

# Evolutionary implications of vocal development in the first half-year of life

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## Key words

Vocal development, contextual flexibility, babbling

## Abstract

The study of human infant vocal development has yielded new perspectives on how the capacity for speech is built, and has provided important suggestions about the paths that our hominid ancestors may have followed in evolution of speech. The research to be considered in this paper highlights a natural logic that characterizes the steps of vocal development in human infants. Important aspects of that natural logic appear to have applied to evolution of speech as well (see Oller & Griebel, 2005). The paper thus suggests a relation between ontogeny and phylogeny where, at least in key respects, both abide by a common logic pertaining to the possible ways that a powerful vocal communication system might be built.

It has been argued previously that a critical first step in establishing a foundation for a speech capacity in primates is the evolution of a substantially higher degree of “contextual flexibility” in vocalization (Oller, 2000; Oller & Griebel, 2005) than has been reported to occur in non-human primates (see Cheney & Seyfarth, 1999; Hauser, 1996). In general, non-human primates are seen to produce a small set of relatively stereotypical vocalizations each of which is relatively firmly tied to specific contexts of usage (to express for example distress, aggression, warning, affiliation, etc.). Until a species has the capability to use vocalization contextually flexibly, it is hard to imagine how the species could learn new sounds or use sounds with arbitrarily assigned meanings, as is required of course in speech.

The paper will present empirical results from our laboratories illustrating that in the first five months of life, human infants develop substantial contextual flexibility of vocalization. Signs of contextual flexibility include: 1) variability (lack of stereotypy) of sounds occurring within a single definable context (such as face-to-face comfort interaction), 2) repetitive playful production of acoustically identifiable sound categories (such as squeals, growls or raspberries), and 3) utilization of identifiable sound categories in multiple circumstances of emotional expression (as when the same sound type is utilized to express negative emotion on one occasion and positive emotion on another). Evidence of all these types of contextual flexibility in human infants has previously been presented (Oller, Buder, & Nathani, 2003).

New data to be presented in the paper come from longitudinal research in our laboratories where infants are video-taped from two cameras simultaneously and are audio recorded with very high fidelity. The recordings are intensive and coding involves both extensive acoustic analysis and extensive auditory and visual judgments to determine context and vocalization categories.

For the three indicators, specific analyses are conducted in turn: 1) to illustrate variability within circumstance, acoustic analysis is applied to sequences of infant sounds produced in comfortable face-to-face interaction, illustrating quantitatively the rich vocal quality variations that occur, while in a relatively constant state of apparent comfort; 2) to illustrate repetitive

playful production, lag sequential analyses are used to show that infants produce different acoustically identifiable sound types in systematic (i.e., non-random sequences); and 3) to illustrate contextual variability in the usage of individual categories, cross-classification analyses are applied to data on the relations between facial expressions and categories of infant sounds. All the data indicate clearly that by 4-5 months of age, the human infant is firmly in command of producing sounds in ways that show contextual flexibility, a clear foundation for speech.

## References

- Cheney, D. L., & Seyfarth, R. M. (1999). Mechanisms underlying vocalizations of primates. In M. D. Hauser & M. Konishi (Eds.), *The design of animal communication* (pp. 629-644). Cambridge, MA: MIT Press.
- Hauser, M. (1996). *The evolution of communication*. Cambridge, MA: MIT.
- Oller, D. K. (2000). *The emergence of the speech capacity*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Oller, D. K., Buder, E. H., & Nathani, S. (2003). *Origins of speech: How infant vocalizations provide a foundation*. Chicago: Miniseminar for the American Speech-Language Hearing Association convention.
- Oller, D. K., & Griebel, U. (2005). Contextual freedom in human infant vocalization and the evolution of language. In R. Burgess & K. MacDonald (Eds.), *Evolutionary Perspectives on Human Development* (pp. 135-166). Thousand Oaks, CA: Sage Publications.