

Infant Speech Perception and Babbling

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Much work in the study of early life speech perception centers on an infant's ability to discriminate sounds. Studies rely on an infant's reactions to spoken language, measured by various physical and biometric responses, as evidence of an infant's ability to perceive distinct spoken sounds. Studies have identified a number of characteristics of human speech, termed cues, which infants have demonstrated they can recognize.

There is evidence that in later fetal stages and into early infancy, a child already demonstrates a preference for the mother's voice (DeCasper, A.J., Lecanuet, J.P., Busnel, M.C., Granier-Deferre, C. & Maugeais, R., 1994) and has the ability to differentiate the native language (NL) from a foreign language (Nazzi, Bertoncini, & Mehler, 1998). This evidence pertains largely to responses to *suprasegmental*-level elements of speech, such as intonation contours, rhythm and pausing. The early sensitivity to suprasemental features is likely due to the level of sound accessible from the womb, with fine-grained features being too subtle to discern. In addition, after birth, infants are exposed to child-directed speech (also called "motherese")—a slower speech style with extended syllable duration, exaggerated intonation, and a higher pitch—and this input aids an infant in perceiving word boundaries.

Jusczyk and Aslin (1995) have shown that at 6 to 7.5 months of age infants can detect word forms, utilizing input cues such as stress, *phonotactics* (recurrent sequencing of phonemes), the distribution of allophones, and the statistical regularity of phonemic co-occurrence. As an example from English, the voiced bilabial /b/ occurs much more frequently at the beginning of a

word than its voiceless counterpart /p/, which occurs more regularly at the ends of words. Such patterns aid in the detection of when one word ends and another begins.

At the phonemic level, infants have shown they can recognize a *phoneme*, the smallest unit of speech that carries meaning (such as the sound /d/ in English), when occurring at word-initial or final position, or when spoken by different people (Gervain & Werker, 2008). By the time they are nine months old, infants also have become receptive to the phonotactics in the spoken language to which they are most commonly exposed.

The receptive phase of language acquisition in early infancy contributes to the progression of infant speech. The various features of language discussed above can be viewed again with the shift in focus from reception to production.

Infant Speech Production

It is worth noting first that the anatomy of an infant's vocal apparatus differs from that of adults, and even that of older children. An infant has less jaw control at a very young age; the vocal tracts are short also, lengthening over time; finally, the descent of the larynx does not begin until the third year (Crelin, 1987). These features limit how well an infant can approximate the speech sounds they hear. In spite of the physical limitations, research has revealed that the sounds produced in babbling do begin to correspond closely to native language (NL) speech sounds from an early age.

Much like the work of Nazzi et al. (1998) found that infants are able to recognize NL speech input, research has also shown that infant babbling "drifts" toward the NL to which the infant is most often exposed. As an example of NL vowel sounds in babble, Boysson-Bardies (1993) performed an acoustic analysis of a broad sample of babbling by infants from four different NL environments, finding that vowel sounds produced by 10-month-olds resemble the

NL more closely than the babble of infants with different NLs. This is a significant finding because it breaks with the earlier belief that babbling did not directly correspond to the development of speech, with babbling previously having been categorized as a pre-linguistic stage, and speech as the linguistic stage.

Babbling is characterized by a series of phases. *Reduplication* in babbling, the repetition of a consonant-vowel combination (e.g., *bababa*) in infant speech, commences at approximately six months of age (Roug, Landberg & Lundberg, 1989). This stage is characterized by little variation in the intonation patterns or the consonant-vowel selection. Later, *variegated babbling*, or babbling that includes alternation of the consonant sounds in each syllable (e.g., *mata*, *papada*) begins at approximately 10-14 months of age (Jusczyk, 2000).

In addition to changes in consonant use, the syllable structures of babbling also drift toward the infant's native language. For example, infants from a French NL environment have been found to produce fewer closed syllables (i.e., those ending in a consonant rather than a vowel) than those in an English NL environment, mirroring the frequencies of these patterns in adult speech (Levitt, Utman, & Aydelott, 1992). Similarly, rhythm and stress patterns emerge in the syllabic babbling anywhere between 5 and 13 months of age, and they increasingly resemble the patterns found in the mother tongue (Levitt et al., 1992).

The evidence of speech development among infants is strong. In the early months of life, humans rapidly begin to focus their attention on the speech they hear most frequently, primarily that of infant-directed speech in the native language. The recognition of recurring phonemes, phonemic combinations, and suprasegmental features of the language are apparent not only in perception studies, but in observations of infant babbling.

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Further Readings

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