5 Infants' Contributions to Prelinguistic Conversations Drive Language Learning

Claire D. Vallotton and Rachel Albert

Communication Begins with Conversation

Conversations are communication exchanges between two or more people. They are a means to connect with another human, share ideas, and gain information about others and the world. A conversation is by definition a multidirectional exchange in which participants are sharing and receiving. They are an opening in a system, or a joining of multiple systems of organization (in this case, the individual human). Although it will be, on average, 12 months before a new human utters their first word in a conversation, and another 12 months in which they learn to wait for another speaker and respond in timely turn-taking exchanges of language and gesture (Kuchirko et al., 2018), babies enter the world ready to converse with their caregivers in back-and-forth exchanges of connection (Stern, 2018) and expansion of affective experiences that have their own rhythmic cadence (Trevarthen, 1999). This chapter focuses on the ways in which infants' own cues contribute to their conversations with caregivers' and elicit the responses that will advance their own development. We introduce the concept of *developmental sensitivity* as an explanation of the ways that caregivers adapt to these rapid changes in infants' cues to provide the types of feedback that infants need. This body of research is focused largely on infants and caregivers who can see and hear, which we acknowledge as a limitation, though there are many ways to communicate and converse responsively to support development. Although the literature is dominated by research on infant–mother interactions, many studies include both mothers and fathers. Further, there are notable studies focused on father–infant interactions showing that, like mothers, fathers' sensitive responses to infants are important for their language development, and other studies showing that key differences between father–child and mother–child interactions may provide unique ways to support language development. In addition, infants' interactions with non-parental caregivers, such as early child educators, also vary from those of parent–child interactions in important ways that are addressed later in this chapter when we discuss variation in caregiving contexts.

Far from passive recipients of adult speech, infants enter early conversations with a rapidly growing set of tools they use to respond to others, draw others attention, and enter into back-and-forth exchanges, or dialogs, with others. Infants'

C. D. Vallotton (✉)
Department of Human Development and Family Studies, Michigan State University, East Lansing, MI, USA
e-mail: vallotto@msu.edu

R. Albert
Department of Psychology, Lebanon Valley College, Annville, PA, USA
e-mail: ralbert@lvc.edu

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cries and coos signal their physical needs and desire to interact, their facial expressions, wiggles, and muscle tension give away internal states, and their gaze and eye contact indicate their attention and interests. Over the first year, facial expressions expand and vary to express more distinct internal states. Body language is harnessed as an intentional expression of desires, needs, and interests, and gestures emerge to communicate these intentionally (Crais et al., 2004). Gaze becomes a tool to gain, share, and direct others' attention (Tomasello, 2008). And vocalizations become increasingly varied and intentional as they move toward speech through stages of reflexive phonation (guttural noises), cooing, expansion (open vowel sounds), babbling, then words.

As caregivers (usually adults) respond to these behaviors, they invite infants into multimodal back-and-forth exchanges of experience, the start of conversations, and a driver of communication. Turn-taking, the essential characteristic that makes an interaction into a conversation, emerges early in infant-caregiver exchanges. Through affective exchanges of cycling emotional expression (through faces, bodies, eye contact, and sometimes vocalizations), infants come to experience intersubjectivity with caregivers through shared affective states (Hollich et al., 2000). These attuned interactions quickly build the infant's interpersonal interaction skills, including eye contact, gaze following, and imitation (Feldman, 2007). Experiences of intersubjectivity lead infants to recognize caregivers as communication partners, and motivate communication, not only to get their needs met, but also to share connected states of being, making conversation a goal in itself (Papousek, 2007). According to Hollich et al.' (2000) emergentist coalition model, the processes of word-learning progress from affective to social, then from cognitive to linguistic. And each phase requires different types of inputs from the child's primary communication partners, as well as different kinds of responses to the child's communication cues (Tamis LeMonda et al., 2001). But these are all built upon the foundations of conversation that connect children to their communication partners.

Developmental Sensitivity: The Shifting Nature of Contingent Responsiveness

Conceptually, contingent responsiveness to infant behaviors has been defined in many ways. Contingency embodies an immediacy or promptness of a response that the infant can detect (Bornstein & Manian, 2013). The immediacy component seems bounded by a two- to three-second window, which is short enough for the response to be detected and linked to the preceding behavior, but long enough to allow for a reply without interruption. Responses within this time window are salient to infants and support their learning (Van Egeren et al., 2001). Yet, caregivers are imperfect responders. Across a variety of infant ages and sociocultural contexts, caregivers tend to respond to approximately 63% of infant behaviors with a broad distribution of individual differences. This variability suggests a wide 'sweet spot' for supportive interactions. Further, both under-contingency and over-contingency have adverse outcomes. Infants react negatively when caregivers are disengaged and provide too little interaction, yet too much responsiveness is seen by observers as intrusive, and infants also find it aversive. Extremes in response rates in the first year predict insecure and disorganized attachments.

For many decades, and with good reason, the science of child development has forefronted the undeniable importance of parental responsiveness (prompt, sensitive, or attuned replies) in promoting early development, from foundational work on associations between attachment security and maternal responses to infants' cries to more recent work on language-learning (e.g., Tamis LeMonda et al., 2001), and has identified specific developmental effects of different types of responsiveness (e.g., Bornstein et al., 2008; Vallotton et al., 2017b). The field has shown repeatedly that when it comes to caregiver responses, by and large, more is better; at least if your analyses are within the broad window of optimal responsiveness, and if responsiveness is measured using the common blunt variables such as rate of responses per minute or ratio of infant

cues to caregiver responses. So how can there be such a thing as *over*-contingency? Because beyond just the response rate and timing, different infant cues call for different types of responses, and often even nonresponsiveness (i.e., silence, or lack of a detectable response to the infant). That is, there is a type of developmental sensitivity that caregivers may exhibit that, in the moment, may look *un*responsive (or less responsive), but is in fact, just the kind of response the infant needs.

Socially contingent interactions are both prompt and meaningful (Masek et al., 2021). Meaningful responses align with the infant's current state of attention and build in sophistication as infants develop. Researchers often conceptualize these behaviors as sensitive using macro-analytic scales or micro-analytic coding to examine the impacts of particular responses on infant learning. But even at the microanalytic level, measures often combine and oversimplify both the suite of infant cues and the many types of caregiver responses. A sensitive caregiver may rock and *shhhh* a crying infant rather than vocalizing a soothing response. They may distract a frustrated child by showing a shiny toy to divert their attention away from their frustration, rather than naming and discussing the child's emotions, which can perpetuate frustration. They may watch thoughtfully as an infant explores a new object with their hands and mouth. And they may listen silently as an older infant hums or makes open vocal sounds, waiting until the child makes a clearer word-like sound, or combines their vocalizations with a directed gaze, or a reach or point, before responding to the more developmentally advanced cue (Albert et al., 2018).

In this chapter, we bridge learnings from the literature using both the micro- and macro-approaches to consider the importance of moment-to-moment contingent responding nested within a system of *developmental sensitivity* (Fig. 5.1). We define developmental sensitivity as *responding that is prompt, aligned, and informed by an interaction history with infants' shifting cues and needs over developmental time*. Developmentally sensitive caregivers do not respond to all cues all the time (Bornstein & Manian, 2013), nor all cues the same way (Bornstein et al., 2008; Gros-Louis et al., 2006). Instead, developmentally sensitive caregivers respond in different ways to multiple infant cues in the current moment (Vallotton et al., 2017a) in the context of their interaction history (Vallotton et al., 2017b). They consider shifts in infants' cues that indicate their developmental phase and readiness for new types of input. While messy and imperfect, these developmentally contingent responses advance infants' development across domains.

Developmental Sensitivity in Cultural Context

In addition to the immediate context and developmental history, each caregiver is operating within their own cultural context of caregiving, which influences many aspects of infant–caregiver conversations, from macro-meanings to micro-behaviors. Culture shapes caregiving goals and priorities, such as the degree to which caregivers wish to promote children's autonomy, relatedness, and interdependence with others the degree to which they prioritize children's language development (e.g., Johnston & Anita Wong, 2002) and prompt children to speak up for their own needs versus anticipating and meeting needs in advance of infants' cues (Rothbaum et al., 2006). Thus, culture shapes the very nature of sensitivity and responsiveness within interactions in ways that shape language. It influences the relative amount of time caregivers will spend in proximal and distal interactions, such as those depicted in Fig. 5.1. It influences how caregivers' interpret children's cues how quickly they respond (Rothbaum et al., 2006), and the degree to which they direct infants' attention versus respond to infants' interests. Cultural context also influences the functions and content of caregivers' communication, including the relative frequencies of caregivers' speech to regulate infant behavior, refer to objects, or prompt infants to vocalize, the degree to which regulatory speech is framed positively or negatively, and the relative frequency with which caregivers talk or gesture in reference to infants' actions versus the objects

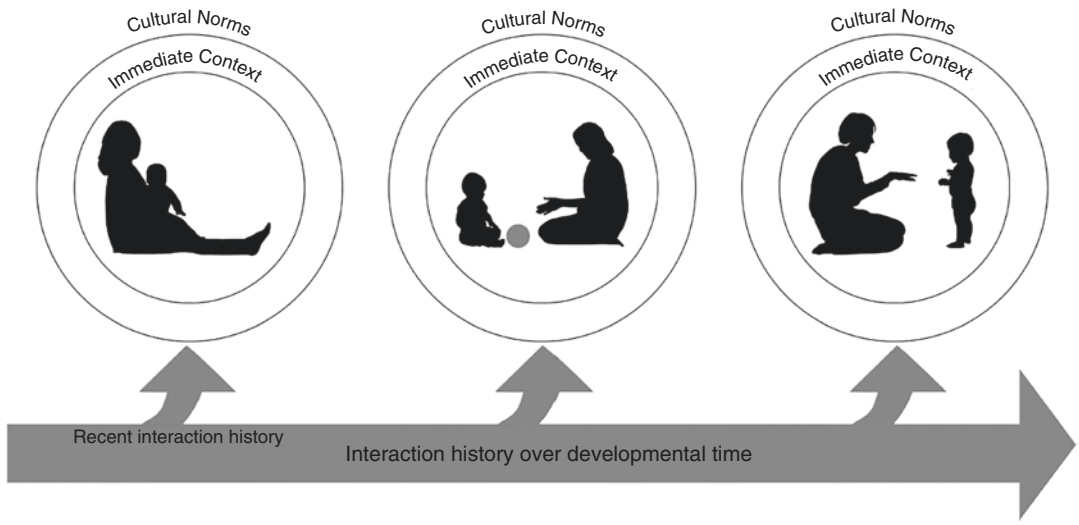

Fig. 5.1 Developmental sensitivity in context. Conversations are shaped by the immediate context of the interaction (inner circle) and cultural context of caregiving (broader circle). In dyad A, the caregiver holds the infant on their lap, modeling a proximal caregiving style in which the infant is kept close, communicating through touch and vocalization, but sharing less eye contact. Dyad B illustrates a distal interaction pattern in which caregiver and infant face one another and share attention on and communication about objects, facilitating development of joint attention as object exploration. In dyad C, the referential landscape has expanded further as the infant becomes increasingly mobile and both caregiver and infant can reference absent objects. The small arrows remind us that caregivers are responding to the immediately preceding interaction history on a smaller timescale (moments, minutes, or hours) that informs proceeding conversational turns. For example, the conversation in dyad B is built upon previous exchanges with the ball; and in figure C, both caregiver and infant could refer to a toy out of sight, if they both understand the referential common ground they share in their immediately preceding interaction history. As the child's memory and symbolic skills rapidly expand, the immediate interaction history to which they can refer will grow to hours and days. The larger arrow represents the inherited interaction history built up over developmental time (days and months). (Image created by Briley Cox)

on which they are acting (e.g., Wang & Vallotton, 2016). All of this cultural variation is then related to a host of infants' later communication and language skills (Wang & Vallotton, 2016) showing that these communicative interactions serve to transmit culture from one generation to the next.

Thus, developmentally sensitive prelinguistic conversations are subtly but rapidly shifting multimodal exchanges between the fastest learners in our species and the caregivers who are somehow instinctively keeping up with them and responding in ways that take into account the dyadic context in the moment, their culturally shaped priorities and goals, and their history of interactions indicating the child's growing communication skills in order to engage in iterative exchanges that meet the child's immediate needs and advance their development toward more mature communication. Caregivers are intuitive geniuses!

What Are Infants' Contributions to the Conversation?

Although scientists of infant communication and language learning tend to focus on just one or a small set of cue modalities, infants bring their whole bodies to the endeavor of expressing their states and needs and connecting with their caregivers, and their cues are inevitably multimodal (Bates et al., 1975). Although these modes are not yet fully coordinated and under the child's control, infants communicate their cognitive, physical, and affective states through facial expressions and muscle tone, body movements and vocalizations, which are typically all following the direction of their gaze. When they first begin to reach for an object of interest, they reach with all four limbs (and sometimes also their heads), looking toward, grunting, and straining

their whole body toward the object or person of their desire. As these different types of cues become more distinct (e.g., facial expressions become more clearly linked to different states; gestures become more refined as fine motor actions), infants' cues come under more of their control, and then become coordinated to elicit caregivers' feedback more intentionally. This coordinated multimodality is a signal that infants' behaviors are intended as communication cues (Bates et al., 1975). By 12 months infants not only increase the clarity of communication cues by using concurrent gestures and vocalizations, but also use them in a socially coordinated way. By 12 months, infants begin to intentionally combine gestures (i.e., pointing) and vocalizations to direct adults' attention to shared interests, specifically when they understand from eye gaze that the adult communication partner's attention is available (Igualada et al., 2015). Infants specifically use vocalizations to get adults' attention, or correct their attention, when adults are not already attending (via eye gaze) where infants want to direct their attention. Further, infants' abilities to use these social cues (i.e., eye gaze) to modify their own use of multimodal cues at 12 months is related to their later language development at 18 months (Igualada et al., 2015). Thus, infants' own attention and learning are guided by multimodality of stimuli and by the end of their first year, they, too, can use multimodal cues as intentional communicative acts to direct others attention and elicit feedback (in the form of adult communication) that supports their language learning.

Table 5.1 provides a general developmental timeline for infants' communication signals, the communication that these signals elicit from caregivers, the functions that caregiver feedback serves to support development, and the infants' social-emotional, cognitive, and language development processes that are supported by these communicative exchanges with developmentally responsive caregivers. That is, how infants' cues elicit and become part of conversational feedback loops that lead to language learning and a lot more. In the following sections, we first consider the infant communication signals that are noticeable to caregivers, focusing specifically on vocalizations and gestures, and what each elicits from caregivers. We then dive deeper to explore the developmental processes that these developmentally sensitive conversations facilitate in three domains: emotional (e.g., connection and regulation), cognitive (e.g., memory and attention), and language development (e.g., vocabulary and syntax).

Vocalizations

Vocal Development from Birth to First Words Infants actively contribute to communicative interactions from birth by producing prelinguistic vocalizations. Regardless of their ambient language, infants' prelinguistic vocalizations undergo dramatic experience-driven developmental change over the first year. The progression of infant prelinguistic vocalizations from immature grunts toward first words is best described by Oller's (2000) infraphonological coding system, which captures both perceptual and acoustic features of speech, such as vowel resonance and timing of consonant–vowel transitions. Infraphonology refers to a well-formed syllable's infrastructure and consists of four prelinguistic speech categories. In the first 2 months of life, infants are in the phonation stage, producing *quasi-resonant* vowels. Quasi-resonant vowels are vocalizations produced with a closed vocal tract (e.g., nasal vocalizations and grunts). Between 1 and 4 months of age, infants enter the primitive articulation stage and begin producing *fully resonant* vowels. Fully resonant vowels are vocalizations produced with an open vocal tract (e.g., [a], [o] and other coos). These early non-cry vocalizations, while independent from emotional state or context, allow infants to explore their vocal capabilities and experiment with the impact of their vocalizations on the social environment. Infants start producing marginal syllables during the expansion stage, which begins between 3 and 8 months. Marginal syllables consist of slow sequences of consonant–vowel articulation with long transitions between consonants and vowels. Finally, infants enter the

Table 5.1 Infants' contributions to conversations and their own development: Developmental phases of infant communication signals, caregiver communication behaviors and functions, and the developmental processes facilitated by infant–caregiver conversations

Age	Infant Communication Signals	Caregiver Communication Behaviors	Caregiver Communication Functions	Emotional Development Processes	Cognitive Development Processes	Language Development Processes
0–3 months	Cries; Facial expressions; Body language/wiggles	Infant-directed musical vocalizations; Facial expressions imitate and exaggerate infants' expressions	Meeting needs; Expanding and regulating emotions; Speech sound exposure with hyperarticulation	Comfort; Sense of safety	Response to stimuli (orientation of attention); Exploration	Statistical speech sound learning (phonemic discrimination)
3–6 months	Coos (vowels); Eye contact; Smiling	Infant-directed speech; Exaggerated facial expressions	Drawing attention to interaction and communication	Security; Emotion discrimination	Intentional actions; Exploration; Gaze following	Statistical learning (transitional probabilities)
6–9 months	Canonical babbling; Directed gaze; Joint attention	Infant-directed speech; Vocal "play"	Scaffold participation in social routines	Connection; Emotional regulation	Attention organization/ control; Imitation; Experimentation	Catalog of familiar speech sounds; Intentional turn-taking; Statistical learning (grammatical parsing)
9–12 months	Reduplicated and variegated babbling; First gestures (reach, show, wave, point); Triadic interactions; Gesture + vocal combinations	Infant-directed speech; Modeling and scaffolding social routines (speech, gesture); Simplified speech; Triadic joint attention	Organizing attention for word-mapping	Social referencing	Object permanence	Receptive vocabulary building; Fast mapping
12–18 months	First words; Pointing; Social gestures; Symbolic gestures; Socially coordinated gesture + vocal combinations; Gesture + speech combinations	Recast of child's speech; Elaboration in response to child speech and gestures	Word-mapping	Internal working models; Shared reference (to absent referent); Triadic interactions	Attention beyond here and now (absent referent); Deferred imitation	Receptive vocabulary building; Intentional communication "about"
18 months	Multi-word utterances		Conceptual development; Support for "grammar spurt"	Prosocial behaviors	Moving toward representation and abstraction	Expressive vocabulary building

canonical stage between 5 and 10 months of age and begin producing well-formed syllables. These *canonical syllables* are fully resonant vowels combined with faster consonant–vowel transitions (e.g., [ba], [da]). Infants exposed to consonant–vowel dominant languages produce disyllables that follow a [CV] pattern, while infants hearing languages with higher frequencies of [VCV] words produce more [VCV] disyllables. Caregivers perceive and classify the combination of multiple canonical syllables (e.g., [baba], [badadaba]) as babbling. As infants approach their first birthday, they begin to combine syllables to produce words, although infants still regularly produce all four prelinguistic speech categories well past their first birthday as their prelinguistic vocalizations gradually shift into words.

What drives this progression of vocal development toward more advanced types of speech is a combination of physiological and social factors. Some maturation of the vocal organs is necessary for infants to produce consonant–vowel syllables. However, social interactions through conversations with caregivers are necessary for and accelerate the progression of speech development. For example, deaf infants show a delayed onset of canonical babbling compared to hearing infants. Around 3 months of age, repetitive and rhythmic patterns of interactions emerge through coordinated gaze, touch, and vocal communication (Feldman, 2007), and have been described as having a musical quality (Trevarthen, 1999). This early synchronicity is most evident in vocal turn-taking, in which caregivers initially organize vocal interactions by coordinating their responses to alternate with infants' vocalizations. Between 3 and 5 months, infants test their voices and determine that their vocalizations, not just their cries, receive reactions from caregivers. This development goes hand in hand with the emergence of social smiling as infants learn that they can influence those around them in many ways. By 5 months, infants will actively work to re-engage with a caregiver who has stopped interacting with them by babbling more frequently (Goldstein et al., 2009). They learn the value of their vocalizations for interacting with the world and can instrumentally use their vocalizations to generate further social interactions.

In the second half of the first year, infants become more sensitive to the timing of caregiver feedback and will modify the qualities of their vocalizations in response to contingent input. Specifically, infants begin producing more vocalizations that contain common vowels (V), consonants (C), and disyllable patterns (e.g., CVCV) that match their ambient language. For example, infants rapidly produce more consonant–vowel syllables when caregivers respond to infant vocalizations by speaking consonant–vowel (CV) syllables (Goldstein & Schwade, 2008). However, infants non-contingently exposed to the same input do not modify their vocal production. Around their first birthday, infants begin arranging their vocalizations into recognizable words culminating months of prelinguistic conversations with caregivers.

Impact of Infant Vocalizations on Caregivers The social shaping of infant vocalizations from babbles to first words is possible because infants' prelinguistic vocalizations are highly salient to caregivers, capturing caregiver attention and prompting multimodal responses. Hearing caregivers are sensitive to and influenced by several cues in infants' vocalizations when deciding whether they will engage and how to respond. Mothers can differentiate and categorize vocalizations using the infraphonological properties and use those properties when asked to rate the vocal maturity of infants' vocalizations (Albert et al., 2018). Canonical syllables are perceived as the most speech-like, while caregivers rate quasi-resonant vowels as the least speech-like. Caregivers then implicitly use their perception of vocal maturity when determining whether or not to respond promptly to infant vocalizations. For example, by the time infants are 9 months old, vocalizations that are perceived as least speech-like (e.g., quasi-resonant vowels) are most likely to be ignored (Albert et al., 2018), while canonical syllables are more likely to receive a response. The vocal qualities of the babble also impact the type of information moth-

ers provide. The most common responses to vocalizations include describing and asking questions about what the infant is doing and acknowledging the vocalization with a conversational placeholder (e.g., "uh-huh"). But, canonical syllables are more likely to be imitated than other vocal types, where marginal syllables are more likely to elicit narrative responses (e.g., "You're so big" or "You're playing"). These differentiated response rates and types may create a developmental cascade and change infants' opportunities for learning as infants who produce more advanced syllables elicit more frequent responses and then become more likely to produce additional syllables in response.

Vocalizations are inherently multimodal, so beyond the vocal qualities, each vocalization is accompanied by infant gaze among seeing infants; although blind infants also orient their face toward objects and caregivers when vocalizing, and as first observed by Fraiberg (1975), selectively orient toward the voices of their preferred caregivers. Infants use eye gaze to aim their vocalizations in one of three ways: caregiver-directed, object-directed, and undirected. Caregiver-directed vocalizations are those produced while the infant looks at the mother's face. Caregivers are highly responsive to caregiver-directed vocalizations and their responses to these vocalizations in the first year are predictive of infants' rate of [CV] production from 8 to 14 months. Further, responsiveness to caregiver-directed vocalizations positively predicts vocabulary scores at 15 months where responses to undirected vocalizations were negatively correlated with vocabulary. As infants age, the frequency of caregiver-directed vocalizations decreases, and infants produce more vocalizations at objects.

Object-directed vocalizations are produced while the infant looks at an object held or within reach. In contrast, undirected vocalizations are produced at neither an object nor a caregiver, such as when infants vocalize toward an empty space. Regardless of vocal quality, vocalizations directed at objects are more likely to receive a response than undirected vocalizations (Albert et al., 2018), making object-directed vocalizations a highly salient cue to caregivers. Parental responsiveness to their 9-month-old infants' object-directed vocalizations predicts infants' language development at 15 months. This result may be because infants appear to be signaling a readiness, and even desire or demand, to learn when they vocalize at objects. At 11 months, infants learn word-object associations for objects labeled after a babble but not after a silent look. Object-directed vocalizations also elicit different types of information than undirected vocalizations. Caregivers respond to object-directed vocalizations with more sensitive and detailed information, such as descriptions (e.g., "That's a cup.") and questions (e.g., "Is that a ball?"). The vocalization provides a clear referent that can be labeled or discussed. In contrast, caregivers provide more narrative ("You're talking. You have so much to say today."), and affirmation responses (e.g., "Yeah,", "Uh-huh, I know.") to undirected vocalizations, perhaps to acknowledge the conversational attempt when infants are not attending to an object (Albert, 2021). Such differentiated responses demonstrate that infants direct their own learning by producing babbling in various ways and that caregivers are capable, not only of responding to infants' interests in the moment, but of tracking infants' developmental progress over time and sensitively aligning their responses to meet infants' current developmental needs. Infants with visual impairments adapt similar strategies to indicate directedness with touch and body orientation. These interactions cascade over multiple months, driving the infant's vocal production closer to first words, and then to the expansion of their vocabulary. For sighted infants, caregiver responsiveness to gaze-coordinated vocalizations predicts expressive vocabulary up until 24 months (Donnellan et al., 2020).

Caregivers also respond to variation in children's vocabulary. A study of fathers' child-directed speech to their 2-year-old children showed that fathers' lexical diversity (using a wider range of words, rather than repetitively using the same words) was predicted specifically by the children's language proficiency, including children's own receptive and expressive vocabu-

lary (Quigly & Nixon, 2020). Fathers' lexical diversity was not predicted by other social characteristics of the children, indicating that fathers were tuned in specifically to several aspects of their children's language development and adapting their own language in developmentally sensitive ways. This rich language stimulation from fathers specifically has been shown to support children's later expressive communication skills (Pancsofar & Vernon-Feagans, 2006).

Gestures

Gesture Development from Wiggles to Words In early communication, baby language is body language. As babies gain motor control, social awareness, and symbolic thinking, their use of their bodies to cue caregivers progresses from reactive, gross motor movements that indicate general states of arousal and comfort to more intentional and refined small motor movements that communicate specific interests, needs, emotions, and thoughts (Fusaro & Vallotton, 2011). Communicative gestures are motor movements, done with hands or head, that communicate meaning (Vallotton, 2016). Young children's gestures can be organized into three broad categories: conventional, deictic, and representational or symbolic gestures. Conventional gestures are culturally specific and used in culturally shared social routines, like waving hello or goodbye, blowing a kiss, clapping for excitement or praise, or putting fingers to lips indicate quiet. These conventional gestures emerge early, around 8 months (Kwon et al., 2018), and vary from culture to culture in how common they are and when they develop (Kwon et al., 2018). Deictic gestures that can communicate within the immediate context to direct another's attention to a shared referent, including an absent referent, and to regulate another's behavior by making a request; reaching to indicate an object emerges around 7.5 months on average, while pointing emerges around 10.5 months (Crais et al., 2004). However, there is some evidence that this varies culturally as well, with those in Taiwan, where adult child interactions are more proximal, reaching, showing, and pointing later than those in the United States and Germany, which engage in more distal-style caregiver–child interactions (Kwon et al., 2018). Representational gestures are those that can communicate the same referent idea even when decontextualized from the original context in which they developed or were first used (Crais et al., 2004; Vallotton, 2016). Children spontaneously produce these gestures often starting around 12 months of age as they begin to refer to referents beyond the here and now (Bates et al., 1975), though children whose caregivers use them frequently and consistently from an earlier age will begin to use them earlier (Vallotton, 2010b). In the first half of their second year, children increase their use of representational or symbolic gestures until they have the words to replace them (Konishi et al., 2018). Infants will use symbolic gestures earlier and more often if caregivers model them intentionally and use them consistently (Vallotton, 2012). Children will continue to use both deictic and conventional gestures into and through adulthood, as these are integrated fluidly to supplement or emphasize verbal communication, while most use of symbolic gestures will be replaced with words and only retained when necessary to supplement or emphasize language (Goldin-Meadow, 2005). Infants' rapidly growing motor control, from head to body (cephalocaudal), from midline outward (proximal-distal), and from large muscle groups to smaller ones enable or limit infants' abilities to use their hands for communication within the first year of life. But what drives infants' development of these various types of gestures are their growing intentionality to direct their own behavior (Crais et al., 2004), their developing awareness of and interest in connecting and conversing with social partners (Tomasello, 2008), and their expending cognitive skills as they gain object permanence and interest in thinking and communicating about things beyond the here and now (Acredolo & Goodwyn, 1988). As they develop intentionality, they direct communicative cues toward others in order to regulate behavior (protest or request), initiate an interaction or participate in a social routine, direct other's attention, and eventually answer another's

questions or requests (Crais et al., 2004; Fusaro & Vallotton, 2011). By 12 months, infants can use pointing to share their attention and interests with caregivers, and vary their multimodal vocal and gestural cues based on whether their communication partner is attending. As their interests in and intentions toward the world expand beyond the here and now, and their desire to connect with others lead them to share these interests, infants move from conventional and deictic gestures into symbolic ones, and they use these symbolic gestures for a variety of communicative functions consistent with their growing intentionality and self-direction (Vallotton, 2008a), including the use of gestures to hold multi-turn conversations with caregivers about particular things or events in which infants are interested (Vallotton, 2010a). Studies of gesture use in children who are born blind and those who are born deaf reveal the universality and usefulness of gestures as both mental tools (for the speaker) and modes of communication (for the listener). Even in older children and adults, gestures are tools both for thought and for communication (Goldin-Meadow, 2005), but for young children they are ways to connect and converse with caregivers before they have words, and to engage in the kinds of conversations that facilitate language learning (Acredolo et al., 2002)

Impact of Infant Gestures on Caregivers Infants' gestures are communication cues that sighted caregivers can see, interpret, and use to gain insight into infants' mood and arousal states first, and later their mental states, including attention, interest, thoughts, emotions, and even memories (Vallotton, 2011; Acredolo & Goodwyn study on episodic memory). Infants' gesture direct caregivers' attention to their own interests, and draw out responses that meet their needs (Vallotton, 2012) and facilitate their learning (Goldin-Meadow, 2007).

Caregivers' and children's gestures are part of communicative behavior sets that are mutually reinforcing. Infants' initially learn gestures from adults' modeling, which is often unintentional, and can be experimentally induced (Choi & Rowe, 2021; Vallotton, 2012). But once infants begin gesturing, adults respond with more gestures as well as words (LeBarton et al., 2015). There are correlations between infant and caregiver gesture use (Rowe et al., 2008); and experimental studies have shown that infant's gestures can be increased by increasing caregivers' gestures but also that caregivers' can be induced to gesture and talk more by teaching infants to gesture (LeBarton et al., 2015).

Adults become more sensitive and responsive when infants gesture, including both parents (Vallotton, 2012) and child care providers (Vallotton, 2009). Mothers, fathers, and childcare providers feel that they understand infants' needs and intentions better when infants use symbolic gestures (Vallotton, 2011), which may be particularly helpful for those that are not the infants' primary caregivers (Vallotton et al., 2014). In a study of 10 infants and their caregivers in a child care setting observed over 8 months, when infants' used gestures specifically to respond to caregivers' gestures, that is when the infants were acting as communication partners, caregivers' interaction behaviors were more sensitive overall (Vallotton, 2009). Further, in an experimental study, parents in an intervention condition in which they were taught to use symbolic gestures were more responsive to their children's distress cues than those in the control condition, even if their infants used few gestures; but those whose infants used many different gestures were far more responsive to children's distress cues (Vallotton, 2012). Thus, even the expectation that children will gesture may attune caregivers to watch infants' behaviors closely, enabling them to respond more promptly and sensitively; and infants' actual gesturing draws out these responses to be even more sensitively contingent.

Just as with speech, more caregiver gestures is not always better for supporting infants' gesture use. When caregivers overwhelm a child with too many gestures, infants use fewer gestures (Vallotton et al., 2017a). Importantly, when caregivers are engaging with infants in more sensitive ways, they use their interaction history with infants to shape their own use of gestures. In an observational study of 10 infants and their caregivers over time, caregiver sensitivity moderated

the caregivers' use of pointing and symbolic gestures, such that caregivers increased or decreased their own use of these different types of gestures based on the infants' use of gestures in their last several interactions (Vallotton et al., 2017a). Thus, infants' gestures can either increase or decrease adults' gesturing type and frequency in order to draw out the type of communication behavior that will support their development, but only when adults are being more *developmentally sensitive* within the interaction.

Beyond the general increase in responsiveness, caregivers' typically respond to children's gestures with language in specific ways that help children pair words with the referents of their gestures, and enhances language learning (LeBarton et al., 2015; Rowe et al., 2008). Caregivers "translate" their children's gestures into speech, which puts words to children's thoughts and actions (Goldin-Meadow et al., 2007). When children use gestures to emphasize their words (e.g., using a bouncing motion and saying "ball"), caregivers often provide simple labels to confirm what children communicate (e.g., "Yah, the ball."). But when children use two different gestures together (pointing to a bird then flapping arms like wings), or use gestures to complement their use of words (e.g., pointing to a toy and saying "mine"), caregivers elaborate on what children communicate (e.g., "You see the bird flying outside," or "Yes, that bear is yours."). Toddlers' gestural vocabulary (number of different concepts communicated by gestures) predicts their spoken vocabulary, and their gesture combinations (e.g., using gestures to form sentences) predicts their sentence length 2 years later (Rowe & Goldin-Meadow, 2009).

Impacts of Early Conversations on Developmental Processes by Domain

We have now demonstrated that caregivers vary the content of their responses in response to the vocal qualities and directedness of the infant's vocalization and forms of gestures, further establishing the reciprocal impacts of conversation. To illustrate the iterative nature and ultimate impacts of these social feedback loops, summarized in Table 5.1, we consider how caregivers' conversational responses facilitate infant learning beyond infant vocal and gestural advances to create emotional connection, organize infant attention, and scaffold language development.

Conversations Provide Emotional Connection and Regulation

Infants and caregivers engage in face-to-face affective conversations, in which they imitate each others' multimodal cues, including vocalizations, facial expressions, eye contact, and gesture. In many cultures, both male and female caregivers' speech to infants (infant-directed speech) differs from speech to adults in that it is slower, contains longer pauses, simplified sentence structure, and has higher and more exaggerated pitch contours (Kuhl, 2007). As reviewed by Hennessy and Zhao (2023), both mothers' and fathers' infant-directed speech, as well as song, conveys emotional content and provides emotional connection that can both arouse and soothe. When they are attuned, these affective conversations cycle through clear patterns of emotion in which the infants' arousal and both parents' and infants' positive affect are increased until they reach a point where the infant is nearing overarousal and negative emotion. When caregivers are attuned, they will notice the infants' arousal state and decrease their own production of communication cues to help the infant reduce their arousal and bring their emotional state closer to neutral. An attuned dyad will often reconnect emotionally after this brief break in stimulation, through eye contact, touch, and shared affect, and the cycle may start again. In these affectively dynamic cycles of dyadic joint attention, infants experience emotional connection and regulation with their caregiver (Stern, 2018).

At least one study has shown that while mothers use infant-directed speech in similar ways across developmental time, fathers change their rate of infant-directed speech in response to their infants' development in ways that were supportive of later language (Shapiro et al., 2021). Although mothers and fathers across cultures use infant-directed speech in similar ways (as reviewed by Ferjan Ramírez, 2022), male and

female caregivers tend to stimulate and regulate infants' arousal and affect differently. Mother–infant dyads mostly cycle between low and medium levels of positive affect with highly positive arousal states coming on more gradually; whereas father–infant dyads cycle more rapidly into and out of high positive arousal. The affective synchrony infants experience with caregivers within the first year of life has been linked to later symbolic development, including verbal IQ, symbolic play, and use of internal state words. That is, through these early multimodal conversations, infants experience emotional connection, learn to regulate their arousal and affective states, and eventually gain the symbolic competence to label those affective states using words.

When older infants and young toddlers can use gestures to communicate their needs, label their own emotions, or indicate why they feel what they do or what might make them feel better (Vallotton, 2008b), they can take an active role in the regulation of their emotion (Vallotton, 2008a). Caregivers' responses in these moments of emotional communication support young children's regulation attempts and help them to build regulation strategies (Konishi et al., 2018). Children's reasoning about emotions is a much later emerging skill, but it is built upon the earliest foundations of caregivers' responses to infants' first communicative exchanges through affective expressions, and subsequent developmental sensitivity to infants' rapidly shifting communication cues.

Conversations Organize Infant Attention

Developmentally sensitive speech in response to infant behaviors organizes (Masek et al., 2021) and enhances infant attention in real time (Schroer & Yu, 2022). Parental speech can organize attention to the right place at the right time to help infants orient faster and extend sustained attention bouts. When infants are engaged in sustained attention bouts (at least 3 seconds of focused attention), they manipulate objects, developing their hand-eye coordination while also learning about object properties. Parents label and discuss objects to extend bouts of joint attention that predict vocabulary size. Caregivers also synchronize their speech with movement during bouts of joint attention, creating intersensory redundancy. This motion-speech synchrony creates structure between speech and action, increasing the target object's saliency. Aligning all of these caregiver behaviors (talking, holding, moving, and gazing) extends infant attention beyond the effects of gaze alone. Further, adults' pointing and gaze combinations orient infants' attention to objects both within and outside of their initial visual range, expanding infants' attention beyond what is immediately visible. And adults' gesture + word combinations effectively direct infants' attention during word-learning opportunities resulting in greater vocabulary. However, the content of the speech that accompanies these periods of joint attention differentially impacts attention. Caregivers' relative proportion of attuned (i.e., aligned with the focus of infants' attention) versus redirective responses predict infant attentional patterns. Five-month-old infants of highly redirective parents shift their gaze more frequently than those of highly attuned parents. By 1 year, redirective responses from caregivers cause infants to shift their attention more frequently, sustain their attention for shorter bouts, and decrease their caregiver-directed vocalizations. Thus, one pathway to supporting infant language development through parental responsiveness is through modulations in infant multimodal attention (Schroer & Yu, 2022).

Conversations Promote Language Development

Caregivers' responses to infant vocalizations are organized in predictable ways, allowing infants to detect and evaluate patterns. Importantly, caregivers simplify their speech in response to infant vocalizations (Albert et al., 2023). Compared to their speech at other times, responses to vocalizations are shorter, more likely to contain just a single word, and use a reduced number of vocab-

ulary words. Consider a parent's non-contingent statement that contains 13 words, such as "Should we get the ball so we have something new to play with?" compared to their four-word response of "You have a ball" following an infant babbling at a ball.

The simplification of speech in response to the babble likely facilitates language development at the statistical, semantic, and syntactic levels. First, when caregivers simplify their speech, they highlight the distributional patterns of their language. Shorter utterances contain fewer phonemes and word boundaries, allowing infants to track the statistical properties of their language. In this case, an infant can learn that the phonemes [b], [ə], and [l] are more likely to occur together than [ə] and [b], helping them to conclude that "ball" must be a word. Second, at the semantic level, hearing nouns in these simplified sentence frames facilitates word recognition. Pairing the label with a visual cue, such as the infant's own gaze toward the ball, or an adults' point toward the ball, simplifies the learning space and facilitates word-object mapping. Finally, at the syntactic level, simplified examples of speech highlight the grammatical structures of language. Here, "You have a ball" illustrates the standard subject-verb-object ordering of English without extraneous words to complicate infant parsing. Simplifying responses to infant vocalizations reduces the complexity of the infant's environment and highlights the structural regularities in caregiver behavior, facilitating language learning. As infants develop, parents are incredibly attuned to infants' understanding level and implicitly recognize when to simplify and scaffold learning and when to provide more complex speech. For example, parents will simplify and shorten their speech when they label an unknown object before expanding again to discuss known referents, which continues to promote receptive vocabulary and infants' conceptual understanding of the world.

When infants point to an object, caregivers typically translate this simple gesture into simple speech by labeling the referent object, "Yes, that's a bird." But when infants have a number of symbolic gestures for different referents and use a symbolic gesture to refer to an object or action, caregivers engage with infants in a substantive back-and-forth exchange (Vallotton, 2010a; e.g., Infant: Gestures "Bird" then points out the window; Caregiver: "You see the bird outside"; Infant: Gestures "Bird, tree"; Caregiver: "The bird landed in the tree. Now we can't see it anymore"; Infant: Gestures "Where"; Caregiver: "I don't know where it went. I can't see it either."). Thus, infants advanced use of gestures elicits well-timed and elaborated caregiver speech within the context of conversational exchange with triadic joint attention in ways that expand children's vocabulary and grammar (Rowe & Goldin-Meadow, 2009).

Observational studies have shown that parents' own gesture use itself does not predict infants' vocabulary development, but it does predict infants' gesture use, which draws out parents' verbal labeling, which supports children's word-learning and predicts later vocabulary (Rowe et al., 2008). In an experimental study in which infant communication bids were elicited, mothers' responses to infants' gestural communication cues predicted infants' concurrent vocabulary and later word-learning, but mothers' responses to non-gestural cues did not. Mothers' responsive labeling of objects and actions help to explain the links between infants' gestures and their spoken vocabularies. Thus, caregivers' gestures invite infants to gesture as a way to communicate their interests and direct caregivers' attention, which allows infants to draw out the verbal feedback they need in order to learn language.

A systematic review of the research on father–child play shows the developmental benefits of a more directive style of play interaction (Vallotton et al., 2020). Dads are more demanding playmates of their young children than are mothers; they take more initiative in play and ask their children to respond, whereas mothers more often respond to the child's initiatives. Fathers' more demanding style elicits more symbolic behavior and speech from children, which then creates more opportunities to respond and support children's language development. The developmental benefits of greater directiveness may seem

contrary to the dominant idea of sensitivity presented in the child development literature. However, these caregiver interaction behaviors are still prompt, aligned with infants' attention (though they may be directing infants' attention), and informed by an interaction history with infants' shifting cues and needs. Thus, the important contrasts in the literature between mother– and father–child interaction behaviors, and their unique contributions to infant language development, underscore the need to take a broader and longer view in defining developmental sensitivity.

Why Does It Matter?

All of this amazing learning through early conversations is building infant brains. From birth to 3 years, infants' brains are doing incredible work making connections and laying the foundations that will assist their learning and development of their entire lives. At the neural level, infant-initiated conversational turns are associated with white matter growth in areas related to prediction and expressive language development. So, caregivers' responsiveness models the 'serve and return' qualities of conversations and helps infants develop expectations that their behaviors generate social interactions. Dyads that engage in more conversational turns show greater neural synchrony, and the number of parent–infant turns at 6 months predicts white matter myelination at 2 years. Interventions to increase conversational turns suggest a causal link between responsive turn-taking and brain development. Thus, developmentally sensitive conversations support neuroplasticity, facilitating the development of attention, memory, language, and socio-emotional processing.

Caregivers who respond more contingently, and generate more conversational turns have infants with higher vocabularies (Tamis LeMonda et al., 2001). Responsiveness to gestures predicts vocabulary to 18 months across cultural and language groups (Cameron-Faulkner et al., 2021). Responsiveness to children's bids and vocalizations predicts achievement of language milestones in the transition to spoken language, such as first words, first 50 words, and first combinatorial speech (Tamis LeMonda et al., 2001). And responsiveness to gaze-coordinated vocalizations predicts expressive vocabulary up until 24 months (Donnellan et al., 2020). Further, conversational turns predict vocabulary development and language comprehension. The number of conversational turns parents have with children aged 18–24 months is a stronger predictor of verbal comprehension and vocabulary 10 years later than the total number of words spoken, even after controlling for socioeconomic status (Gilkerson et al., 2018).

Tamis LeMonda et al. (2019) assessed maternal responsiveness in early childhood in a way consistent with the idea of developmental sensitivity, combining particular types of responsiveness that change to response to children's growing needs (e.g., verbal responses to child vocalizations and object labeling at age 1 and 2; use of clear and complex speech, and acknowledging child speech at age 3; and use of longer words, complex sentence structure, and encouraging children to talk at 4.5 years). These developmentally sensitive interactions were part of a composite measure of the early learning environment that predicted children's academic outcomes to 5th grade; and these longitudinal associations were mediated through children's academic language skills at 4.5 years, including vocabulary and letter-word identification; findings were consistent across racial-ethnic and language groups in the United States. Thus, developmentally sensitive parent–child conversations predict the pre-kindergarten language skills that enable children's academic success through elementary school.

These findings reiterate the importance of developmental sensitivity in caregivers' interactions over and above the frequency of interactions. These responses cascade over time to predict developmental milestones such as emerging literacy, school readiness, and adolescent cognitive processing (Gilkerson et al., 2018). Beyond cognitive development, early conversations are also predictive of children's socioemotional capabilities in toddlerhood. Higher conversational

engagement at 18 and 30 months is predictive of emotional regulation skills and secure attachments at 7 years. In summary, infants' early conversations are the starting point for creating social relationships that help babies figure out the world and lay the foundation for becoming skilled communicators and lifelong learners.

Variability in Children's Cues and Context

In addition to the rapid vocal and gestural advances described earlier in this chapter, and variation across cultures in the goals, proximity, function, and content of communication within caregiver–child interactions described earlier, developmentally sensitive conversations are also shaped by layers of individual differences within the dyad, and variability across the physical and social environment. Returning to Fig. 5.1, if we imagine additional children in any of these circles of interaction, then the conversations around them immediately become more complex. At any time, the caregiver could be responding to an infant who just initiated a conversational turn or providing overheard speech as they react to other children nearby. Further, if we imagine that those infants in Fig. 5.1 vary, not only in their age and developmental stage, but also in temperament, sex, and a range of neurological characteristics, we see how very differently these interactions may look and sound, and how these differences may shape development.

Individual Differences Among Infants and Caregivers

Infants exhibit various individual differences in engagement, attention, and interest in social interactions. There is a large range of normative behaviors among typically developing infants regarding the frequency of gestures and vocal production. Some babies are more or less chatty. Some infants are more interested in engaging with people, while others focus on object interactions. Similarly, individual differences among caregivers also impact conversations. Both personality differences and situational context might shift caregivers' patterns of engagement at any particular time. Sometimes, caregivers are focused and engaged, looking for every opportunity to capture their infant's attention and start a conversation. At other times, they may be multitasking, reflecting on their mental to-do list while passively attending to their infant's activities. Caregivers who are more selective when responding may be more effective at scaffolding infant attention by engaging in moments that help infants sustain their attention for longer (Schroer & Yu, 2022). Increased selectivity may also make caregiver responses more salient when they occur and, therefore, more potent for learning. Conversations also shift as infants become more mobile because new postures bring new opportunities to engage and elicit language from caregivers. Mobile infants expand the conversational space to more places and objects including absent referents.

Infants with developmental disorders or sensory impairments exhibit additional variability in when they reach communicative milestones beyond the range of typically developing infants. For example, infants with hearing impairment, Down syndrome, and those at higher risk for diagnosis of autism spectrum disorders (ASD) demonstrate different patterns of vocalizations and often show delays in producing canonical babbling. Infants with later ASD diagnoses also use fewer gestures, but parents are similarly responsive to children's gestures for those who are typically developing and those who will later be diagnosed with ASD (Choi & Rowe 2021). Conversely, children with Down syndrome produce more gestures than typically developing peers, but after controlling for expressive language, rates are similar; that is, children with Down syndrome use gestures for a longer period to supplement their language learning. Mothers of children with Down syndrome continue to translate their children's gestures into words at similar rates as their children age. Thus, the individual characteristics of infants that shape their communication behaviors will draw out variations in caregiver responses in ways that can sup-

port language, although these are moderated by cultural beliefs about ways to promote children's language.

Variability Across Contexts

The immediate context, or local environment, in which conversations occur also shapes the content and opportunities for infants to learn from conversations. At home, caregivers develop a rich interpersonal interaction history with their infants, building on activities in familiar locations and establishing routines and expectations around meal times, personal care, and play. Infants create common ground from regular interactions with familiar people and objects, and interaction patterns shift as conversations expand to include siblings and other adults nearby. These rich interactions extend to novel spaces outside the home, but caregivers and infants adapt their play and responses when in less familiar environments. Infant gestures and vocal cues inform parents when a situation requires more explanation, and parents seamlessly adapt their language to simplify speech to label and discuss unknown objects. In addition to parent–infant infant interactions, babies worldwide are frequently cared for by non-parental caregivers such as relatives, babysitters or nannies, and educators in childcare settings. The group dynamics of childcare classrooms inevitably alter conversations. For example, infants will hear more overheard speech as the number of children near a caregiver increases. Classroom activities such as meal times, playtime, book sharing, and personal care routines also create different opportunities for relational language, vocabulary building, and interactions. In childcare contexts, there are more demands on caregivers' attention and additional context cues for adults to react to when they are responsible for multiple children of various ages with varying developmental needs. Further, non-parental caregivers working in group care settings have less developmental history with each infant, and care for several infants at a time, each of whom are rapidly shifting in through subtle phases of communication skills. Unlike parents, infant teachers do not modify the rate or content of their responses based on the maturity of infants' vocalizations (Albert, 2021); thus, the context of their work with infants may make them less developmentally sensitive to shifts in infants' vocal maturity. However, when they can focus their attention and respond sensitively in the moment, infant teachers can take into account their recent interactional history with an infant to modify their own communication behaviors in ways that support infants' communication (Vallotton et al., 2017a). Thus, even though infant teachers in group care contexts must split their attention to respond to multiple rapidly changing infants with whom they share less developmental history, they can still respond in developmentally sensitive ways.

Suggestions for Parents and Practitioners

So far, we have demonstrated that infant behaviors such as vocalizations and gestures are powerful cues for organizing caregiver attention to elicit conversations that shape infants' language development through numerous mechanisms. We have also shown that parents intuitively and implicitly track their infant's capabilities to respond appropriately without explicit training (Papousek & Papousek, 2002). Despite often feeling like they are inexpert in understanding their own children, parents are intuitive geniuses at reading and responding to these subtle cues in ways that advance development.

However, the variability in children's learning outcomes suggests room to enhance language development support by working with families or educators for whom it is a priority. The guidance provided to parents, practitioners, and early childhood educators is often vague, making broad appeals to simply talk more, or providing strategies to verbally regulate infant behavior, with less emphasis on specific ways to promote language development. Many parenting and teacher education programs stress sensitive responding to infant behavior, but there is less emphasis on responding contingently to engage

in true back-and-forth conversations with babies. Thus, we conclude this chapter with concrete suggestions that can be used to help families or educators engage infants in conversations to promote learning.

Selective Silence: Shut Up and Watch

Perhaps counterintuitive, our first recommendation is to watch and listen. When a caregiver's culture emphasizes the value of language, caregivers are often urged to provide a steady stream of chatter to expose their children to as much speech as possible. Parents who speak nonstop are more likely to inadvertently redirect their child's attention or disrupt moments of focused play. Continuous chatter is also exhausting for both caregivers and infants! Just like adults, babies need downtime and space to explore. In Western home environments, 20–30% of an infant's active day contains no speech. These auditory breaks are helpful as they give infants time to process recent experiences and play independently. In many non-Western cultures, speech directed to infants is less frequent, and independent play is the norm. Observing infant activity and looking for moments to establish meaningful conversations around their interests can authentically jumpstart conversations when infants are receptive to engaging. Recognizing that infants are active conversation partners shifts the focus from talking to fill the auditory space toward recognizing when infants are trying to engage caregivers in conversation through joint attention, gestures, and babbling.

Model Multimodal Communication to Promote Bidirectional Conversations

Caregivers must remember that much of communication is nonverbal and multimodal; that is, infants intentionally communicate with their faces, hands, eyes, and mouths. Watching and listening to what infants are attending to, feeling, and attempting to do will give caregivers lots of relevant things to talk with infants about. When caregivers communicate with their hands as well as their words, they provide infants with examples of multiple communication modes that infants can learn to use prior to speech, giving infants more tools to participate in conversations with caregivers and elicit the responses that will help them learn language.

Intentionally Sensitive Responses: Talk Smarter, Not Harder

Once caregivers focus on creating conversations, other adaptive behaviors that support learning emerge. As previously discussed, the moments following an infant's communicative acts are prime opportunities for infant learning because infants are more receptive to learning and because caregivers align their responses in ways that facilitate learning. First, caregivers tuned in to their infant's babbling *simplify their speech* when responding contingently. Simplified responses to babbling are shorter, less grammatically complex, and contain targeted vocabulary, which provides language examples when infants are primed for learning.

Second, caregivers look for opportunities to play, discuss, and label objects that match the infant's visual attention and gestures. Following the infant's lead *establishes joint attention* and increases the likelihood of providing an aligned response that matches the focus on the infant's engagement. For example, when 9-month-olds babble at nearby objects, caregivers often respond by expanding the babble into a word. Responses that match the infant's focus of attention can enhance vocabulary building. However, redirective responses, such as labeling an object the infant is not attending to, negatively impact later vocabulary (Tomasello & Farrar, 1986). Providing labels that align with what the baby is looking at rather than what their babble sounded like helps them build word-object associations and is associated with comprehensive vocabulary at 18 months.

Caregivers in tune with their infant's capabilities recognize infant speech qualities and respond more frequently to babbles that sound closer to words. Parents will *scaffold their infant's vocal development* by responding most frequently to the infant's more speech-like sounds. For example, vocalizations with consonants (e.g., [ba] or [da]) are more advanced than vocalizations only containing vowels, particularly ones that sound fussy or nasal. Over subsequent interactions, caregivers respond selectively to more complex behaviors, effectively signaling the value of communication and shaping infants to more advanced behaviors.

Once infants have a range of words or symbolic gestures and begin to use them in combination, caregivers can *expand on infants' advanced communication cues* in ways that elicit further communication with infants and keep the conversation going. Infants' own combinations of words or gestures + words that form multimodal sentences are cues that they are ready to hear and learn more elaborate speech. When caregivers respond to these advanced cues with longer sentences it supports children's grammatical development.

Summary and Key Points

Developmentally sensitive responses require caregivers to attend to the relative sophistication of infants' communication cues, which indicates their developmental readiness for different types of caregiver input. The subtlety of the changes in infants' cues, along with the everyday complexity of caregivers' lives, embedded either in home or early education contexts, makes a concept like developmental sensitivity seem infinitely challenging, and shows the intuitive genius of caregivers who support their children's language development through authentic and loving everyday interactions, making it look so natural and so simple.

Key Points

- Infants are active contributors to conversations, initiating and extending conversations through their gestures and vocalizations.
- Caregivers' developmentally sensitive contributions to conversations are a product of both the infant's actions in the immediate context, the dyad's shared recent interaction history, and the cultural norms that inform the caregivers' parenting practices.
- Individual differences and variability in each of these components adds richness and complexity to the interaction space.
- Multiple caregivers (mothers, fathers, and non-parental caregivers) support infants' language learning, and may be differentially sensitive to infants' cues, and respond in complementary ways that collectively promote optimal language development.
- Encouraging caregivers to notice and respond in developmentally sensitive ways—including through selective silence, multimodal engagement, and language simplification in the word-learning phase—can enhance language learning opportunities for infants.

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