measure of cognitive control of visual attention. Across four deaf mother-deaf child dyads, we observed children's locus of gaze during a five minute interaction, as well as gaze shifts between the book and mother and behaviors that prompted such shifts. During book reading sessions, children's gaze was primarily divided between the mother and the book, with only 8% of the time, on average, looking off-task. The proportion of gaze directed to the mother and the book varied by child, with two dyads looking proportionally more to the mother, and two dyads looking proportionally more to the book. Our analysis of gaze shifting behavior revealed an extremely high frequency of gaze shifts between the book and the mother, the majority of which were prompted by either maternal or child behavior. There was a high association between the total number of gaze shifts and vocabulary. A comparison of eye gaze behavior during book reading and free play revealed similar gaze patterns across interaction types. Comparison of deaf children's gaze behavior to that of hearing children revealed that hearing children's gaze was primarily focused on the book, with infrequent gaze shifts throughout the interaction.

The findings of the current study suggest that, unlike hearing children, deaf children interacting with their mothers are constantly shifting gaze between their mother and the book or toy on which they are currently focused. These gaze shifts enable the child to perceive meaningful input and connect it to the non-linguistic context in a sequential but organized fashion. Children's gaze shifts are not random, but instead appear purposeful and motivated by specific maternal or child behaviors. These maternal behaviors ranged from overt, attention-getting devices such as a tap on the child's body, a wave, or a point on the book, to more subtle and likely sub-conscious prompts, such as a maternal shift in gaze or utterance onset. These subtle shifts appear to cue the child either to look up for linguistic input, or to look down to connect either previous or upcoming input with relevant information from the book. Thus, in order to achieve the type of simultaneous attention to both linguistic and non-linguistic information that hearing children receive through multiple modalities, in a

signed interaction both partners must constantly monitor one another's actions and react to those by shifting gaze at appropriate times. It is possible that this complex understanding of eye gaze and attention in the self and others leads to a precocious ability in some deaf children to understand certain concepts of theory of mind, such as perspective-taking. This question certainly warrants further study.

In the current sample, children were already adept at cognitive control of eye gaze before the age of 2, with the youngest two children shifting gaze 36 and 67 times across the five minute book-reading interaction. Then, between the ages of 2 and 3½, gaze shifting appears to become even more sophisticated and frequent, with the older two children shifting gaze 112 and 105 times across the five minute interaction. Furthermore, the two younger dyads had either the same number or fewer shifts during book-reading than during free play, while the two older dyads both shifted gaze more frequently during book-reading than during play, suggesting that the complex gaze shifting that occurs during book-reading may undergo further refinement after the second year.

Concurrent measures of vocabulary on three of the four children show that frequency of gaze shift increases in parallel with the number of words children know. While the current sample does not enable a statistical correlation, particularly without considering the influence of age, the association between gaze shifting behavior and vocabulary suggests that these skills are contingent upon one another. As children learn to look to the interlocutor at the appropriate times, and then look back and forth between the interaction partner and relevant objects, they are able not only to perceive linguistic input, but to connect that input in a meaningful way to the world around them. This finding extends current knowledge on infant gaze following and its relationship to early language acquisition (Morales, Mundy & Rojas, 1998), by showing that gaze control continues to develop and plays a crucial role in language development after the first year.

Importantly, the children in the current study all had at least one deaf parent and therefore had been exposed to ASL from birth from native or highly experienced users of the language. These children had been socialized into a visually rich environment from their first exposure to language. Moreover, their parents had years of experience communicating through sign language and thus an in-depth understanding of the requirements of visual attention. This type of rich experience creates the environment in which cognitive control of eye gaze can be learned easily and naturally. Similarly, an earlier study of deaf children's interactions with a caregiver showed that by age 2, children appropriately established mutual gaze with an interaction partner before communicating in ASL, and also had a terminal gaze at the end of their turns (Richmond-Welty & Siple, 1999). Thus, when begun at birth, children's exposure and experience enables development of sophisticated eye gaze shifting behavior. In contrast to the current sample, the vast majority of deaf children are born to hearing parents who generally have no prior experience with sign language (Mitchell & Karchmer, 2004). Deaf children who, at the earliest stages, do not gain the same

type of experience communicating with skilled adults in the visual mode, may need to acquire this skill as a condition of learning language. This potential difference in deaf children with deaf vs. hearing parents has important implications for intervention and is an area requiring further study.

The current results speak to the nature of attention in early childhood. As stated at the outset, the case of *visual* attention, because it is observable, allows us a window into early attention that cannot be obtained with auditory attention. Previous studies of visual attention have generally focused on the period of infancy, and much has been learned about early social cognition through the study of gaze following (e.g. Carpenter, Nagell, & Tomasello, 1998). In the current study we begin to observe that the cognitive control of attention continues beyond infancy. By the age of two, children have the cognitive awareness to purposefully direct attention in a way that enables meaningful input, and this development continues into the third year. It is also evident that children use this cognitive skill to manage their own interactions. For example, the children in this study responded to maternal cues, but also initiated their own gaze shifts, driven by their motivation to contribute to the ongoing interaction. From this perspective, language and cognitive processes underlying attention develop in concert, with children actively contributing to the construction of their linguistic and social environments from an early age.

References

Andrews, J.F., & Taylor, N.E. (1987). From sign to print: A case study of picture book reading between mother and child. *Sign Language Studies, 56,* 261-274.

Akamatsu, C.T., & Andrews, J.F. (1993). It takes two to be literate: Literacy interactions between parent and child. *Sign Language Studies, 81,* 333-360.

Aram D., Most T., & Mayafit H. (2006) Contributions of mother-child storybook telling and joint writing to literacy development in kindergartners with hearing loss. *Language, Speech, and Hearing Services in Schools, 37,* 209–223.

Anderson, D. & Reilly, J. (2002). The MacArthur Communicative Development Inventory: Normative Data for American Sign Language. *Journal of Deaf Studies and Deaf Education, 7*(2)*,* 83-119.

Baker, A. E., & van den Bogaerde, B. (1996). Language input and attentional behavior. In Carolyn E. Johnson & John H. V. Gilbert (Eds.), *Children's language* (Vol. 9, pp. 209-217). Mahwah, NJ: Lawrence Erlbaum Associates.

Bus, A G.; Van Ijzendoorn, M.s H.; & Pellegrini, A. D. (1995). Joint book reading makes for success in learning to read: A meta-analysis on intergenerational transmission of literacy. *Review of Educational Research, 65*(5), 1-21.

Carpenter, M., Nagell, K., & Tomasello, M. (1998). Social cognition, joint attention, and communicative competence from 9 to 15 months of age. *Monographs of the Society for research in Child Development,63*(4).

Crasborn, O., Sloetjes, H., Auer, E., & Wittenburg, P. (2006). Combining video and numeric data in the analysis of sign languages with the ELAN annotation software. In C. Vetoori (Ed.), *Proceedings of the 2nd Workshop on the Representation and Processing of Sign languages: Lexicographic matters and didactic scenarios* (pp. 82-87). Paris: ELRA.

Demuth, Katherine, Jennifer Culbertson, and Jennifer Alter. 2006. Word-minimality, epenthesis and coda licensing in the early acquisition of English. *Language and Speech, 49*, 137–174.

De Temple, J.M. & Snow, C.E. (2003). Learning words from books. In A. van Kleeck, S.A. Stahl, & E.B. Bauer (Eds.). *On reading books to children: Teachers and parents*. Mahwah, NJ: Lawrence Erlbaum Associates

Harris, M. (1992). *Language experience and early language development: From input to uptake*. Hillsdale: Lawrence Erlbaum Associates.

Harris, M., Clibbens, J., Chasin, J., & Tibbitts, R. (1989). The social context of early sign language development. *First Language, 9*(25), 81-97.

Hill, Eric (1987). *Spot Goes to the Farm*. G. P. Putnam's Sons. New York, NY.

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: Lawrence Erlbaum Associates.

Isbell, R., Sobol, J., Lindauer, L., & Lowrance, A. (2004). The effects of storytelling and story reading on the oral language complexity and story comprehension of young children. *Early Childhood Education Journal, 32*(3), 157-163.

Kasza, Keiko (1996). *A Mother for Choco*. Puffin Books. New York, NY.

Lartz, M.N., & Lestina, L.J. (1995). Strategies deaf mothers use when reading to their young deaf or hard of hearing children. *American Annals of the Deaf, 140*(4), 358-362.

Maestas y Moores, J. (1980). Early linguistic environment: Interactions of deaf parents with their infants. *Sign Language Studies, 26*, 1-13.

Mitchell, R.E. and Karchmer, M.A. (2004) Chasing the mythical ten percent: parental hearing status of deaf and hard of hearing students in the United States. *Sign Language Stud. 4,* 128–163.

Mayer, Gina & Mayer, Mercer (1993). *Taking Care of Mom*. Golden Books Publishing Company. New York, NY.

Morales, M., Munday, P., & Rojas, J. (1998). Following the direction of gaze and language development in 6-month olds *Infant Behavior and Development, 21*(2), 373-377.

Ninio, A. (1983). Joint bok reading as a multiple vocabulary acquisition device. *Developmental Psychology, 19*(3), 445-451.

Richmond-Welty, D. E. G, & Siple, P. (1999). Differentiating the use of gaze in bilingual-bimodal language acquisition. *Journal of Child Language*, *26*, 321-328.

Scarborough, Hollis S., & Dorbich, Wanda. (1994). On the efficacy of reading to preschoolers. *Developmental Review, 14*(3), 245-302.

Schleper, D.R. (1995a). Reading to deaf children: Learning from deaf adults. *Perspectives in Education and Deafness, 13*(4), 4-8.

Snow, C. E., & Ninio, A. (1986). The contracts of literacy: What children learn from learning to read books. In W. H. Teale & E. Sulzby (Eds.), *Emergent literacy: Writing and reading* (pp. 116–138). Norwood, NJ: Ablex.

Tomasello, M. (1988). The role of joint attentional processes in early language development. *Language Sciences, 10,* 69-88.

Waxman, R., & Spencer, P. (*1997*). What mothers do to support infant visual attention: Sensitivities to age and hearing status. *Journal of Deaf Studies and Deaf Education*, *2*, *104*–114.

Whitehurst, G. J., Falco, F. L., Lonigan, C. J., Fischel, J. E., DeBaryshe, B. D., Valdez-Menchaca, M. C., and Caulfield, M. (1988). Accelerating language development through picture book reading. *Developmental Psychology, 24,* 552–559.