The Simon Paradigm in a Throwing Task: The Quiet Eye Inhibits Interference

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Introduction

For the explanation of the well-documented efficiency of long final fixations for superior motor performance, among others, it is hypothesised that the so-called Quiet Eye (QE) inhibits interfering movement variants in movement preparation and execution (Klostermann, 2013). For an experimental test of this hypothesis, interferences were experimentally manipulated by applying the Simon paradigm (e.g., Lu & Proctor, 1995) in a throwing task.

Methods

In a within-subject design, 16 participants threw balls at two targets displayed either to the left or to the right at a screen. In each trial, the respective target position was instructed via headphones by high- vs. low-pitched tones that were either presented to the left or the right ear (stimulus-response congruence was counterbalanced). Consequently, half of the trials had congruent and half of the trials incongruent stimulus and response locations. As dependent variables QE onset and offset – i.e. the first fixation on the target after stimulus onset relative to movement initiation – as well as the radial error were calculated. Furthermore, efficiency of QE was assessed by running intra-individual correlations between the QE measures and the radial error. All variables were analysed by 2 (congruence) x 2 (target position) ANOVAs with repeated measures. Further, the relevance of QE efficiency was determined by simple t-tests with zero correlation as test value. Two participants had to be removed due to technical problems with the eye tracker.

Results

The Simon manipulation was successful as revealed by a later movement initiation, $F(1,13) = 12.42$, $p < .01$, $\eta^2 = .49$, and inferior performance, $F(1,13) = 4.71$, $p < .05$, $\eta^2 = .27$, in incongruent when beeing compared to congruent trials. Beyond, both for QE onset and QE offset neither significant main effects nor interactions were revealed (all $ps > .12$). Finally, only for QE offset a significant main effect for congruency appeared, $F(1,13) = 5.91$, $p < .05$, $\eta^2 = .31$, with lower and from zero differing, $t(13) = 2.84$, $p < .05$, $d = 0.79$, negative correlations for incongruent vs. congruent trials.

Discussion

Since incongruences between stimulus and response location affected the throwing movement negatively the lab-based Simon effect could be extended to gross motor skills. Additionally, as expected, only for incongruent trials the efficiency of the QE was revealed with later QE offsets enhancing performance. This finding suggests that interferences caused by the stimulus-response incongruence evoked a functionality of the QE strengthening the suggestion of an inhibition mechanism for the explanation of the QE phenomenon (Klostermann, 2013).

References

Lu C-H, Proctor, RW (1995). Psychon B Rev, 2, 174-207.
Klostermann, A (2013). Sportwiss, doi: 10.1007/s12662-013-0313-9.