

Building Blocks of Language: Speech Perception in Infants (Eimas et al., 1971)

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Language is a very important component of what makes humans, humans. Without language, we would not be able to communicate thoughts, feelings, or ideas. Learning a native language starts at infancy and continues well into our adult lives. However, the beginning of learning a language at infancy might not be as simple as it seems. In adulthood, when hearing a foreign language it might be hard to figure out where one word stops and where another begins. Infants are doing the same thing, except on a much different scale.

The first step in learning a language is to be able to tell the difference between sounds that are made in speech rather than actual words. A study done by Peter D. Eimas and his colleagues at Brown University in 1971 sought to determine the exact age where infants begin to differentiate between syllables made in various speech sounds. These speech sounds, dubbed phonemes, end up being the building blocks to learning a language.

In the study, Eimas and his colleagues used infants aged between one and four months old and tested their ability in discriminating between a 'b' sound and a 'p' sound. The infants were then hooked up to a fake nipple which measured their rate of sucking, using this as an indicator of how interested the infants were with the surroundings around them. In order to accurately determine whether infants could hear the difference between the sounds, the frequency of the sounds were only ten milliseconds apart, making their timing very fast and indicating that infants had to have a very tuned ear in order to differentiate the sounds.

In the experiment, infants were exposed to two conditions of sounds: one condition included sounds that were on opposite sides of the phonetic spectrum while the second condition

had sounds that were in the same phonetic category. When exposed to conditions where the sounds were in the same category, the infant suckling rate increased but after repeated exposure, the suckling rate decreased as infants lost interest. When a phoneme from an opposite category was introduced, the suckling rate once again increased, showing that the infants could perceive the difference between the previous phoneme and the new one.

The study's results indicate that infants as young as one month old were able to respond to speech sounds as well as differentiate between opposite phonemes. It was also easier for infants to discover two different speech sounds than it was for them to identify the sounds that were in the same phonetic category. This shows that not only are infants able to tell the difference between different speech sounds but they are able to do so in a similar manner that adults do to perceive different words.

The classic study suggests that infants are born with skills that help them categorize sounds that vary slightly with relatively limited exposure to speech as well as virtually no experience in producing the same sounds. It also suggests that infants are capable of doing this with no reinforcement of behavior. This also implies that understanding speech and language might be a part of a human's biological makeup and therefore, must be functioning at an early age.

Because most languages contain about 40 distinct phonemes, an infant must first learn to recognize all of them. When infants babble or mumble different sounds, they are trying to make the same phonetic sounds that they hear adults making. Infants then are able to sound out vowels, mostly due to their ability to recognize different components of speech and are well on their way to acquiring language.

It's worth pointing out that in humans, there is a sensitive time period in which language acquisition may occur. Infants are born with a high affinity, or drive, for language but this starts to deplete at around 11 months. As adults, it is much harder to distinguish different phonemes that we had such a high affinity for as infants, which is why learning a foreign language as an adult is much harder when compared to an infant learning a new language. After 11 months, infants stop being able to discriminate phonemes from other languages and settle with phonemes from their first language, subsequently losing their ability for foreign language phonetics. At around five years, children have gone well past their first word and are able to master the sound of grammar and language and continue adding on to their vocabulary as they grow older.

After Eimas and his colleagues' initial study, other studies have been done to show that infants are able to discriminate between different consonant that form from different articulations (formation of clear and distinct sounds in speech) such as 'ba' and 'ga' as well as where the articulation takes place (oral or nasal) and can distinguish between 'ba' and 'ma'. Further studies have shown that infants are able to not only distinguish between consonants they normally hear from their first language but from nonnative consonants as well.

These studies can help us understand language acquisition and what makes it possible for infants to learn their first language so quickly. This knowledge can be used further in understanding how adults learn a foreign language when compared to an infant learning their first language. This could potentially allow us to learn a foreign language much quicker, while truly learning the basic speech sounds first, much like infants and their first building blocks of language.

Further Reading:

Eimas, P. D., Siqueland, E. R., Jusczyk, P., & Vigorito, J. (1971). Speech Perception in Infants. *Science*, Volume 171, 303-306.

C. Floccia, A. Christophe, J. Bertoncini. High-amplitude sucking and newborns: the quest for underlying mechanisms. *J Exp Child Psychol.* 1997 Feb; 64(2): 175–198. doi: 10.1006/jecp.1996.2349