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# VISUAL LANGUAGE & VISUAL LEARNING RESEARCH BRIEF:



## EYE GAZE AND JOINT ATTENTION

FUNDAMENTAL SKILLS FOR SUCCESSFUL INTERACTIONS IN  
HOME AND SCHOOL ENVIRONMENTS



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### Key Findings on Eye Gaze and Joint Attention:

- Deaf children perceive both language and non-linguistic information visually.
- Eye gaze and joint attention between child and caregiver function together as a foundation for the development of communicative competence.
- Deaf children with exposure to sign language from birth develop the ability to shift their eye gaze between objects and people in a frequent and meaningful way from an early age.
- Language input that occurs during episodes of joint attention is linked to enhanced vocabulary, language, and literacy development in both deaf and hearing children.
- Deaf children who have developed the pragmatic ability to manage, monitor, and self-regulate their own visual attention are more prepared for the complex visual exchanges that take place in the classroom.

Written by:

Amy M. Lieberman  
Ph.D.

When babies are exposed to language from birth, they learn language spontaneously and naturally through their interactions with parents, family members, peers, and many others. But in addition to learning the language itself, children must also learn how to *use* the language in meaningful ways so that they can communicate effectively with others. For example, children need to learn how to take turns in a conversation, how to begin communicative and social interactions, and how to manage and regulate all the linguistic input they receive.

While all children must acquire these discourse skills, deaf children need to acquire a specific set of skills in order to perceive *visual* language input and understand interactions in their environment. Deaf children and their caregivers must learn to communicate information so that it is both accessible and relevant. The foundation for this type of communication begins in infancy, when the earliest interactions between infants and their caregivers take place.

Visually-oriented communicative competence includes the development of pragmatic and discourse skills that enable children to participate in successful social interactions with others. An important topic covered here in this research brief is the child's development of control over eye gaze and attention; these cognitive skills are crucial for the ability to acquire language and social skills. Cognitive development in this area begins during the earliest face-to-face interactions between infants and their caregivers and continues throughout early childhood. As they grow older, deaf children's cognitive skills develop further, and this, in turn, facilitates each child's ability to participate in the visually and linguistically sophisticated interactions that happen in the classroom.

## What is joint attention?

From birth, parents respond to their infant's coos, smiles, and movements as though they are meaningful communicative acts, and may smile, vocalize, or otherwise imitate their infant's actions. These types of exchanges, sometimes called "proto-conversations," are important for the infant's developing emotional and social competence,

including bonding and attachment, as well as early understanding of turn-taking and meaningful communication.<sup>1</sup> Beginning around six months, as infants become more mobile and start to explore the world around them, the focus of their attention shifts to the objects in their environment. Soon after that, they begin to coordinate attention between caregivers and objects in a meaningful way by looking, for example, back and forth between the caregiver and the object. This kind of shared focus between a child, a caregiver, and an object or event is known as joint attention.<sup>2, 3, 4</sup>

## Why is joint attention important?

Infants' ability to engage in joint attention is an important developmental milestone. Joint attention serves as a foundation for developing communicative competence and is one basis for the development of early social and cognitive skills.

For both hearing and deaf children, joint attention interactions are also crucial for language development. Specifically, the language children hear and see during this particular type of interaction with their caregivers is strongly linked to early vocabulary development. When caregivers share attention with their infants, and comment on the object or event on which the infant is focusing, infants acquire new words more easily and efficiently than if the caregiver simply attempts to redirect the child's attention.<sup>5, 6</sup> Joint attention interactions that focus specifically on shared book reading have also been linked to later language development and reading ability.<sup>7, 8</sup>

## How do deaf children and their caregivers engage in joint attention?

Deaf children, like all children, rely on joint attention in order to learn about the world around them, and importantly, to learn language. However, whereas a hearing child can be *looking* at an object while *listening* to their parents talk about that object at the same time, deaf children receive their information through a single modality, vision. Deaf children perceive language input *and* explore their environment primarily through the visual mode. So how are complex joint attention interactions achieved in this situation?

To answer this question, researchers have examined strategies used by deaf parents when interacting with their deaf children. Deaf parents who use a natural sign language to communicate demonstrate a linguistically-oriented and intuitive knowledge about adapting to the visual needs of their deaf children.<sup>9, 10</sup> For example, with young infants, deaf parents will sometimes lean into the child's line of sight when signing so that the child can see the parent's signs while they are both focusing on a specific object. Deaf parents may sign directly on their child's body, or on a book or toy. They may also manipulate the position of an object so the child can see both the object and the parent simultaneously. Another strategy deaf parents use to obtain visual attention is to tap their child lightly or wave their hands towards the child; these are signals for the child to look up at the parent. As children grow older, parents use less of these overt or explicit signals, and instead will wait for the child to look up at them before beginning to sign. By the time their children are two or three years old, parents will simply start to sign in normal signing space, trusting that when the child notices the parent signing, she will spontaneously look up at the parent in order to perceive the signs.<sup>11, 12</sup> These strategies, collectively referred to as "child-directed signing," are a natural feature of interactions that occur between parents and their children when an accessible, visual language is the basis of communication. Indeed, the communicative adaptations that deaf parents make with their deaf children are parallel to those that hearing parents make to gain and maintain the attention of their young hearing infants when they use child-directed speech or "motherese."<sup>13</sup> Thus, when young deaf infants are exposed to a linguistic environment that is inherently structured around the demands and expectations of communication in a visual language, they acquire the accompanying pragmatic and conversational skills that allow them to engage in successful interactions with their caregivers. Furthermore, these rewarding interactions serve to facilitate emotional and social development.

Deaf children have also been shown to develop important skills that allow them to engage in joint attention. VL2 research indicates that from a very young age, deaf children who have been exposed

to signed language from birth learn to shift their gaze between their caregiver and an object or event on which they are focusing. Children as young as two years old constantly shift their gaze back and forth; this gaze control helps them connect the language input they are perceiving to the object they are focused upon.<sup>14</sup> And deaf children are very good at knowing *when* to make these shifts. For example, they will look up at the mother as soon as she lifts her hands to start signing, and they will look down at an object as soon as she ends a signed sentence. This rapid and meaningful gaze shifting is not seen in hearing children and is an example of the kind of adaptations children make when perceiving language visually.

## What other roles may eye gaze play in early child cognitive and social development?

Beginning at birth, infants are naturally drawn towards the eyes of their caregivers. Infants learn to follow the direction of adults' gaze beginning around 6-9 months, and sensitivity to eye gaze becomes even greater by 12 months. This ability to follow eye gaze has been demonstrated to be related to later language development<sup>15</sup> In addition, gaze following is thought to be important to a child's ability to understand the perspectives and intentions of others. That is, infants are able to interpret adults' gaze as an indicator of their mental state, such that when an adult looks towards a specific location, the infant may understand that there is a communicative intent linked to the adult's gaze.<sup>16</sup> In this way, gaze following may be an early precursor to a broad range of cognitive skills known as "theory of mind," or the ability to understand that people's mental states drive their behavior.<sup>17</sup>

For deaf infants, as discussed above, eye gaze is particularly important because not only is gaze used to perceive objects and events, it is also used to perceive language. Deaf children must learn to control their own gaze in a manner that allows them to alternate attention and perceive relevant input. Deaf children who are not able to shift gaze effectively are at risk for receiving greatly diminished language access; that is, if a child does not know how to "look for language," he will not get

the same quality and quantity of language input as a child who has learned to shift gaze appropriately.

In adult users of ASL, eye gaze plays a variety of functions. In discourse, eye gaze is used to regulate turn-taking.<sup>18</sup> Eye-gaze is used in role shifts and direct quotation during narrative production.<sup>19</sup> Eye gaze also plays a syntactic role in sign language, used to mark pronominal reference<sup>20</sup> and to supplement manual marking of verb agreement.<sup>21</sup> Thus eye gaze is used not only to perceive language, but is an important component of sign production and is under careful control by proficient signers.

## How do eye gaze and attention contribute to deaf children's learning?

When deaf children enter school, they bring with them the knowledge and skills they have acquired through their early interactions at home. This is important because the classroom environment is highly stimulating, with many events occurring simultaneously, and most importantly, many people interacting at once. Instead of carefully controlled interactions with a parent, children are now faced with interactions involving multiple people with different skills and different amounts of experience communicating through a visual language. Research has shown that deaf children who have been exposed to language from birth enter school more equipped to handle the stimulating and visually complex environment of the classroom.<sup>22</sup> For example, deaf children must understand that in order to have a successful interaction with a peer or teacher, they must first obtain that person's attention, and this involves using some type of signal to establish eye contact. They must also learn to participate in interactions involving groups, such as meetings or teacher-led book sharing events. In these situations, children must understand where to direct their gaze, how to initiate a turn, and how to manage multiple visually stimulating events. Thus a strong early foundation in visual interaction is essential for developing these more complex abilities.

## What about deaf children learning spoken language?

The population of deaf children today is a highly diverse group in relation to degree of hearing loss, level of assistive technology used, educational approach used, and other factors. Deaf children acquiring spoken language through the use of either hearing aids or cochlear implants have been found to benefit from the use of visual information in order to perceive speech most effectively.<sup>23</sup> Techniques such as lip-reading, cued speech, and audiovisual perception all rely heavily on the visual information conveyed by the speaker. In children with cochlear implants, the ability to integrate auditory and visual information has been found to be an important predictor of speech perception and general language ability.<sup>24</sup> Thus, deaf children's acquisition of visual attention and gaze control is important for achieving linguistic milestones, regardless of the mode of communication or specific language being learned.

## What can be done to help deaf children develop skills in visual attention?

Lots! There are many ways in which parents, teachers, and others can support the development of attention in young deaf children. In some intervention programs, deaf parents who are proficient ASL signers have been used as role models to assist hearing parents in learning how to interact and share books with their deaf children.<sup>25,26</sup> Parents can become sensitive to the visual needs of their deaf children by, for example, giving children time to shift between objects and people, and by ensuring that spontaneous looks from the child to the parent are rewarded with relevant and meaningful signs.

Specific strategies to achieve joint attention include:

- Placing signs into the child's current focus of attention;
- Using attention-getting signals (tapping the child, waving towards the child) to establish eye contact before signing;

- Physically setting up the interaction so that both the parent and the objects can be seen with minimal shifting (for example, sitting across from the child);
- Waiting for spontaneous looks from the child before signing;
- Providing relevant signs when the child spontaneously looks up;
- Giving the child time to explore objects before eliciting attention; and
- Using specific signs such as LOOK, along with a pleasant, positive manner, to prompt the child that linguistic input is forthcoming

A young child's ability to control his or her own gaze and attention can be documented from an early age and can be used as a screening tool to determine how to improve these abilities. Although there is much research still to be done, it is clear that gaze control and visual attention are critical early abilities that all children, but particularly deaf children, need to acquire in order to become successful communicators, ready to interact in visually complex environments at home, at school, and beyond.

## Translating VL2 Research to Practice

The National Science Foundation-funded Science of Learning Center on Visual Language and Visual Learning (VL2) publishes research briefs as a resource for educators and parents. The goal is to inform the education community of research findings, to summarize relevant scholarship, and to present recommendations that educators and parents can use when addressing the multifaceted challenges of educating deaf and hard of hearing children.

Research briefs are available at [vl2.gallaudet.edu](http://vl2.gallaudet.edu).

### VL2 Center Mission Statement

The Center's primary mission is to improve learning through an understanding of the behavioral and brain mechanisms of learning primarily through vision and visual processes, with our scientific questions being motivated and informed by an exciting balance of advances and questions in science and advances and questions in learning

and social environments. Our mission is to create a science of learning using a two-way discovery model in which practitioners and scientists exchange ideas freely and mutually identify core questions in educational and social practice that would be fundamentally advanced with knowledge from the behavioral and brain sciences. The mission involves the advancement of two overarching complementary groups.

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#### Credits

Writer: Amy M. Lieberman, Ph.D.  
Content development and copy-editor: Kristen Harmon, Ph.D.  
Consultants: M. Diane Clark, Ph.D. and Laura-Ann Petitto, Ph.D.  
Design: Melissa Malzkuhn, M.A.  
Research Assistant: Erica Wilkins