



Commentary

The infant's developmental path in phonological acquisition

Daniel Swingley*

University of Pennsylvania, Philadelphia, Pennsylvania, USA

Research on how language acquisition begins has been fragmented both in terms of scientific communities and in terms of the phenomena that are taken to characterize developmental progress. In her article, Marilyn Vihman argues for an integrative approach that takes the child's efforts at speech production as primary, and notes that infants' knowledge of how words sound may accrue over a protracted period developmentally. Here, I briefly discuss how reconceptualization of the process can help integrate perspectives previously at odds.

For the past 25 years or so, there have been two distinct scientific narratives concerning young children's phonological learning—one dominated by research in the perceptual tradition of cognitive psychology, and another with a heavier emphasis on naturalistic observation and individual differences. These traditions have been approaching each other recently, but for the most part they are separate, with practitioners in distinct departments (psychology and cognitive science on the one hand, linguistics or speech and communication on the other). The separation is manifested characteristically in a divergence of views about the significance of experiments on infants' phonetic categorization. The target paper by Marilyn Vihman (2017) illustrates a reconsideration of these findings that will help reconcile the two perspectives.

Over the first year, infants get better at categorizing speech sounds of the native language and worse at categorizing non-native sounds. In most of the cases studied, infants a few months old distinguish clear instances of similar-sounding phones of any language. Then by about 12 months, children thenceforth fail to distinguish similar non-native phones, but do distinguish native ones (again with a few exceptions, e.g., Narayan, Werker, & Beddor, 2010). It is typically concluded that by 12 months, infants have developed an inventory of native speech sounds, and the ability to interpret spoken language in terms of these categories. This perceptual adaptation is part of the foundation of the current cognitive-psychology treatment of early language, alongside the other 'statistical-learning' findings of the past two decades (e.g., Aslin, Saffran, & Newport, 1998; Gerken, 2006). Language-specific speech-sound categorization would naturally be adaptive for the learning of words and morphology.

The signature findings of the linguistic and clinical tradition, on the other hand, include a range of other phenomena, but two critical points are the intimate connection between performance in phonological tasks and the structure of the vocabulary (e.g., Beckman &

*Correspondence should be addressed to Daniel Swingley, Levin Building, 425 S. University Avenue, Philadelphia, PA 19104, USA (email: swingley@psych.upenn.edu).

Edwards, 2000), and the convoluted path children's words may take in going from babbling to adultlike word production (e.g., Vihman & Croft, 2007).

With these empirical findings in mind, Vihman contributes evidence that infants' knowledge of some words' phonology is rather fragmentary. Although infants appear sensitive to phonological distortions of very frequent words (e.g., Swingley, 2005), they may only know certain aspects of many other words, focusing their attention on salient features (such as gemination or lexical stress) and on sounds that are actively being learned. According to the experimental evidence presented concerning the articulatory filter hypothesis, children first attend more to words with sounds they say (while developmentally they only favour one sound in production), and then attend more to sounds they do not say yet (when they favour more sounds). During both periods, children may elect to attempt words that contain sounds closer to mastery.

The long-term consequences of this particular pattern are not yet clear. But the result is interesting for two reasons. First, it shows that young children are active learners in the domain of phonology. If Vihman's characterization is correct, it suggests that children have some awareness of their own abilities, and direct their attention to the parts of the speech signal that they need to work on. They seek out patterns and use them. Second, the result highlights a broader point about the process of early language development. Infants' precocious successes in native-language perceptual learning and in detecting patterns in language materials do not imply that by 12 months infants have become analog-to-digital converters, transforming the continuous speech signal into a neat list of phonologically appropriate categories ready to engage in linguistic contrast. It is more likely that consonant and vowel categories are salient features of some but not all instances of words.

How do we reconcile the two broad conceptualizations of infants' language development raised above? In part by acknowledging that the lexicon develops earlier than once thought (Bergelson & Swingley, 2012), giving lexical patterns a role in the development of the speech-sound categories revealed in infancy. The phonetic distributional evidence alone appears insufficient for vowel category learning; words, which fill the perceptual space more sparsely, may be crucial in guiding the infant to the native phonetic categories (Feldman, Griffiths, Goldwater, & Morgan, 2013; Swingley, 2009). This hypothesis echoes long-standing arguments in the linguistic and clinical tradition about lexical learning feeding into phonological representation (e.g., Edwards, Beckman, & Munson, 2004).

In addition, it is important to recognize, as Vihman does, that successful categorization of phonetic stimuli is not the same thing as encoding continuous speech in terms of such categories; indeed, given the rampant hypoarticulation of speech outside the phonetics laboratory (e.g., Hawkins, 2010) and in the nursery (e.g., Stoel-Gammon, 1984), requiring segmental matches to the lexicon would render much conversation unintelligible. Infants must learn their language's sounds, and they do; but learning the sounds does not itself tell infants how to use them (Swingley, 2016).

Thus, the way to reconcile the two prevailing perspectives on infant phonological development is to consider empirically motivated changes to the classic acquisitional timeline, bringing the dawn of the lexicon closer to the first months, but acknowledging that although learning speech sounds is an important foundation, it is not the whole building. Vihman's review suggests some welcome new ways to think about how the rest of the construction proceeds.

Acknowledgement

This work was supported by NIH grant R01-HD049681 to Daniel Swingley.

References

- Aslin, R. N., Saffran, J. R., & Newport, E. L. (1998). Computation of conditional probability statistics by 8-month-old infants. *Psychological Science*, *9*, 321–324. doi:10.1111/1467-9280.00063
- Beckman, M. E., & Edwards, J. (2000). The ontogeny of phonological categories and the primacy of lexical learning in linguistic development. *Child Development*, *71*, 240–249. doi:10.1111/1467-8624.00139
- Bergelson, E., & Swingley, D. (2012). At 6 to 9 months, human infants know the meanings of many common nouns. *Proceedings of the National Academy of Sciences of the United States of America*, *109*, 3253–3258. doi:10.1073/pnas.1113380109
- Edwards, J., Beckman, M. E., & Munson, B. (2004). The interaction between vocabulary size and phonotactic probability effects on children's production accuracy and fluency in nonword repetition. *Journal of Speech, Language, and Hearing Research*, *47*, 421–436. doi:10.1044/10924388.2004.034
- Feldman, N. H., Griffiths, T. L., Goldwater, S., & Morgan, J. L. (2013). A role for the developing lexicon in phonetic category acquisition. *Psychological Review*, *120*, 751–778. doi:10.1037/a0034245
- Gerken, L. A. (2006). Decisions, decisions: Infant language learning when multiple generalizations are possible. *Cognition*, *98*, B67–B74. doi:10.1016/j.cognition.2005.03.003
- Hawkins, S. (2010). Phonological features, auditory objects, and illusions. *Journal of Phonetics*, *38*, 60–89. doi:10.1016/j.wocn.2009.02.001
- Narayan, C. N., Werker, J. F., & Beddor, P. S. (2010). The interaction between acoustic salience and language experience in developmental speech perception: Evidence from nasal place discrimination. *Developmental Science*, *13*, 407–420. doi:10.1111/j.1467-7687.2009.00898.x
- Stoel-Gammon, C. (1984). Phonological variability in mother-child speech. *Phonetica*, *41*, 208–214.
- Swingley, D. (2005). 11-month-olds' knowledge of how familiar words sound. *Developmental Science*, *8*, 432–443. doi:10.1111/j.1467-7687.2005.00432.x
- Swingley, D. (2009). Contributions of infant word learning to language development. *Philosophical Transactions of the Royal Society B*, *364*, 3617–3622. doi:10.1098/rstb.2009.0107
- Swingley, D. (2016). Two-year-olds interpret novel phonological neighbors as familiar words. *Developmental Psychology*, *52*, 1011–1023. doi:10.1037/dev0000114
- Vihman, M. M. (2017). Learning words and learning sounds: Advances in language development. *British Journal of Psychology*, *108*, 1–27. doi:10.1111/bjop.12207
- Vihman, M. M., & Croft, W. (2007). Phonological development: Toward a 'radical' templatic phonology. *Linguistics*, *45*, 683–725. doi:10.1515/ling.2007.021

Received 10 August 2016; revised version received 9 August 2016