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An electroencephalographic investigation of the impact of eye movements in a memory probe task

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Most neuroscientists often neglect that the soundest motivation for excluding EEG epochs contaminated by saccades from analysis does not entail only signal quality but also signal meaning. Saccades can in fact be an overt manifestation of spurious cognitive processing that may distort the interpretation of event-related potentials (ERP). We evaluated this potential risk by comparing two artifact removal methods (a standard epoch rejection method and independent components analysis, or ICA) on a lateralized ERP component indexing visual working memory load, i.e., the sustained posterior contralateral negativity (SPCN).

Subjects had to memorize an array composed of a variable number of laterally displayed colored squares. In half of the experiment, subjects had to keep their gaze at fixation, whereas they had to saccade towards the memoranda in the other half. The memory array was displayed for 100 ms or 500 ms so as to check for effects of the post-saccade physical availability of the memoranda on SPCN amplitude and latency.

The results were clear-cut in showing that, relative to epoch rejection, ICA correction preserved both quality and meaning of SPCN amplitude. The post-saccade physical availability of the memoranda affected the latency of the SPCN, with shorter SPCN offset latency when the memoranda were exposed for 500 ms than for 100 ms, probably due to a post-saccade retinotopical remapping of the memoranda.

The results are discussed with reference to the possible modifications of instructions and designs that can be used to test visual working memory load in analogous probe designs.

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