

October 10, 2011

Hearing Bilingual: How Babies Sort Out Language

By PERRI KLASS, M.D.

Once, experts feared that young children exposed to more than one language would suffer “language confusion,” which might delay their speech development. Today, parents often are urged to capitalize on that early knack for acquiring language. Upscale schools market themselves with promises of deep immersion in Spanish — or Mandarin — for everyone, starting in kindergarten or even before.

Yet while many parents recognize the utility of a second language, families bringing up children in non-English-speaking households, or trying to juggle two languages at home, are often desperate for information. And while the study of bilingual development has refuted those early fears about confusion and delay, there aren’t many research-based guidelines about the very early years and the best strategies for producing a happily bilingual child.

But there is more and more research to draw on, reaching back to infancy and even to the womb. As the relatively new science of bilingualism pushes back to the origins of speech and language, scientists are teasing out the earliest differences between brains exposed to one language and brains exposed to two.

Researchers have found ways to analyze infant behavior — where babies turn their gazes, how long they pay attention — to help figure out infant perceptions of sounds and words and languages, of what is familiar and what is unfamiliar to them. Now, analyzing the neurologic activity of babies’ brains as they hear language, and then comparing those early responses with the words that those children learn as they get older, is helping explain not just how the early brain listens to language, but how listening shapes the early brain.

Recently, researchers at the University of Washington used measures of electrical brain responses to compare so-called monolingual infants, from homes in which one language was spoken, to bilingual infants exposed to two languages. Of course, since the subjects of the study, adorable in their infant-size EEG caps, ranged from 6 months to 12 months of age, they weren’t producing many words in any language.

Still, the researchers found that at 6 months, the monolingual infants could discriminate between phonetic sounds, whether they were uttered in the language they were used to hearing or in another language not spoken in their homes. By 10 to 12 months, however, monolingual babies were no longer detecting sounds in the second language, only in the language they usually heard.

The researchers suggested that this represents a process of “neural commitment,” in which the infant brain wires itself to understand one language and its sounds.

In contrast, the bilingual infants followed a different developmental trajectory. At 6 to 9 months, they did not detect differences in phonetic sounds in either language, but when they were older — 10 to 12 months — they were able to discriminate sounds in both.

“What the study demonstrates is that the variability in bilingual babies’ experience keeps them open,” said Dr. Patricia Kuhl, co-director of the Institute for Learning and Brain Sciences at the University of Washington and one of the authors of the study. “They do not show the perceptual narrowing as soon as monolingual babies do. It’s another piece of evidence that what you experience shapes the brain.”

The learning of language — and the effects on the brain of the language we hear — may begin even earlier than 6 months of age.

Janet Werker, a professor of [psychology](#) at the University of British Columbia, studies how babies perceive language and how that shapes their learning. Even in the womb, she said, babies are exposed to the rhythms and sounds of language, and newborns have been shown to prefer languages rhythmically similar to the one they’ve heard during fetal development.

In [one recent study](#), Dr. Werker and her collaborators showed that babies born to bilingual mothers not only prefer both of those languages over others — but are also able to register that the two languages are different.

In addition to this ability to use rhythmic sound to discriminate between languages, Dr. Werker has studied other strategies that infants use as they grow, showing how their brains use different kinds of perception to learn languages, and also to keep them separate.

In [a study of older infants](#) shown silent videotapes of adults speaking, 4-month-olds could distinguish different languages visually by watching mouth and facial motions and [responded with interest when the language changed](#). By 8 months, though, the monolingual infants were no longer responding to the difference in languages in these silent movies, while the bilingual infants continued to be engaged.

“For a baby who’s growing up bilingual, it’s like, ‘Hey, this is important information,’ ” Dr. Werker

said.

Over the past decade, [Ellen Bialystok](#), a distinguished research professor of psychology at York University in Toronto, has shown that bilingual children develop crucial skills in addition to their double vocabularies, learning different ways to solve logic problems or to handle multitasking, skills that are often considered part of the brain's so-called executive function.

These higher-level cognitive abilities are localized to the frontal and prefrontal cortex in the brain. “Overwhelmingly, children who are bilingual from early on have precocious development of executive function,” Dr. Bialystok said.

Dr. Kuhl calls bilingual babies “more cognitively flexible” than monolingual infants. Her research group is [examining infant brains](#) with an even newer imaging device, magnetoencephalography, or MEG, which combines an [M.R.I.](#) scan with a recording of magnetic field changes as the brain transmits information.

Dr. Kuhl describes the device as looking like a “hair dryer from Mars,” and she hopes that it will help explore the question of [why babies learn language from people](#), but not from screens.

Previous research by her group showed that exposing English-language infants in Seattle to someone speaking to them in Mandarin helped those babies preserve the ability to discriminate Chinese language sounds, but when the same “dose” of Mandarin was delivered by a television program or an audiotape, the babies learned nothing.

“This special mapping that babies seem to do with language happens in a social setting,” Dr. Kuhl said. “They need to be face to face, interacting with other people. The brain is turned on in a unique way.”