Task relevance of visual information and the functionality of "Quiet Eye". An essential dependency?

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Introduction

Although the performance-enhancing effect of the Quiet Eye (QE) is well documented (Vickers, 2011), underpinning mechanisms have been only rudimentarily studied. Therefore, an inhibition hypothesis is proposed, postulating that in the QE period interfering movement variants are inhibited so that the most appropriate movement variant can be optimally parameterized. The aim of this study was to test a central prediction of this hypothesis by examining whether QE effects depend on the task relevance of visual information.

Methods

In a within-subject design both QE onset and information relevance (both times early vs. late) were manipulated using an experimental paradigm in which 20 participants had to throw balls as accurate as possible at a virtual target disk (Klostermann et al., 2013). The manipulation consisted of a peripheral flicker cue to evoke a final fixation earlier or later at one of four possible target positions at which correspondingly the target disk was presented earlier or later. As variables QE onset and offset – i.e. beginning and end of the last fixation on the target position before movement initiation – as well as the radial error (RE) were calculated and analyzed with a 2 (QE onset) x 2 (target onset) ANOVA with repeated measures and planned t-tests.

Results

The QE manipulation was successful as independent of target onset, earlier QE onsets were located in the early compared to the late QE onset conditions, $F(1, 19) = 35.5$, $p < .001$, $\eta^2 = .65$. No differences in QE offset were revealed. Above that, the RE was significantly lower in the early compared to the late target onset condition, $F(1, 19) = 4.5$, $p < .05$, $\eta^2 = .19$. Finally, a significant QE onset x target onset interaction was found, $F(1, 19) = 5.3$, $p < .05$, $\eta^2 = .22$, revealing performance differences only between the early QE / target onset condition and the remaining three conditions (all *ps* < .05) No further differences were found (all *ps* > .50).

Discussion

The results support the inhibition hypothesis in so far as throwing performance did not depend on the QE duration but on the duration in which information about the actual target position was displayed. This finding indicates that it is not the length of the QE duration per se that matters but the effective use of this duration for processing *task relevant* visual information. Notably, a comparison of the two conditions in which only the QE but not the target onset differed, supports in particular this interpretation as no performance differences appeared. Further evidence was presented, emphasizing the functionality of the QE for offline parameterization processes in the framework of the proposed inhibition hypothesis.

References

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