

Dichotic stimulation accentuates hemispheric asymmetry in pre-attentive change detection for different acoustic features

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Introduction: The left and right hemispheres show functional asymmetries in the processing of acoustic (e.g., temporal) features that are crucial for speech perception. Anomalous asymmetry for a certain acoustic feature may provide a clue to identify the source of deteriorated speech perception. The current study examined the effects of the manner (dichotic vs. monaural) and the ear (left vs. right) of stimulation on the mismatch negativity (MMN) for speech and non-speech sounds, pursuing a fast and reliable method to examine the hemispheric asymmetry at pre-attentive level.

Methods: Speech and non-speech stimulus sequences each comprised a frequent sound (standard: S) and four types of infrequent sounds (deviant: D) that differed from the standard in duration, frequency, intensity, or vowel (or an equivalent temporal-spectral change in non-speech stimuli). The standard and the deviant stimuli appeared alternately (e.g., S D_{frequency} S D_{duration} S...), according to the fast paradigm developed by Näätänen et al. (2004, Clin Neurophysiol). In dichotic condition, speech and non-speech stimuli were presented alternately, with speech stimuli to the right ear and non-speech stimuli to the left ear. The stimulus-ear relation was reversed for half of the experiment. In monaural condition, either the speech or non-speech stimuli alone presented to a single ear. Subjects watched silent films with subtitles and ignore the stimulus sounds.

Results and Discussion: The ear of stimulation had a significant effect on the MMN amplitude for the speech and non-speech stimuli in the dichotic condition whereas it had no effect in the monaural condition (Fig. 1). The results indicated that dichotic stimulation accentuated differential processing of speech vs. non-speech sounds even at preattentive level. The observed ear effects may reflect asymmetric hemispheric contributions for the processing of different acoustic features.

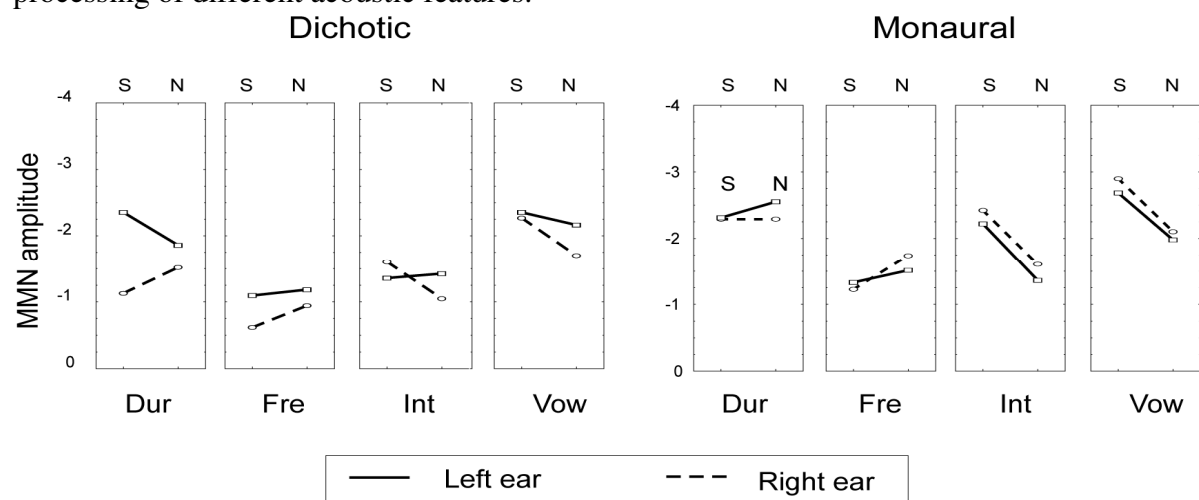


Fig.1 MMN amplitude for duration (Dur), frequency (Fre), intensity (Int), and vowel (Vow) changes in speech (S) and non-speech (N) sounds presented to the left or right ear.