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Paper Title: Neural Generators of Intensity Mismatch Negativity Modelled with a Recurrent Neural Network A Pilot Study on the Role of Sound Level Transitions

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Abstract

Intensity mismatch negativity (MMN) is an electrophysiological response to auditory oddball stimulation with unexpected changes in sound pressure level. Studies using only quieter deviant stimuli leave uncertainty regarding the nature of resulting MMN, with louder deviant stimuli potentially evoking an opposite polarity amplitude shift due to intensity modulation of the auditory evoked response. To test this hypothesis, we conducted a pilot study with three subjects listening to an intensity oddball paradigm with 80 dB standards and 70 dB and 90 dB deviants. Event-related potentials and deviant-minus-standard difference waveforms were analyzed to determine whether MMN elicited by 70 dB and 90 dB reflects simple intensity modulation. We modelled the resulting neural activity with a recurrent neural network (RNN) to estimate generative signals from a distributed source space computed with a template head co-registered with standard 10-20 system electrode locations. Event-related potential waveforms suggest that intensity MMN elicited by quieter and louder auditory stimuli cannot be explained simply by intensity modulation of the auditory evoked response, given that both produced negative amplitudes from 0.1 to 0.25 s. Results from RNN-based source estimation are consistent with bilateral thalamic and right prefrontal contributions to intensity MMN evoked by rising and falling sound level transitions