CHAPTER 15: INFANT COMMUNICATION

Abstract
From birth, infants experience the bidirectional influences of social and cognitive processing. Ample evidence reveals our evolutionarily endowed urge to interact: babies want to be “in touch” with other people, and this honed instinct has consequences for how they develop. Indeed, acquisition of a range of human abilities is dependent on extensive and extended early social interaction. In this chapter, we examine the early biases that contribute to the development of socio-cognitive functions, including social attention, verbal and nonverbal communication, and full-blown language. A critical component of healthy child development is regular communication with others. Thus, infants’ engagement in communication has implications for their acquisition of a range of socio-cognitive abilities. Not surprisingly, typical (and atypical) infant communication is also predictive of developmental outcomes. Thus, the goal of probing how infants communicate is to understand how they perceive and interpret the actions of others in relation to themselves, processes that have enormous implications for future developmental outcomes.

Infant Communication

What are the building blocks underlying language comprehension and production? Some would say that the answer is infants’ receptivity to language input; others would focus on the receptivity of their neural tissue. The reality is: The act of processing input shapes the tissue itself. From birth, social and cognitive processes influence one another. Nowhere is this more evident than in the case of language learning. Humans are social animals, and the emergence of our cognitive abilities are dependent on the language we learn through extensive social interaction. The language skills and abilities that infants accrue contribute to how they will interact with people as they continue to develop.

Here, we focus on infant communication and how it lays the groundwork for language learning, including the early social biases that guide this learning. Evidence from a range of sources reveals our evolutionarily endowed urge to interact with others. Babies and young
children are motivated to be “in touch” with other people, and this honed instinct has major developmental consequences. Infants elicit input and feedback from caregivers, who provide the raw material for early language development, including speech sound discrimination and initial sound production. Healthy social development helps infants and young children communicate with others, which in turn helps them learn to communicate more and better. Not surprisingly then, typical and atypical early social cognition are predictive of later learning and development, including of language.

Building Blocks of Language Comprehension and Production

Language shapes our social interaction, engaging almost every area of the brain. In the case of spoken language, producing speech requires specialized neural circuits for controlling the muscles of the larynx, tongue, mouth, and lips; understanding speech requires circuits for parsing a dense incoming stream of auditory input and assigning meaning to its component parts. On top of that, we identify and interpret facial expressions, body language, and tone of voice, distinguishing between sentiments as distinct as sincerity and sarcasm. These pragmatic processes must be integrated with the syntactic and semantic processes in some way as well. In short, communicating via language requires a brain that allows formulation of ideas well enough to express them in such a way that others will understand. The journey from being a preverbal infant to being a mature speaker/listener seems should be a long one.

Auditory Input Interacts with Developing Brain Structure

A key question to ask about language development is to what degree the neonatal brain is preconfigured to learn language, and to what degree early—even prenatal—input prepares it for the learning process? A purely non-nativist view favors bottom-up influences on language
development, according to which sensory input shapes a plastic brain; a purely nativist view favors a black-box, modular characterization of how infants come to handle the complex, combinatorial features of language as quickly as they do. Although the ‘nature versus nurture’ debate presents a false dichotomy, it remains informative as we try pull apart the intertwined threads.

The first issue is to understand that infants’ acoustic exposure begins in the womb. The tissue and liquid barriers protecting the developing fetus serve as low-pass filters, absorbing frequencies greater than 5000 Hz (Jardri et al., 2008) much like apartment walls absorb high frequency sounds and transmit low frequency sounds. This means that phoneme-specific information, such as that distinguishing one speech-specific sound from another, is not experienced by the developing fetus. Prosody, on the other hand, conveys the overall shape of speech to the developing fetus. Researchers have used both behavioral and physiological measures (i.e., fetal movement, heart rate) to extrapolate information about when fetal auditory processing begins and what sorts of auditory distinctions the developing fetus can make. For example, researchers have determined that sound is processed as early as 22 gestational weeks (Hepper & Shahidullah, 1994; Lecanuet et al., 1995). Fetal habituation, a metric of encoding or memory, takes place in response to repeated sounds as early as 32 gestational weeks (Morokuma et al., 2004). Closer to term, infants’ sensitivity to more complex sounds increases, allowing them to distinguish between variations in music (Kisilevsky et al., 2004) and to differentiate the prosodic structures of familiar and novel rhymes (Decasper et al., 1994).

Remarkably, these fetal sensitivities were established while the child is still in utero! For example, DeCasper and colleagues (1994) used measures of fetal heartrate changes to familiar
and unfamiliar rhymes to determine what the fetus was hearing. But neonates likewise demonstrate what they have learned while in utero by showing auditory preferences immediately following birth. In a seminal study, newborns learned to elicit playback of their mother's voice or the voice of an unfamiliar female by sucking on a nonnutritive nipple in different ways. They demonstrated a clear preference for their mother’s voice over the unfamiliar voice, despite having limited postnatal experience (DeCasper & Fifer, 1980). Likewise, newborns demonstrated a preference for a story to which they were exposed repeatedly—Dr. Seuss’s *The Cat in the Hat*—over a novel story in the same language (DeCasper & Spence, 1986).

Additional findings abound: Newborns can discriminate speech from non-speech when it is played forwards, but not backwards (Ramus et al., 2000); they prefer the language of their own environment over another, unfamiliar language (Moon et al., 1993); they can distinguish between stress patterns of different multisyllabic words (Moon et al., 1993); and they can categorically discriminate lexical versus grammatical words (Shi et al., 1999). Newborns can distinguish between two rhythmically dissimilar languages (Mehler et al., 1988); are sensitive to word boundaries (Christophe et al., 1994); and can differentiate between good and poor syllable forms (Bertoncini & Mehler, 1981).

Of course, when we say that newborns prefer a stimulus like their native language over another with a different rhythmic structure, this is probably not only due to prenatal exposure, as they have likely experienced some early postnatal exposure. The constraints of doing research with newborns means that they may be a few days old by the time they are tested. Nonetheless, early perceptual abilities are not due to any "genetic" transmission of the language the caregivers speak. Rather, infants are primed for the full-blown version of the language they’ve been hearing

in low fidelity form for the second half of their prenatal period. Consistent with this, infants in bilingual households who have been exposed to two languages prenatally do not show differential preference for them when tested as newborns, despite being capable of discriminating between the two (Byers-Heinlein et al., 2010).

**Emerging Sensitivity to Language-Specific Structure**

Language learning involves learning a language’s phonemes, from which an infant can begin to develop the phonological representations critical to recognizing the sound structure of individual words. What phonemes are used in any given language has been influenced by the more general way that acoustic continua produced by the vocal apparatus can be broken up. For example, the voicing continuum (i.e., timing of vibrations of the vocal folds, voice onset time VOT) can be divided into specific perceptual categories, such as the English minimal pairs /b/ and /p/. Such sound pairs are perceived categorically (i.e., as one sound or the other with no in between) by adult native speakers, and are used contrastively to denote different meanings (e.g., bat vs. pat). Different languages parcellate voicing (and other) continua differently (Cho et al., 2019).

How sensitive are newborns to their own and other languages’ phonetic categories? Many of the acoustic differences are minute (e.g., 20 ms difference in VOT turns /b/ into /p/), yet young infants are exquisitely sensitive to the acoustic changes that mark phonetic boundaries. In a ground breaking study, Peter Eimas and colleagues (Eimas et al., 1971) found that when 1-to 4-month-old English exposed infants were habituated to one of two synthetic English syllables, /ba/ or /pa/, differing only on VOT, they dishabituated upon exposure to the other one. From this, one might conclude that language-specific auditory sensitivities are innate to humans. However,
the ability to categorically perceive such sounds was shown to not be specific to humans, as it was observed in crickets (Wyttenbach et al., 1996), chinchillas (Kuhl & Miller, 1975) and macaques (Kuhl & Padden, 1983). In other words, human phonetic categories evolved from constraints imposed by general characteristics of the sensory system rather than ones unique to human ears and brains (Kuhl, 1986; Smith & Lewicki, 2006).

In another set of classic studies, Janet Werker and Richard Tees (Werker et al., 1981; Werker & Tees, 1984) demonstrated that 6-month-old infants were able to categorically perceive phonemes in languages they’d never before been exposed to, while adult monolingual English speakers were oblivious to these contrasts. Based on this remarkable finding, it has since been demonstrated that infants transition from a broad ability to distinguish many/most minimally contrastive phoneme pairs to an increasingly specialized capacity to distinguish primarily the phoneme pairs relevant to their ambient language(s). This perceptual tuning takes place in the first postnatal year, meaning that by between 10 and 12 months of age, infants are more adept at discriminating native compared with nonnative contrasts. In other words, the ability to discriminate nonnative phonetic contrasts declines across the second half of the first year of life. Thus, while both monolingual English- and Japanese-exposed infants are able to make the English /r/ and /l/ distinction prior to 6 months of age, by the end of their first year, only the monolingual English-exposed infants will continue to differentiate these sounds (Kuhl et al., 2006), because the /r/ vs. /l/ distinction is not used in the Japanese language and the neural process of perceptual tuning renders it increasingly imperceptible to a Japanese-exposed infant.

How does this tuning happen? Although perceptual learning is a lifelong ability, developmental critical periods like the one for native language minimal pairs have a constrained

timeline, whereby functional brain circuits are shaped in an experience-dependent manner. Other examples of the emergence or maintenance of specific abilities abound. For example, studies with people acquiring an initial language post-puberty (e.g., deaf children raised without visual language, so-called feral children) show that acquisition of native syntax, among other language specific abilities, is constrained and that lack of stimulation during the early childhood period has lasting effects on the both the brain and behavior. Thus, deprivation during the early developmental time frame leads to lifelong deficits in language—and likely other—abilities. The importance of early exposure to language, whether spoken or signed, to the brain development of congenitally deaf children is a topic of recent research (Hall et al., 2018a, 2018b), as is making sure that pediatric cochlear implant users are receiving appropriate levels of stimulation (Sevy et al., 2010).

In sum, infants younger than six months can discriminate a wide range of speech sound contrasts, both native and nonnative (see Saffran et al., 2006 for a review). Their sound-specific sensitivity increases with continued exposure to the phonetic contrasts in their environment, while they experience a corresponding loss of sensitivity to sounds from other, nonnative languages (Werker & Desjardin, 1995). Thus, perceptual tuning is best conceptualized as an experience-dependent sharpening of the boundaries between two closely related native speech sounds (Aslin & Pisoni, 1980; Kuhl et al., 2001; Polka et al., 2001) relative to those between nonnative sounds. For nonnative sounds, maturation and lack of experience further blurs the nonnative speech sound boundaries until they longer exist. This matters: children’s sensitivity to native relative to nonnative contrasts at the end of the first year positively predicts their language abilities in the second year, whereas maintenance of sensitivity to nonnative contrasts shows a

negative relationship with language ability measures in the second year (Kuhl et al., 2005). Finally, these nonnative boundaries can be resharpened is exposure is reintroduced (as when a child begins learning a new language before puberty), but the window is a closing one that becomes permanently shut post-puberty.

**Language Engages the Infant Brain beyond the Language Network**

Across languages, caregivers exaggerate their speech to infants (Fernald et al., 1989; Fernald & Morikawa, 1993), increasing the pitch of their voice and expanding its range and variability over time. Moreover, caregivers also repeat themselves, a lot. Infants are attracted to these features, attend to speech directed at them, and thereby gain experience from their interactions with people who produce such sing-song and repetitive speech. While the acoustic properties of infant-directed speech appear to underlie its effectiveness in attracting infants’ attention, the particular components that drive infants’ extended preference are less clear. It would seem that infants develop their preference for this infant-directed speech postnatally (assuming parents only produce it once the child is born), meaning they are not biologically predisposed to exhibit such a preference. Yet at birth infants discriminate between positive and negative emotions (Mastropieri & Turkewitz, 1999), and respond differently to positive and negative emotions as conveyed by tone of voice (Fernald, 1992; M. Papoušek et al., 1990). Of course, people are generally happy when they address infants, so the issues of pitch and affect are tightly intertwined (Kitamura & Burnham, 1998). As it turns out, when affect and pitch are manipulated independently, the positive affective properties override pitch in attracting infants’ attention! In other words, infants show no preference for infant- over adult-directed speech when the affect is held consistently positive across both (Singh et al., 2002). Not surprisingly, since

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“happy talk” draws infants’ attention in a positive way, caregivers (and doting others) are more inclined to manipulate their vocal acoustics to elicit this response. Indeed, and also unsurprisingly, adults rate infants’ facial responses to infant-directed speech as more “attractive” than their facial responses to adult-directed speech (Werker & McLeod, 1989). Thus, infants’ preference for positive emotion, along with adults’ inclination to produce happy talk when speaking to infants, is a critical component of their early preference for infant-directed speech.

The combination of infants’ early exposure to speech and their precocious preference for faces—the source of spoken language—positions them to learn the relationship between auditory and visual speech (i.e., the visual information provided by the articulating mouth). As a result, perceptual tuning extends to visual speech, as demonstrated by Weikum et al. (2007), who exposed 4-, 6-, and 8-month-old monolingual English infants to either English or French faces producing visual speech (i.e., the faces articulating sentences with the sound turned off). Four- and 6-month-old, but not 8-month-old, monolinguals detected the difference between English and French from visual cues alone. In contrast, 8-month-old bilingual (English-French) infants were able to detect the difference between the two languages.

Infants quickly become attuned to the temporal relationship between auditory and visual speech as well. In an influential early study, Kuhl and Meltzoff (1982) observed that when hearing /a/ vowels, 4-month-old infants looked longer at a face articulating /a/ than at a simultaneously articulating face producing /i/, a finding that was later replicated and extended to infants as young as 2 months of age (Patterson & Werker, 1999, 2003). Similarly, 8-month-olds prefer to look at a gender congruent visual display relative to an incongruent one when hearing a gender specific voice (Patterson & Werker, 2002). Five- to 15-month-olds look longer at a visual

speech stream that matches a three syllable nonword with degraded phonetic detail (Baart et al., 2014), and 4- and 6-month-olds even prefer to look at a cooing monkey face over a monkey face producing a grunt if they are simultaneously hearing the cooing sound (Lewkowicz & Ghazanfar, 2006).

Are infants sensitive to more extended temporal relationships between auditory and visual speech? Lewkowicz and Pons (2013) demonstrated that they are, finding that by between 10 and 12 months of age, infants’ representation of speech entails multiple modalities. First, the researchers familiarized infants with either their native (English) or a nonnative (Spanish) continuous auditory speech stream, after which the infants were presented with two simultaneous (silent) videos of a face producing visual speech. In one video, infants saw the face articulating the previously heard string of speech while in the other, a semantically matched version (i.e., a translation) of the same string of speech was articulated in the opposite language. Ten- to 12-month-olds looked less at their native visual speech when they were previously familiarized to auditory speech in that language, most likely because they had detected the correspondence between sight and sound and preferred the novel visual speech (i.e., they showed a novelty effect). By the end of the first year, infants have associated the auditory and visual forms with their ambient language. A similar study found the same effect in six-month-olds (Kubicek et al., 2014). Thus, from birth, infants use multiple sources of information to learn about communication, and they do so in increasingly complex ways as they consolidate experience across the first year of life.

Is it Imitation, or an Urge to Interact?

Thus far, we have focused on speech-specific aspects of infant language learning. However, several other factors contribute to the process. Fundamentally, infants are wired to connect with other people. In particular, face recognition is a foundational component of typically developing infants’ communication toolkit. Faces convey information of profound social significance, including a person’s identity and emotional state, and perceiving faces quickly becomes one of children’s most developed skills. A host of findings have converged on the relevant perceptual mechanisms supporting face recognition and the neural mechanisms underlying this ability. While infants may initially engage in social interactions for seemingly simple reasons, such as maintaining proximity to their caregiver (Gergely, 2001; 2010), a range of mechanisms are in play early on to ensure that infants continue to elicit attention from others. This is largely focused on others’ faces, with infants striving to imitate others’ facial expressions. The process of imitation involves the gradual coordination of several emerging systems—social, cognitive, and motor—across the first two years of life and contributes enormously to an infant’s ability to communicate.

In a now classic study, newborn infants imitated an adult model’s facial gesturing, including both tongue protrusion and mouth opening (Meltzoff & Moore, 1983). Although methodological aspects of these demonstrations are nuanced, there has been sufficient replication over the years (Butterworth, 1999; Meltzoff, 2005) to suggest that infants model others’ gestures early in life: they imitate others. Although questions remain about whether this is truly imitative or rather reflects the triggering of a motor schema or action pattern available in a preexisting motion repertoire (Jones, 2017), imitative-like behavior appears to be a critical entry point for infants into the social world around them.
Language Learning is Social Learning

In an influential study, Patricia Kuhl and her colleagues (2003) demonstrated that human’s capacity to learn language is influenced by interacting with other people. This was achieved by comparing the relative loss/maintenance of categorical perception in 9-month-old English learning infants as a product of their immediate social environment. Across two experiments, infants were trained on a Mandarin Chinese contrast that is undetectable by native English speakers. In the first study the infants were trained on these contrasts during play sessions with adult Mandarin speakers; control infants experienced the same play sessions, but in English. At the end of the training, the experimental group of infants were able to distinguish the speech contrast, performing at a level comparable to Mandarin learning infants in Taiwan. The control group did not. In a second study, the same training sessions took place with a new group of infants, but this time this was presented by video. Again, half got the training in Mandarin and half in English. Despite showing high engagement with the videos, there was no discrimination after training by either the experimental or control groups, highlighting the importance of engaged and contingent interaction for language learning to take place. In short, language is social, and language learning takes place in responsive social exchanges.

Caregivers elicit speech from their infants and young children by being sensitive to their abilities, including responding to their speaking attempts in a supportive and contingent manner. Indeed, learning is most efficient at promoting language development when caregivers calibrate their own speech to be just challenging enough for their child. For adults to maintain speech in this range, they must be in touch with a child’s rapidly changing abilities. Thus, a caregiver’s own frequent exposure to the child’s language (e.g., through active conversation) helps guide

appropriate tuning to the child’s specific developmental level (Zimmerman et al., 2009). Prime opportunities for language learning occur when adults focus on and talk about things that are relevant to an infant’s own attentional focus. Caregivers who are responsive to what their infants are engaged by may specifically support advances in language development by providing labels for objects and events when they are receiving attention from both the caregiver and the child. This joint attention eases the challenge for the child to match linguistic symbols to their referents, a process that reinforces the social-communicative function of language itself (Tomasello & Farrar, 1986).

**Contingencies Model Coordinated Communication**

Contingency-seeking in infants was demonstrated in a seminal study (Watson & Ramey, 1972) in which 2-month-olds increased their leg kicking when it resulted in a highly contingent stimulus, such as making a mobile rotate, but not when the event was noncontingent on leg-kicking. Infants prefer a certain level of contingency (Bahrick & Watson, 1985); they also produce a particular amount of contingency in their own behavior. Indeed, parent-infant dyads develop contingency in their interactions, with one member of the dyad closely following the other’s behavior with similar behavior. By the second month, infants convey positive affect during live interactions with their mothers that contain variable contingency, whereas they actually show *negative* affect when they are shown replays of their mothers from these interactions in which their mother necessarily is acting noncontingently (Murray & Trevarthen, 1985). This is in spite of these replays having just as much emotion and social stimulation as the live interaction!

In a three-part (live-replay-live) paradigm, mothers interacted directly and contingently with their 9-week-old infants both before and after infants were exposed to a replay of the mother. In the replay, the mother similarly engaging as in the two live sessions, but because the replay condition was prerecorded, she was not acting contingently in response to her infant. Based on measures of affect and engagement (i.e., smiling, gazing at mother, mouth closed, frowning, infants were found to react more negatively in the replay condition than in either of the live conditions (Nadel et al., 1999). Indeed, in the second live condition, infants’ positivity returned to levels observed in the first live condition, demonstrating that the change in behavior in the replay condition was not due to a natural decline in infant engagement, but rather to the lack of contingency between the mother and infant. In short, contingency helps infants establish correspondence between themselves and others, thereby encouraging development of the representation of oneself as an intentional agent in the world.

This contingency-based coordination process starts early. In a clever experiment, Michael Goldstein and his colleagues tested the importance of contingency by telling caregivers precisely when to respond to infant vocalizations (Goldstein et al., 2003). In half of the infant-caregiver pairs, mothers were trained to respond contingently to their infants’ vocalizations by producing nonvocal social responses (i.e., smiling, touching). Mothers in the other half of the infant-caregiver pairs were instructed to respond to their infants based on the response schedules of the mothers in the contingent group, thus noncontingently. Infants who received social feedback that was contingent on their vocalizations produced more developmentally advanced vocalizations—both during the manipulation and after maternal responding was no longer being manipulated—relative to those infants who received feedback independent of when they vocalized. These

results thus demonstrate that social interaction is a critical link between early speech perception and subsequent production. Infants who learn the contingency between their own vocalizations and the responses of their caregivers thus learn to influence the behavior of social partners, an important step forward in early communicative development. When caregivers respond contingently to infants’ vocalizations with their own speech, infants structure their sounds to match those phonological patterns (e.g., vowel sounds elicit more vowel sounds from infants and words elicit more consonant-vowel combinations) (Goldstein & Schwade, 2008).

Goldstein and colleagues (Elmlinger et al., 2019) recently observed that caregivers simplify the statistical and syntactic structure of their speech in response to their infants’ babbling. Their contingent speech contained fewer unique words and contained both shorter utterances and more single-word utterances than non-contingent speech. Thus, infants’ immature vocalizations create opportunities for them to learn by eliciting simplified responses from parents that contain simplified, more learnable information. Moreover, caregivers who use more linguistically diverse contingent speech with their infants have infants with more advanced vocalizations. Thus, a functional perspective has emerged whereby infant language learning regulates and is regulated by social interactions with adults. This early communication is foundational to the development of complex language going forward.

**The Importance of Both Quantity and Quality in Speech Input**

We have argued that infants’ fundamentally social motivation to communicate provides them with the opportunity for language learning. While this is by now supported by extensive research, it is also true that language exposure is not uniform across all children. In a seminal study, Hart and Risley (1995) demonstrated that the raw number of words children hear varies...
enormously as a function of a family’s socioeconomic status (SES), with average income families producing up to double the number of words as is produced by lower income families. These researchers made the (then provocative) suggestion that such differences in frequency of exposure might underlie the reliable differences in language outcomes observed as children from these families enter and proceed through formal education. There is now substantial evidence that early differences in both the amount and quality of speech children hear influences their emerging language abilities. The amount of language that children experience before the age of three is positively correlated with their language production skills and cognitive development more generally (e.g., Arterberry et al., 2007; Bornstein & Haynes, 1998; Huttenlocher, 1998; Huttenlocher et al., 1991; Rowe et al., 2005; Shonkoff & Phillips, 2000). The quality of that language exposure, including both linguistic (i.e., vocabulary diversity and sophistication, grammatical complexity, and narrative use (Rowe, 2012), as well as interactional features (i.e., contiguous (time-locked), contingent (topically similar), back-and-forth conversation (Hirsh-Pasek et al., 2015) also matters. Fortunately, caregiver-child conversational turn-taking involves a rich experience of high-quality linguistic, attentional, and social features, but the quality and quantity of speech input is often mediated by socioeconomic status (Hoff, 2003).

There is a broad relationship between SES and young children’s brain structure and function (for review, see Farah, 2017). More recently, there has been increasing focus on establishing mechanistic knowledge about specific environmental factors associated with specific variation in brain structure. There is now some evidence that certain aspects of children’s language environments relate to functional brain responses in prefrontal cortical regions (Garcia-Sierra et al., 2016; Sheridan et al., 2012). We know there is substantial variation

in the amount of language children experience, in part due to variable SES (Gilkerson et al., 2017). Do such differences in language exposure relate to differences in neuroanatomy? By relating young children’s real world language exposure between the ages of 4 and 6 years to their neuroanatomy, Romeo and colleagues (2018) were able to confirm that greater adult-child conversational experience is related to stronger, more coherent white matter connectivity in white matter tracts relevant to language. In other words, how the children’s brains were developing was a product of their prior language experiences. Interestingly, these findings were independent of SES and of the sheer quantity of adult speech. Rather, microstructural analyses of the white matter were found to mediate the relationship between conversational turns and children’s language skills, indicating a neuroanatomical mechanism underlying the so-called language gap. In short, quality matters more than quantity to children’s emerging language abilities, and is reflected neuroanatomically as well.

Conclusion

Communication is inherently social. At the earliest stages of development, infants are shaped by the sounds around them. Subsequently, caregivers’ biases to communicate in particular ways help infants focus their attention specifically on speech sounds. The inherent structure of the speech signal together with the contingent structure of the infant-caregiver interaction serve to highlight regularities in speech and in interactive form; infants respond to this, as reflected in their subsequent productions of new vocal forms. Particular maternal responses, such as imitations and expansions, correlate positively with language development. Through these responses, infants learn the association between the production of particular sounds and their outcomes. Finally, caregivers’ input during social interactions and early

“conversations” scaffold language learning by providing information about activities and objects that are the focus of infants’ attention in the first place. In sum, socially guided communication is fundamental to infants’ initial language development, and lays the foundation for subsequent advances in language learning and social development alike.

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