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Genevieve Steiner

University of Wollongong, gsteiner@uow.edu.au

Robert Barry

University of Wollongong, rbarry@uow.edu.au

Craig J. Gonsalvez

University of Wollongong, craig@uow.edu.au

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Abstract

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Matching-stimulus-interval affects the N2 and the P3: a principal components analysis

Genevieve Z. Steiner^{1*}, Robert J. Barry¹ and Craig J. Gonsalvez¹

¹School of Psychology, University of Wollongong, Australia

Aims: Intervals between matching stimuli (target-to-target interval, TTI; nontarget-to-nontarget interval, NNI) have been shown to play a role in determining the amplitude and latency of the P3 ERP component in a variety of oddball tasks. The mechanism of matching-stimulus-interval effects is unknown, however it has been theorised that interval effects seen in the P3 are an outcome of working memory processes (update and decay of the memory trace, or “template”). To further understand this mechanism, we explored whether TTI and infrequent NNI determined the magnitude of another ERP component, the N2, in a visual three-stimulus oddball task. **Method:** Continuous EEG data were acquired from 24 university students whilst they completed a three-stimulus visual oddball task with a fixed SOA and seven manipulations of TTI and infrequent NNI. Offline data were corrected for artefact, filtered, epoched, baselined, and separate averages were computed for each TTI and infrequent NNI. Post-processed ERPs were then submitted to an unrestricted temporal principal components analysis (PCA) with orthogonal VARIMAX rotation. Two factors identified as the N2 and P3 in terms of their latency, topography, and sequence, were extracted for subsequent analysis. **Results:** As expected, P3 amplitude augmented as matching-stimulus interval increased; this linear trend differed between stimuli, with targets eliciting a steeper increase in P3 amplitude than infrequent nontargets. N2 also showed an across-stimulus increase in negativity as interval increased, but unlike the P3, this did not differ significantly between stimulus types. **Conclusions:** It was demonstrated that matching-stimulus-interval effects are not restricted to the P3, with interval effects evident in an earlier component, the N2. This suggests that the TTI/NNI-mechanism may be the outcome of a wider range of executive processes than originally conceptualised, or a refractory-period effect, and future theory development needs to take this into account.

Keywords: Event-related potentials (ERPs), Target-to-target interval (TTI), Sequence effects, Interstimulus interval (ISI), P3(00), Principal Components Analysis (PCA)

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* Correspondence: Miss. Genevieve Z. Steiner, School of Psychology, University of Wollongong, Wollongong, NSW, Australia, gsteiner@uow.edu.au