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Visual-Auditory Interactions and Mismatch Negativity: A Study of the McGurk Effect

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In a previous study we assessed the sensitivity of the mismatch negativity (MMN) to illusory auditory changes. The present study expands the former study to a larger subject sample and adds important control conditions. We induced illusory sounds using the McGurk effect, in which viewing the mouth of a speaker saying "KA" while listening to the speaker say "MA" produces the illusion of hearing "NA." Subjects (n=19, ages 19-25 y) watched movies in which an actor recited a series (4800 trials) of syllables in an oddball task (80% "MA" standards, 10% "KA" target deviants, 10% illusory "NA" non-target deviants). Each subject performed the task under a "strong" condition (MA+KA=NA), and a "weak" condition (BA+GA=DA). Half of the subjects also performed control conditions in which they processed only auditory or visual deviant stimuli. Subjects pressed a button in response to target deviants (KA, GA). For all stimuli, a computer recorded event-related potentials (ERPs) from 30 scalp electrodes, referenced to the nose. We computed average ERPs for each subject x stimulus x condition and measured MMNs in difference waves (deviant auditory - standard, illusory deviant - standard). The illusory deviant stimuli clearly elicited the MMN. However, individual subjects differed in the sensitivity of their MMNs to the illusory deviants. Our results suggest that the MMN generator does not merely rely on auditory information in comparing deviant with standard auditory stimuli. Such information appears to include perceptual interactions such as the visual-auditory illusions of the McGurk effect. Our results also have implications for models of perceptual memory in speech perception.