Constructing L2 phonetic categories: The influence of variability in neural responses during training

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Even with years of practice, adult learners tend to need more focused and targeted input to achieve native-like perception and production of second language (L2) sounds compared to children. The present study aims to clarify the neural mechanisms through which L2 perception is influenced by variability in first language (L1) sounds. Native English and native Spanish speakers completed a five-day training paradigm during which they learned to discriminate nonnative Hindi sounds. Participants underwent electroencephalogram (EEG) recordings from the scalp, baseline discrimination tasks, and training. We expected that the L1 would modulate the EEG waveform known as the mismatch negativity (MMN) after sound onset elicited in an oddball paradigm. This measure indexes early phonetic learning and previous research has shown that the waveform’s amplitude can change or shift with new phonetic learning, indicating a reorganization of early acoustic and phonetic processing (see Näätänen, 2001, for a review). Importantly, we manipulated the oddball paradigm such that the frequent stimuli were variable; therefore, participants had to construct and use phonetic categories from varying stimuli (see Näätänen, Pakarinen, Rinne, & Takegata, 2004). Unlike previous studies that use the same stimulus repeated as the frequent stimuli (e.g., Tuninetti & Tokowicz, in press), varying the standard stimulus requires more naturalistic processing for using existing and constructing new phonetic categories. Results demonstrate that both learner groups showed a modulation in the MMN waveform after training, but the change was eclipsed by the native contrast that was tested as a control. These results are examined in light of the Perceptual Assimilation Model (PAM; Best, 1991, 1995), the Speech Learning Model (SLM; Flege, 1995), the Native Language Magnet model (NLM; Kuhl et al., 2008), and the Unified Competition Model (UCM; MacWhinney, 2005), examining similarity between L1s, neural hardwiring in the brain, and competition between phonetic contrasts.


Näätänen, R. (2001). The perception of speech sounds by the human brain as reflected by the mismatch negativity (MMN) and its magnetic equivalent MMNm. *Psychophysiology; 38*:1–21.


