

Top-down lexical knowledge directly influences early speech perception

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One of the foundational issues in speech perception is the extent to which top-down information from lexical representations can influence early speech perception. Behavioral measures have been insufficient to solving this debate because they cannot distinguish perception from categorization effects. Cognitive neuroscience measures such as event-related potentials (ERP), however, serve as useful tools for understanding speech sound encoding as it unfolds *over time*, thus allowing us to separate perception from later-occurring processes. Specifically, the auditory N100 ERP component has been shown to be an index of acoustic cue encoding and attention.

In two experiments, we measured cross-modal sequential semantic priming effects on N100 responses. Participants saw visual primes that formed a clear association with the target (“MARCHING *band*”), led to no specific association (“BUTTER *bomb*”), or consisted of a non-word mask. Auditory targets were stop consonants varying in voice onset time (VOT), an acoustic cue signaling the difference between voiced and voiceless sounds. Stimuli included short/voiced (/b,d,g/), ambiguous, and long/voiceless (/p,t,k/) VOT values.

Behaviorally, participants were faster to respond to the starting sound of the target in the Association prime condition than the Neutral prime and Mask conditions. In subjects’ brain responses, we found the expected bottom-up effect of the stimulus VOT (larger N100s for shorter VOTs; Toscano et al., 2010). Additionally, in Experiment 1, we found that Association primes produced smaller N100s when targets were perfectly predictive, suggesting that listeners attended less to those targets. In Experiment 2, ambiguous and unexpected VOTs were added to investigate whether semantic context changed how listeners encode sounds, and we found that ambiguous VOTs were encoded similarly to the voicing endpoint elicited by the prime in the Association condition. These results provide the first ERP evidence that top-down lexical information *directly* influences early perceptual responses through lexical-prelexical interactions.