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# Electrophysiological correlates of the effect of age on mental arithmetic performance

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## Abstract

**Introduction:** According to the findings of current cognitive aging research a decline of activation of brain networks during the execution of various types of tasks can be observed in the elderly. In the present study linear and nonlinear computational techniques were used to quantify changes of EEG-synchronization during mental arithmetic. Region-, and frequency specific EEG-synchronization changes were expected to accompany task performance requiring working memory processing, and that these will be different in young and elderly subjects. **Methods:** A group of elderly (N=20, mean age: 65.4 yrs) and young (N=20, mean age: 22.45 yrs) subjects were studied. The subjects performed a subtraction task in which decision making was required with respect to the result (correct/incorrect), signalled by appropriate button pressing. The EEG was recorded by 33 electrodes. The 2048 ms long epochs before button pressing were analysed by calculating linear-nonlinear EEG-synchronization and graph theoretical indices in different frequency bands, and behavioural (RT, number of errors) measures. **Results:** Increased synchrony of the slow frequency bands and characteristic patterns of graph theoretical measures were found to be associated with task execution, which changes were more conspicuous in the young. Behavioural performance was worse (marginally significant) in the elderly. **Conclusions:** The more robust changes of synchronization features and better performance in the young probably correspond to a more optimal neural network organization especially regarding long-distance integrative activity associated with efficient working memory processes.

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