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Mismatch negativity reflects cognitive performance in healthy older adults

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The EEG technique has been repeatedly shown to support the differentiation of healthy individuals from patients with varying levels of cognitive decline (e.g., mild cognitive impairment – MCI, or different stages of Alzheimer's Disease – AD), mostly in response to cognitive tasks[1–3]. Recently, Stothart et al.[4] reported that EEG components reflecting basic visual processing (e.g., N1, P1 and mismatch negativity – MMN) can be used to distinguish healthy individuals and patients with early AD and amnestic MCI. Furthermore, the amplitude of MMN was associated with the degree of cognitive impairment, measured by mini-mental state examination. It is not yet clear whether these early visual EEG components reflect cognitive performance of individuals without complaints.

Methods: In order to shed light on this question, we recruited 10 elder individuals from the community that did not present any complaints on cognitive decline (average age 72.8, 2 females, all right-handed) and 1 patient with mild cognitive impairment (MCI) diagnosed at the Memory Clinic of UZ Leuven (male, 65 years old, right handed). The Clinical Dementia Rating (CDR) for individuals recruited from the community was equal to 0, while that of the patient was 0.5. All participants were tested using MMSE and the Montreal Cognitive Assessment (MoCA) test before invited to participate in the EEG session. During that session, 64 electrode-EEG was recorded from our participants in response to a modified visual oddball paradigm of which the task was to count the occurrence of a rare stimulus (red filled circle among prevalent blue filled circles). Besides task-related rare- and task-unrelated stimuli, an additional distractor stimulus was presented and its response subtracted from that to the task-unrelated stimulus, yielding the MMN.

Results: For almost every participant a MMN response could be recorded. For the community-recruited individuals we observed a statistically significant moderate positive correlation (Pearson's, Rho = 0.6, $p<0.05$) between MMN amplitude and MoCA outcome. However, for the MCI patient, the MMN amplitude was considerably lower despite the good performance on MMSE and MoCA.

These results suggest that MMN holds promise as a tool for identifying cognitive impairment even when cognitive test results are comparable to those of healthy individuals.

References

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