Language learning: Researchers use video games to crack the speech code

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When we speak, our enunciation and pronunciation of words and syllables fluctuates and varies from person to person. Given this, how do infants decode all of the spoken sounds they hear to learn words and meanings?

To replicate the challenges of learning language as an infant, Carnegie Mellon University's Lori Holt and Sung-Joo Lim and Stockholm University's Francisco Lacerda used video game training with a mock "alien" language. They discovered that listeners quickly recognize word-like units. They will present their findings at the Acoustical Society of America's annual meeting May 23-27 in Seattle.

To uncover how spoken sounds are decoded, the research team designed a video game narrated in deliberately distorted speech. The soundtrack, unintelligible in any language, was the only source of instruction for 77 adult players in the study. With just two hours of play, the participants could reliably extract world-length sound categories from continuous alien sounds and apply that learning to advance through the game.

"Traditionally, when we study adult learning in the lab, it's nothing like how infants learn language," said Holt, professor of psychology at CMU and a specialist in auditory cognitive neuroscience. "This video game models for adults the challenge language learning poses to infants. This presents the opportunity to study learning in ways that are just not feasible with infants."

Lacerda, professor of phonetics and an expert in language acquisition, agrees that the use of a video game is a promising new way to explore language learning. "This is a wonderful opportunity to approximate the task facing infants by creating a setting where adults are forced to infer what the meaning of different sound elements might be, and to do it in a functional way."

Understanding how language is learned has broad implications from treating dyslexia — which causes difficulty identifying functional sound units — to improving second language learning. Lim, a graduate student in psychology at CMU and lead author of the study, has used the game to help adults learn English. "Native speakers of Japanese can use this type of training to learn English consonants they have difficulty distinguishing," she said.

Holt, director of CMU's Speech Perception and Learning Laboratory, investigates how the brain interprets sound in order to provide a model of auditory categorization to solve problems related to speech perception and communication disorders. Holt and her colleagues are interested in taking this current study further to determine how the video game and its alien soundtrack engage different areas of the brain to produce rapid and robust learning. Their next step is to investigate this by observing players with functional magnetic resonance imaging (fMRI) to view their real-time brain reactions to the video game.

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