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Relational Factors in Pragmatic Skill Development: Deaf and Hard of Hearing Infants and Toddlers

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Abstract

In this article, we review relational factors in early childhood believed to contribute in unique ways to pragmatic skill development in deaf and hard of hearing (DHH) infants and toddlers. These factors include attending to infant interactions with caregivers and others, supporting development of theory of mind through play and use of mental state language (ie, describing one's own or others' thoughts, feelings, and beliefs), and providing accessible opportunities for social interaction. On the basis of a review of the literature and clinical experience, we offer prescriptive strategies for supporting DHH children's development in these areas. To improve outcomes for DHH children, medical care providers and allied health professionals have a responsibility to support the development of young DHH children's pragmatic abilities by understanding these variables, coaching caregivers regarding their importance, and facilitating referrals for support when necessary.

DEFINING PRAGMATICS AND RELATIONAL FACTORS

Pragmatics is typically defined as the "social use of language,"[1] although various definitions exist.[2] Pragmatics draws on understanding human interactions in specific contexts and requires engagement with a communicative partner or partners.[3,4] Many deaf

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and hard of hearing (DHH) children demonstrate lags in pragmatic skills, even when they possess average cognitive abilities and average performance in other aspects of language functioning.[5,6] Recognizing that pragmatic skill development inevitably occurs within the context of the child's environment, emerging research has logically begun to explore factors in the DHH child's world to better understand these developmental gaps and to inform targeted interventions. This work is critical. Deficits in DHH children's pragmatic skills have been associated with negative outcomes, including behavioral challenges, academic delays, social difficulties, and mental health concerns.[7-9] As DHH children grow, struggles with pragmatic skills, such as recognizing others' intentions, discerning truth from a lie, and communicating a sequence of events, may contribute to their being at a greater safety risk (studies suggest that by the time DHH children reach young adulthood, they are 3–4 times more likely to have experienced maltreatment, such as neglect and abuse, and to have been exposed to trauma[10-12]).

Pragmatic skill deficits are also related to both delayed language and poorer outcomes in other populations, such as children with specific language impairment[13] and children with autism spectrum disorder (ASD).[14] Research with specific language impairment and ASD populations has taught us that language skills must develop within the context of social relationships.[15-18] In contrast with the case of ASD, in which brain-based differences are thought to impact the children's perception of and engagement with their social environment,[19,20] our literature review did not reveal compelling evidence of brain-based causes for pragmatic difficulties observed in DHH children. However, relational variables, including attending to infant interactions with caregivers and others, supporting development of theory of mind (ToM) through play and use of mental state language, and providing accessible opportunities for social interaction, did surface in the review of the literature on pragmatic skill development in DHH children. These relational variables do seem to be amenable to intervention. Thus, by attending to the relational factors below and implementing the recommendations offered, it should be possible to promote pragmatic development in children who are DHH.

RELEVANCE TO MEDICAL CARE PROVIDERS AND ALLIED HEALTH PROFESSIONALS

Most developmental screenings commonly used by medical care providers (eg, pediatricians, developmental pediatricians, family care physicians, nurse practitioners, nurses, and, perhaps, otolaryngologists in the case of DHH children) typically begin with screening the child's use of language in later infancy.[21] Furthermore, developmental screenings are often focused on the skills the child demonstrates, with minimal consideration of the contribution of the child's relationships and environment. Allied health professionals (including, but not limited to, audiologists, speech-language pathologists, social workers, psychologists, child specialists, and early intervention providers) may sometimes be involved early in a child's life yet are often included in the intervention or care team only after problems have been identified.

Importantly, medical care providers and allied health professionals are in the unique position of requesting assessments, monitoring developmental progress, guiding families to services, and helping families access necessary supports. Recognizing that pragmatic difficulties have been identified from a young age among DHH children,[22,23] we have adopted a developmental model of pragmatics.[24] This model recognizes that children begin to develop foundational skills necessary for acquiring and using language for social interaction before the child's use of first words. In this article, we outline how a young infant's reduced hearing can interact in complex ways with their relationships and environment to influence the development of pragmatics. Notably, some of these concepts reside more broadly within health topics. For example, parent responsiveness and parental sensitivity have been described as critical variables in other areas of health, such as feeding intervention and treatment adherence.[25,26] Other factors, such as critically evaluating whether a child has adequate access to communication, may be unique to working with the DHH population. We posit that for DHH children in particular, attention must be given to relational variables (by medical care providers, allied health professionals, and caregivers) to avoid negative outcomes that can be associated with poor pragmatics.[7,9,27]

RELATIONAL FACTORS IMPACTING PRAGMATIC SKILL DEVELOPMENT

Developmental pragmatics has been described as being at the intersection of social cognitive and communicative development.[24] During the first year of life, rapid changes can be noted in how infants monitor, control, and predict others' behaviors. Early exchanges, before the emergence of formal language, are foundational to the mutual understanding between the infant and others. The developmental pragmatics model outlines a number of relational factors between infants and toddlers and their caregivers and others that shape the child's trajectory for pragmatic development.

We do not incorporate every relational factor that can influence general child development in this article; rather, we have narrowed our selection of early childhood relational factors to those that have been described in multiple articles involving studies of DHH children that have detailed direct implications for intervention. A glossary of these relational variables is provided (see Table 1) to facilitate understanding of the meaning of these terms and show how these relational variables are linked to the development of pragmatics.

INFANT-CAREGIVER SYNCHRONICITY

Early in typical development, infants are inherently social and demonstrate a preference for faces and caregiver voices.[28-30] Infants' brains track the changing fluctuations in this feedback loop, forming the foundation for understanding pragmatic expectations in social interactions. Research with hearing children reveals that early foundations for pragmatic skills are established through vocal turn-taking and imitation.[31,32] Imaging studies using functional near-infrared spectroscopy reveal the direct influence of mutual gaze, infant emotion, and the prosody of the adult communicator on the ability of the dyad to interact reciprocally.[33] Contingent social responsiveness helps infants to know what is expected of them and to learn about their environment. As infants grow in relationships with their caregiver(s), they show improved synchrony in their interactions, demonstrating matching

behaviors, affective states, and biological rhythms.[34] This dynamic, temporal "dance" of parent-infant synchronicity lays the foundation for bonding and infant self-regulation, also known to be important in later pragmatic development.[34]

CAREGIVER RESPONSIVENESS

Caregivers can show their responsiveness through a number of ways. Visual attention, joint attention, and fostering language are of particular relevance to the ways in which caregivers respond to DHH infants and toddlers.

Visual Attention

Visual attention involves deploying focus on something in the visual field.[32] Responsive caregivers recognize the DHH child's need to shift their visual attention between caregivers and objects; thus, they structure environments to make communication accessible.[35] DHH children must have the opportunity to attend to an object and receive feedback from the caregiver. Because this does not typically occur simultaneously, as it might for a child with typical hearing (eg, a child points to an object and hears the caregiver label that object), time must be allotted to allow the DHH infant the opportunity to shift from the object to the caregiver. Caregivers need to allow time for young children to look at a toy, for example, and then look back to the caregiver for additional information. Two important elements of responsive caregiving for children who are DHH are pacing of conversations and checking in to see whether the young DHH child is following a spoken or signed message or an event happening in the environment.[36] Fortunately, learning how to engage with DHH young children and hold their attention is teachable.[35,37,38]

Joint Attention

Caregiver responsiveness is essential for developing joint attention skills: the ability of the child and caregiver to attend to the same object so that communication about that object can ensue. Joint attention fosters the child's language development.[39] This is particularly important when a child is DHH.[40] Caregivers may have more difficulty sustaining interactions when their DHH child is not responsive to the caregivers' communication attempts (eg, when a DHH child is not able to hear a caregivers' vocalizations).[39] When caregivers are not aware of how to engage their DHH child in sustained joint attention, this can disrupt the development of early pragmatic skills.[41] Caregivers can be coached to build joint attention through strategies that account for their child's specific needs to build joint attention in DHH children.

Fostering Language

Caregiver responsiveness has been shown to be a predictive factor in language outcome studies of DHH children.[40,42] Responsive caregivers expand children's early interactions using techniques such as asking questions or giving choices to extend interactions.[3,43] When caregivers show high levels of responsiveness and infant-caregiver dyads are in sync, a feedback loop is established that lays the foundation for early pragmatic skill acquisition and demonstration.[28,44] For example, when caregivers respond to their child's cooing and babbling sounds as if they have meaning, children quickly learn to recognize others as

communication partners and the power of their own communication to impact others' behaviors.

ATTACHMENT

From infancy, caregiver-child interactions serve as a driving force in developing pragmatic abilities. Parents might be naturals at responding to their infant and establishing family routines in a language-rich environment, or they may need modeling and reinforcement to see how much even newborn infants can communicate through behaviors some parents may not be used to thinking of as communication (eg, eye contact, facial expressions, reaching, vocalizations that are not yet words). Once caregivers learn how to recognize these behaviors as an infant's invitation to engage, they can increase their own efforts to reciprocate and respond to enhance their connection with the infant. Congruent, responsive, and reciprocal early interactions with caregivers lay the foundation for future exchanges with communicative partners.[44,45] A child who is securely attached expects caregivers to be available, responsive, and understanding; they show greater interest in and empathy toward others.[46]

Caregivers' own attachments and relationship histories with their parents and caregivers' views about their child's behavior affect caregiver-infant attachment and influence how caregivers interpret their child's behavior and relate to the child.[47] Secure attachment is vital because it lays the foundation for the development of early pragmatic skills.[48,49] In some cases, the presence of a hearing loss in a child can affect the development of trust and security in the attachment relationship with the caregiver[50]; as one example, a caregiver may be accustomed to using verbal cues to comfort their infant, yet the DHH infant may require visual cues to help them calm. This mismatch in styles can influence the level of trust that is perceived in the caregiver-infant dyad. Caregivers who have learned to be attuned and responsive to their child's unique cues tend to have children who are securely attached. In addition, security of attachment is strengthened when caregivers have the resources to cope with stress inherent in parenting a child who is DHH. Caregivers' emotions regarding their child's hearing status (eg, grief, guilt, overwhelm), and even the necessity of having early intervention in the family's life, can negatively influence their ability to bond and form attachments with the infant. Fortunately, there are protective factors that can help caregivers to resolve these feelings, making the disruption of the attachment less likely. These factors may include accessing individual support (such as counseling), connecting with successful DHH role models and trained DHH adult mentors (who are familiar with current recommended practices in early intervention for DHH infants and toddlers), and establishing connections to other families of DHH children (sometimes referred to as parent-to-parent support).[48,49,51,52]

These early secure attachments provide young children with foundational skills to interact with others. However, because pragmatic language skills ultimately require the ability to engage with a wide variety of communication partners, it becomes increasingly important for young children to practice engaging with individuals beyond the caregiver relationship. Thus, learning pragmatic skills is facilitated through interactions with a wider range of communication partners, which allows young children multiple opportunities to

practice pragmatic skills, such as understanding others' perspectives and adjusting one's communication appropriately.[24]

THEORY OF MIND (TOM)

ToM is the ability to understand others' mental states (eg, thoughts, beliefs, perspectives, and knowledge) and recognize that these may differ from one's own. Early markers of ToM development in infancy include joint attention, attending to others' facial expressions, and shifting gaze between an object and a person.[53,54] This is followed by ToM understanding reflected in infants' understanding of others' intentional actions and understanding that others' desires can differ from one's own.[53,55] Early pretend play and use of mental state terms (eg, describing what the play character is thinking or feeling rather than simply describing what the character is doing) are important in development in ToM as well.[54] By the end of toddlerhood, typically developing children can demonstrate understanding of other's perspectives, reflect on how others are likely to respond, and adjust their actions and communication (to some extent) in accord with social demands, demonstrating acquisition of early pragmatic skills.[56]

It is clear that language development plays a role in ToM.[57] DHH children who are native signers (ie, exposed to American Sign Language from birth) show typical development of ToM, in contrast with DHH children who use sign language to communicate but are exposed to it later.[58] It is important that DHH children be exposed to a whole language (whether signed, spoken, or both) because insufficient access to language can result in delays in language development and ToM. Many DHH children, especially those with delayed language, struggle with various aspects of ToM, resulting in difficulties in social interactions and making ToM an important consideration in supporting DHH children's pragmatics.[59-61]

INTERACTIVE PLAY

Play is linked to ToM and to pragmatic development in important ways: (1) play that involves repetition can foster the ability of the child to predict caregiver's actions (eg, peek-a-boo), and (2) interactive play can foster infants' ability to recognize that their behaviors have some influence on their caregivers.[24] Early play is interactive, involving "serve and return" between the infant and caregivers.[62,63] As children develop, increasingly complex play, in which adults model understanding of others' thoughts, beliefs, and desires through the use of representational objects (eg, dolls, figurines, stuffed animals), enhances ToM development.[24] The play of children with typical hearing and children who are DHH is similar in infancy, when interactive play is largely visual, tactile, and movement oriented. As infants grow into toddlers and young children, they tend to incorporate more understanding of their world in their play. Studies reveal that many DHH toddlers, however, engage in less representational and preplanned play.[64,65] Attending to and scaffolding the play of DHH children to foster representational play has multiple benefits, including fostering ToM and early reciprocal interactions that serve as the foundation for strong pragmatic skills.

MIND-MINDEDNESS AND MENTAL STATE LANGUAGE

Mind-mindedness and mental state language allow children to recognize thoughts, feelings, and perceptions of social situations. Exposure to adult communication partners' mind-mindedness (ie, sharing of their own thoughts, feelings, and perceptions of social situations with their infants and toddlers) has been linked to children's later perspective-taking and ToM development.[66,67] Families whose conversations incorporate regular discussion of states of mind, particularly covert and uncommunicated aspects of emotions and beliefs, have children with better-developed ToM. Communication partners' incorporation of verbs that reflect mental states, such as "want" or "try," seem to foster young children's understanding of others' perspectives.[68] Providing responsive attention by putting into sentences a child's desires, feelings, and beliefs (eg, "Oh, do you want my car keys?" in response to an infant pointing at the keys) also promotes toddlers' ToM. In contrast, reduced exposure to mind-mindedness contributes to reduced social cognition and pragmatics.

Studies reveal that some DHH children are exposed to significantly less mind-mindedness terms by their caregivers, resulting in delayed ToM and negatively impacting their pragmatic language development.[61,69] Families are often encouraged to focus on developing language with their DHH young children; they are not often encouraged to think about fostering their child's pragmatics development. The good news is that caregivers and professionals need not wait until language is emerging to address pragmatics; the relational factors outlined in this article facilitate language development. Developing positive relationships with the DHH infant or toddler and being highly attentive to their needs also contributes to pragmatic development.

As with many aspects of pragmatics, a strong language foundation supports the development of mind-mindedness and mental states. Language interventions for many DHH children promotes their understanding of sequencing (eg, "First we eat dinner, second you can have dessert, and after dessert we can play a game.") and contingencies (eg, "If you pick up your toys, then we can go to the park.").[69] Using these linguistic structures, even with young children, helps foster their understanding of early language and pragmatic development.

Although families of DHH children are often encouraged to simplify language to match their child's level of language understanding, we argue that in doing so, mental state terms should not be abandoned. Instead, caregivers should intentionally expose their DHH child to this language in a developmentally appropriate way. Integrating understanding of mind-mindedness can start early, first by using one's affect to reflect back the child's emotions (demonstrating caregivers' recognition of others' emotions), second by exaggerating one's own affect to draw attention to caregivers' emotions, third by including simple emotion terms to label the child's affect or caregivers' own emotions (eg, "you're mad," "I'm sad") and the child's assumed mental states ("you want"), and then by gradually expanding on these concepts with increasing linguistic complexity as the child's language skills progress. As children grow, caregivers can use books as a way to foster mental state language as well by asking how the character may feel or why the character may have acted in a particular way.[70,71]

CONSIDERATIONS FOR ACCESSING LANGUAGE

Language as a Critical Foundation

Language development intertwines with pragmatic development. DHH infants and toddlers require adaptations to language learning on the basis of their hearing status. When considering these adaptations, it is helpful to consider various ways DHH children learn language because they may rely on auditory access and/or visual access to language.

Auditory Access

Ensuring auditory access for DHH children requires intentional effort. It is often assumed that hearing-assistive technology (HAT), such as hearing aids and cochlear implants, provides this access; however, not all DHH infants or toddlers are appropriate candidates.[72,73] Among DHH children who use HATs, it is important to note that they do not hear the same as children with typical hearing. HATs can provide some auditory access, yet gaps are present in the amount and quality of the auditory signals DHH children receive.[74,75] DHH children must fill in the blanks to comprehend the information. This task is much more challenging for children who are in the early stages of learning language (as is the case for DHH infants and toddlers) compared with older DHH children with progressive or late-onset hearing changes and children with typical hearing who already have an established language foundation.[76]

Caregivers who talk a great deal may be exposing their DHH child to many words and concepts. However, as described above, this does not ensure that a child is able to process and understand all of the communication occurring in the environment. For children who are DHH, exposure is not enough. Caregivers and providers also have to ensure the child has access to language.[77] When considering what makes language accessible for a child who is DHH, there are a number of factors to consider, including characteristics of the infant or toddler's hearing level and their ability to wear HATs consistently,[78] ensuring that HAT is in good working order and programmed appropriately,[79] adjusting the distance the child is from the speaker,[74] reducing the presence of competing background noise,[80,81] and attending to the additional processing time needed to cue into a caregiver's comments and shift attention to what is being talked about. For DHH children using listening and spoken language, what is outside the range of their ability to listen (eg, incidental language occurring in the environment that may not be as easily accessible, such as conversations in the next room between parents or specific content and/or terms used in popular auditory media) may need to be taught explicitly (eg, directly telling a child one caregiver is leaving rather than relying on their ability to overhear conversation about this between caregivers).[81]

In addition to being able to auditorily access what is said, DHH children need to be able to access aspects of communication that go beyond the words that are used. DHH children who rely to some degree on spoken language may not have adequate auditory access to some aspects of paralinguistics, such as prosody (ie, patterns and intonations in speech),[82] but may rely on nonverbal aspects to support their understanding.[83] Therefore, they may need to be cued to attend to these important pragmatic features (eg, taught to recognize the difference between a mad face and a disappointed face).

Visual Access

If a child is being raised in a signing environment, yet the sign exposure the child receives is rudimentary or inconsistently used, the child is also not being exposed to accessible and high-quality language. Many DHH children who learn sign language may do so primarily through nonnative users of the language, and their facility for using signs can vary.[84] For children who are relying on sign language, exposure to language includes the amount and quality of language modeling that is occurring. True access ensures that children have the opportunity to "oversee" conversations that others are having and are not only being asked to attend to communication that is directed toward them. These factors are unique to DHH children because they are not generally a consideration for children who do not have reduced hearing.

Often, DHH children need explicit cues to draw their attention to communication in the environment.[35,37,41] For example, in group settings for toddlers, such as day care, establishment of visual cues for turn-taking has been shown to help DHH children attend to the speaker or signer and to help facilitate their ability to take turns. Caregivers' timing of conveying information and referencing objects is also of critical importance.[85]

Promoting Pragmatics Through Access

We are not suggesting one methodology over another. Rather, we wish to emphasize that regardless of the communication modality and methods employed by caregivers, attention must still be given to ensure that a DHH child can effectively access a strong language foundation.[77] Pragmatic understanding is transmitted through experience in interacting with a wide variety of role models in many contexts and is informed by culture.[86-88] There is evidence suggesting that intentional effort must be made to make language accessible to DHH children to foster development of pragmatic language skills.

Whether communication with the DHH child involves signed language, spoken language, or some combination of these, obtaining the child's visual attention before conveying a message is necessary. Understanding and comprehending the nuances of conversations and the contexts in which language is used are fundamental to pragmatic development; to do this, caregivers and others interacting with DHH infants and toddlers need to be cognizant of ensuring that the languages to which the child is exposed are accessible to the child. It is critical that medical care providers, allied health professionals, and caregivers recognize that exposure to language does not equate to access to language.[77,89] Furthermore, access to language is necessary but may not be sufficient for pragmatic development.

MAPPING DEVELOPMENTAL MILESTONES AND THE RELATIONAL FACTORS THAT INFLUENCE PRAGMATIC DEVELOPMENT

To facilitate screening of these developmental pragmatic skills and relational factors, we have developed a table (see Table 2) that allows medical professionals to monitor pragmatics alongside development. It is important to recognize that in this developmental model, skills are built on earlier skills, and reviewing skills expected to have been mastered at previous stages to determine skill gaps may be necessary. Furthermore, this table is not intended to

comprehensively assess all pragmatic skills. Instead, it represents an effort to capture skills that were frequently identified in the literature as particularly relevant for DHH children to screen for early pragmatic difficulties and relational factors, which may contribute to these delays.

Although further work is needed to refine our understanding of pragmatic development and to develop intervention practices, this table also offers evidence-based (when possible) and evidence-informed (when necessary) suggestions for how these relational factors might be addressed to promote pragmatic development. Although particular recommendations may target >1 relational factor, we have included recommendations believed to be most pertinent after the descriptions of each relational factor. In general, we strongly endorse referral to early intervention for all DHH infants and toddlers and their families; many of the suggestions offered can be addressed in the context of the early intervention professional-family partnership. Involvement of allied health professionals with DHH expertise (eg, audiologists, specially trained speech-language therapists, social workers, psychologists, and early interventionists) is paramount.

CONCLUSIONS

Research reviewed here, highlighting a developmental approach to understanding early pragmatic skills, has identified areas of vulnerability for many DHH children. This review also suggests that development of pragmatic skills can be fostered by earlier attention to a number of relational factors. Pragmatic skills in DHH young children can be enhanced by attending to infant interactions with caregivers and others. Providing accessible opportunities for social interaction (by ensuring appropriate visual support and directing the child's attention to social exchanges) can also foster understanding of pragmatic aspects of communication. Attending to DHH children's understanding of the context of a communication exchange and helping to ensure children's understanding of others' experiences in those interactions (ie, ToM) will further promote the development of pragmatic skills. Although the intervention research on the promotion of pragmatics in DHH children is limited, interventions targeting the relational factors that influence pragmatic development are drawn from the existent literature and are intended to describe possible next steps for medical care providers and allied health professionals seeking to improve outcomes for DHH children.

FUTURE DIRECTIONS

Admittedly, research on pragmatics with DHH children is limited. Work in this area is nascent, without large-scale clinical trials. Larger-scale studies assessing outcomes for children who are DHH that include relevant relational factors (eg, caregiver input) have only recently begun.[79,90] Understanding of pragmatics in DHH children is further complicated by varying approaches to the study of pragmatics, including differences in how pragmatics is assessed[2] and different control groups (eg, deaf caregivers versus hearing caregivers, general education settings versus self-contained classrooms),[35,91] rendering comparisons across studies difficult. To truly understand persistent language gaps and, particularly, pragmatic skill difficulties that persist despite DHH children's acquisition of language, there must

be a commitment to a more comprehensive study of DHH children's language skills in future research, and therefore future research must include measurements of DHH children's pragmatic skills.[92] Furthermore, because these skills are best understood within the context of relational variables influencing DHH children's development,[89] we argue for inclusion of these relational factors in research. Rather than focusing research on fixed variables that cannot be altered (such as the hearing status of the parent), we argue that research should instead emphasize relational variables that can be altered and improved with intervention, such as caregivers' responsiveness or use of mental state language (independent of the caregivers' hearing status). Much research is needed to inform better understanding of effective supports and interventions for pragmatic development. When these supports and interventions are implemented, research can also document whether and to what extent they are successful and better describe to what extent strong pragmatic skill development contributes to subsequent long-term successes of children who are DHH. Given evidence suggesting that poor pragmatic skills influence a number of negative outcomes and that pragmatic skill development begins early and is influenced by relational factors that are amenable to intervention, such as those described here, targeting clinical efforts and research to better understand effective intervention has the potential to positively impact DHH children's developmental trajectories and improve their lives.

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ABBREVIATIONS

ASD	autism spectrum disorder
DHH	deaf and hard of hearing
HAT	hearing-assistive technology
ToM	theory of mind

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TABLE 1

Relational Factors Glossary

Concept	Definition	Examples	Role as a Relational Factor
Infant-caregiver synchronicity[34]	The extent to which the caregiver-infant dyad is aligned and show matching behavior, affective states (feelings), and/or biological rhythms	Caregiver slows own breathing, which helps infant's breathing to also slow; in response to infant's feeding cues, caregiver adjusts the pacing of feeding	Facilitates bonding and lays the foundation for infant self-regulation
Caregiver responsiveness (similar to caregiver or maternal sensitivity; both terms frequently seen in the literature)[44]	Caregivers' prompt and contingent replies to infants' communicative attempts and their actions; prompt suggests that a caregiver's actions follow shortly after infant's actions; contingent means that a caregiver's responses are dependent on infant's actions	Infant babbles, and caregiver quickly comments on the infant's communicative attempt ("What is it that you see? Oh wow!") while pointing to objects in the environment that may be the target of infant's attention; caregiver is attuned to infant's different cries of distress and readily adjusts the circumstances to address the infant's needs	Promotes infant word learning and early language development; supports pragmatic understanding
Attachment[49]	The affectionate bond between an infant and an adult caregiver; in secure attachment, an infant seeks caregiver in times of need, yet is able to separate from the caregiver to explore the environment; the caregiver serves as a "safe base" for the infant	Toddler feels comfortable to explore a new environment away from the caregiver (perhaps while keeping the caregiver in sight) yet returns for comfort when needed	Fosters emotional development and lays the foundation for social development and infant selfregulation
ToM[56]	Recognition that others' internal experiences differ from one's own; includes understanding that others' perspectives are influenced by their experiences	Infant hides an object under a blanket for a caregiver to find, believing that the caregiver did not see the act of hiding and will be surprised; toddler sees that another toddler dropped a snack, recognizes the other child may be sad or upset (although child has own snack and does not feel sad or upset)	Facilitates understanding of others' perspectives, desires, and intentions; necessary for social interactions and social communication
Interactive play[59]	Early play between caregivers and infants that incorporates repetition and allows the reciprocal influence on the other's actions; infants are not passively playing with a toy but rather are engaging in activities in which some degree of cause and effect is demonstrated	An infant drops a cookie to the floor and anticipates their caregiver will pick it up; a toddler rolls a ball back and forth with their caregiver; the child rolls the ball faster, and then caregiver does as well	Fosters understanding that infant's own behaviors can have an influence on caregiver's behaviors; foster infants' ability to take situational factors into account in social exchanges
Serve and return[62]	The process by which infant's babbles, gestures, or cries are met by corresponding caregiver reactions to the situation, such as eye contact, words and/or signs, hugs, or comforting touch	Infant and caregiver turn-taking in a communicative exchange, even when the infant or toddler uses only gestures, facial expressions, or perhaps word approximations to engage in the conversation	Contributes to the neural connections in the infant's brain, fostering infant communication and social skill development
Mind-mindedness[66]	Caregiver's treatment of infants as if they have a mind of their own, as evinced by attributing meaning to infants early nonword utterances, labeling infants' internal emotions, or describing what the caregiver believes to be going on in the thoughts of the toddler; caregivers sharing their own thoughts, feeling, and perceptions with their infants and toddlers	Caregiver hears the infant babble, "bababa" and says, "That is right, it is a ball!" The infant, seeing how pleased the caregiver is with the response, continues to babble, "bababa." Toddler pouts, and caregiver makes educated guesses about what the toddler might be experiencing internally, such as, "You seem to be mad that your brother took your toy" or "It looks like maybe your feelings are hurt that your sister does not want to play?"	Fosters perspective-taking and development of ToM
Mental state language[69]	Sharing about one's mental states (eg, thoughts, beliefs, perspectives, and knowledge)	Caregiver shares their internal feelings with infant: "I hoped it would be sunny today, but it is raining. I am feeling a little sad about that." Caregiver asked toddler what the character in a book is probably thinking (encouraging the toddler to recognize that how the character feels can be different from how the toddler feels)	Facilitates children's later perspectivetaking ToM development[66,67]

Concept	Definition	Examples	Role as a Relational Factor
Joint attention[54]	The process of an infant and a caregiver attending to the same salient aspects in their environment; infants will often look to an object and then back at the caregiver, anticipating further information	Infant gains caregiver's attention and gets the caregiver to look at an object (perhaps by vocalizing, pointing, or pushing on the object), and then the infant looks to the caregiver for more information about that object; caregiver wishes to teach the infant a new concept, so the caregiver gains the infant's visual attention to the object and then provides some information about the object using signs and/or words, gestures, or other means	Fosters child's language development and understanding of others as intentional agents; increases child's understanding of their social world

TABLE 2

Mapping of Developmental Milestones and Relational Factors Promoting Pragmatic Development in DHH Children

Well-Child Visit	Screen	Developmental Skills and Relation to Pragmatics	Relational Factors	DHH Considerations	Interventions and Strategies	
					Medical Care Provider (Monitor, Screen, Refer)	Allied Health Professional (Monitor, Guide, Support)
Newborn and early infancy	Maternal depression[93] ACES Infant-caregiver synchronicity Communication access	Infant preference for and/or recognition of caregiver faces and voices	Attachment Caregiver responsiveness	Caregiver adjustment to child's hearing loss may influence ability to respond to child's cues and/or attachment[49] Presence of postpartum depression can impact caregiver attentiveness and responsiveness to child's cues for hunger, distress, and/or excitement, thereby impacting attachment[93] Caregivers of DHH children may be at greater risk for emotional challenges[94]	Mental health supports Infant mental health resources Parent-to-parent support Access to DHH role models	Be aware of symptoms of postpartum depression and indicators of attachment and caregiver responsiveness; refer for mental health supports
		Infant social smile facilitates infant-caregiver bond, establishes attention to affective states, facilitates selfregulation, and enables early turn-taking (ie, infant smiles in response to caregiver and vice versa)	Infant-caregiver synchronicity	DHH infants may provide fewer vocal cues and rely more on visual cues DHH infants have reduced auditory access to their environment, requiring intentional positioning for visual access to caregivers DHH infants rely more on visual and tactile cues and unobstructed access to caregiver facial expressions to promote soothing and self-regulation	DHH-informed early intervention (ie, EHDI supports), access to DHH role models	Caregiver supports: Emphasize attentiveness to child's nonverbal behaviors and to follow child's eye gaze,[38] Teach environmental modifications and face-to-face positioning that promote visual shared attention,[41] Encourage caregivers to use frequent touch and tactile stimulation with DHH child,[95,96] Consider video feedback to foster caregiver responsiveness and sensitivity.[97]
		Infant social reach serves as an early communication skill in addition to fostering opportunities for learning	Communication access Joint attention Visual attention	DHH children rely more on visual and motor cues to support early social communication DHH children may be unable to access language in environment exclusively through listening (even when using hearing-assistive devices)	DHH-informed early intervention (ie, EHDI supports) Sign language instruction Audiological management	Caregiver supports: Attend to and coach ability to establish child's visual engagement,[35,38] Establish caregiver skills for attending to infant's communication, including their motor movements (eg, reaching, moving in response to caregiver's actions), facial expressions, affect, and vocal responses,[35,42] Foster understanding of the need for multiple forms of communication Ensure child has access to communication and coach how to modify the environment to promote access (eg, positioning infant for face-to-face contact, reducing competing background noise, etc).

Well-Child Visit	Screen	Developmental Skills and Relation to Pragmatics	Relational Factors	DHH Considerations	Interventions and Strategies	
					Medical Care Provider (Monitor, Screen, Refer)	Allied Health Professional (Monitor, Guide, Support)
6–12 mo	ACES Language and developmental screen at 9 mo Infant-caregiver synchronicity Prosocial behaviors	Early prosocial skills (eg, eye contact, visual referencing, social smile) Demonstrates pleasure and displeasure through vocalizations and body movements	Attachment	DHH infants form healthy attachments with caregivers who use visual and tactile strategies for calming in addition to vocal cues DHH infants use both verbal and nonverbal cues to communicate pleasure and displeasure	DHH-informed early intervention	Guide caregivers to attend to infant's cues, including drawing their attention to infant's nonverbal cues (eg, body language, affect, motor movements to continue an activity) Position DHH child for visual access to other's affect (eg, facial expressions)
	Communication access	Awareness of other's emotions emerges, which is an early precursor to understanding of other's emotions and perspectives	Caregiver sensitivity and responsiveness Mind-mindness	DHH child may not have access to auditory cues of other's emotions (eg, hearing another child cry)	DHH-informed early intervention	Encourage caregivers to use high affect to draw infant's attention and to supplement child's ability to respond to auditory cues of pragmatic understanding (eg, tone of voice when saying no) that may not be accessible
		Early imitation skills develop, which serve as foundation for conversational and/or social turn-taking (imitation of facial expressions, motor movements, and vocal sounds) Early turn-taking skills promote social reciprocity	Caregiver sensitivity and responsiveness Communication access Interactive play Serve and return	DHH child may require tactile and/or visual cues, in addition to vocal cues to access communication (ie, when vocal cues are not reliably accessed through hearing), to facilitate imitation and early turn-taking skills	DHH-informed early intervention (ie, EHDI supports)	Caregiver supports: Aid in establishing early turn-taking routines in response to infant's cues Coach to attend to child's visual reference, encourage early turn-taking visual and tactile games (eg, peek-a-boo, tickling finger play).
		Early joint attention skills promote language development by attending to same objects and establish pragmatic language skill of shared topic identification and maintenance	Caregiver sensitivity and responsiveness Communication access Joint attention Visual attention	DHH child must visually shift attention between objects and caregivers (rather than attending to object while listening to caregiver)	DHH-informed early intervention, access to DHH role models	Teach strategies for maintaining joint attention while engaged with objects, including environmental modifications (positioning of caregiver and child)[35,37,38,41]
12–18 mo	ACES Language and developmental screen MCHAT-R Social-emotional development Communication access	Early play skills emerge: beginning pretend play with objects, nurturing in role play with dolls and/or stuffed animals, parallel play; parallel play skills emerge (15–18 mo) Early play skills set stage for early pragmatic skills such as: predicting caregiver actions; recognizing behavior has impact on others; social reciprocity; and early ToM	ToM Communication access Interactive play	DHH infants and toddlers may engage in less representational and pretend play; however, this improves when caregivers expand play by modeling pretend play ideas, engaging in turn-taking with their child during play, and modeling understanding of others' thoughts and beliefs through play[64,65]	DHH-informed early intervention Sign language instruction Access to DHH role models	Coach parents to model representational play and work to expand DHH child's play; specifically emphasize turn-taking and modeling understanding of others' thoughts and beliefs through play[66] Discuss with families the importance of play, particularly for children who are DHH
		Expanded early social communication and prosocial skills: preference for being around others; enjoys turn-taking games (eg, peek-a-boo); responds to	ToM Mental state language Communication access	DHH children may be exposed to less language that includes understanding of other's internal mental states, feelings, and perceptions; this, in turn, may	DHH-informed early intervention Access to DHH role models and mentors Sign language	Caregiver supports: Draw attention to children's mental states by mirroring their affect in a responsive way and labeling the feeling they are expressing;

Well-Child Visit	Screen	Developmental Skills and Relation to Pragmatics	Relational Factors	DHH Considerations	Interventions and Strategies	
					Medical Care Provider (Monitor, Screen, Refer)	Allied Health Professional (Monitor, Guide, Support)
		others' emotions, may offer comfort; joint attention on objects; and turn-taking skills expand (3 turns to 30 turns by end of this stage)		result in reduced perspective-taking[58,67]	instruction Audiology: consider technology that promotes access to social situations in difficult listening environments	Model and encourage caregiver use of simple language that models understanding of child's desires, feelings, and beliefs to promote ToM development; verbs such as "want" and "try" to reflect understanding of other's perspectives ("Do you want my purse?").
18 mo to 3 yr	Language and developmental screen Social-emotional screen MCHAT-R Communication access	ToM and social-emotional development: demonstrates awareness of caregiver wishes and expectations; responds to other's feelings; attempts to control feelings; recognizes own behavior can make others mad or sad; begins to label own emotions and, toward end of this stage, other's emotions; begins to try to control own emotions for self-regulation	ToM Caregiver responsiveness and/or sensitivity Communication access Mind-mindedness Mental state language	DHH children may have delayed ToM, which is influenced by reduced overall language and reduced exposure to mental state terms	DHH-informed early intervention DHH role models and mentors Sign language instruction DHH-informed literacy strategies promote broader access to social language and social understanding Audiologic management	Caregiver supports: Encourage to be responsive to their child's demonstrated emotions and to label their child's desires, feelings, and beliefs ("You look mad!" "You really want that toy."); Instruct how to include talk about other people's mental states ("Your sister is mad. She wants her toy back.") at child's language level; Recommend using language that explains how one action precedes and influences another (eg, "First you took your sister's ball, then she cried.")[69] Model reading strategies for DHH children that foster DHH child's language abilities and comprehension of social worlds;[71]
		Play skills expand: represents self and others in dramatic play; represents experiences and/or feelings through play; begins to take turns in play; begins to imitate peer play and ultimately develops skill to develop shared play themes with peer, first with own toys then shared toys; shares toys These skills set the stage for social reciprocity and perspective-taking necessary for strong pragmatics	Communication access Interactive play	DHH children may have delayed language and reduced access to peers who understand their communication and/or communicate using the same language modality	DHH-informed early intervention Access to DHH peers through parent support networks (eg, Hands and Voices), DHH adult role models, and preschool[51,98] Sign language instruction for families and others in child's environment Audiology	Build communities for DHH children that include opportunities to play with other DHH peers[98] Assist parents to provide children with play scripts and useful language to support play with peers

ACES, adverse childhood experiences; EHDI, early hearing detection and intervention; MCHAT-R, Modified Checklist for Autism in Toddlers-Revised