The timing of spontaneous eye blinks shows different influences during a visual and an auditory temporal judgement task

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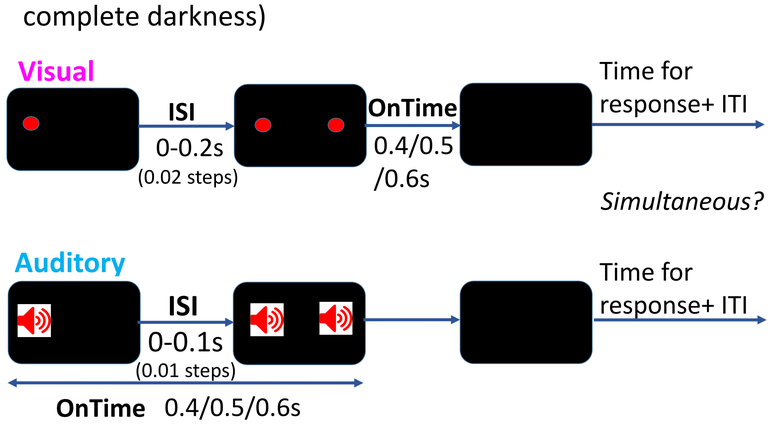
Introduction

Spontaneous eye blinks are modulated in the course of a task, likely due to changing attentional requirements (Oh, Jeong, & Jeong, 2012). Additionally, blink probability is influenced by the sensory input especially in the visual domain (Bonneh, Adini , & Polat, 2016).

Our aim was to disentangle the influences of attention and sensory input on blinking and understand if the duration of relevant information rather than the overall duration of the sensory input influences blink probabilities. We compare the influences between the **visual** and the **auditory** domain.

Methods

- Eyes were recorded using the SMI eye tracker
- Task: Report if the sensory input appeared at the same or at different times with a key press (randomized, on complete darkness)



Analysis

1. **Temporal modulation of the blink rate:** the normalized mean blink rates (value around 1) in a non-overlapping sliding window of 0.1s around the events were compared against 1 with a one sample t-test for each time window (Bonferroni corrected).
2. For **the input specific influence on blink latency**, we divided the trials according to the ISIs and Ontimes and calculated the mean first blink latency for each ISI (normalized over Ontimes).

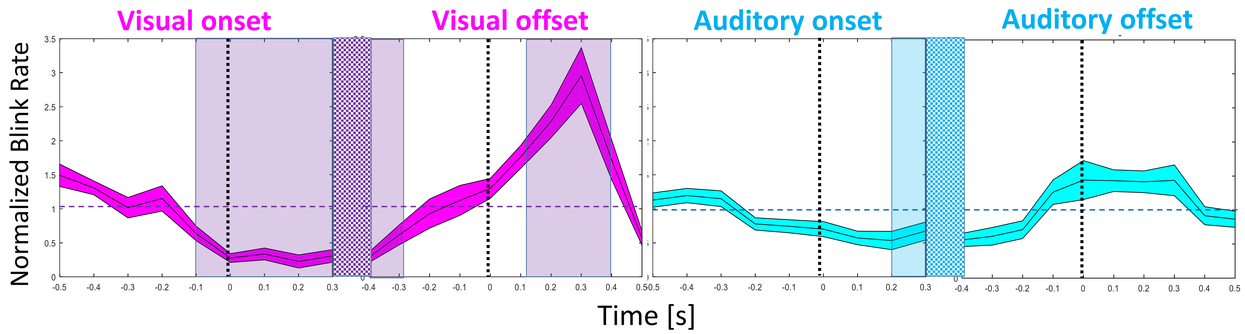
References

Bonneh, Y. S., Adini , Y., & Polat, U. (2016). Contrast sensitivity revealed by spontaneous eyeblinks: Evidence for a common mechanism of oculomotor inhibition. Journal of Vision, 1-15.
.Oh, J., Jeong, S.-Y., & Jeong, J. (2012). The timing and temporal patterns of eye blinking are dynamically modulated by attention. Human Movement Science, 1353-1365.

Results

1. Blink rate

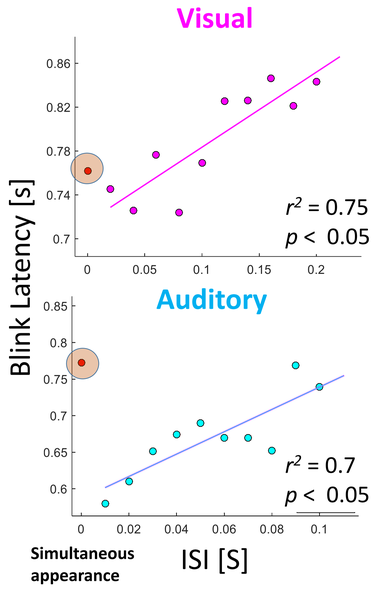
Eye blink rates are modulated similarly for the visual and auditory tasks, with a decrease before the expected sensory input and an increase during the stimulus offset.



2. Blink latency

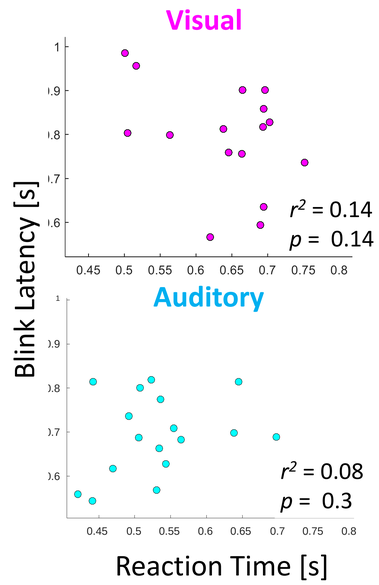
Duration of relevant information (ISI)

Increased ISI -> later blink
Exception: auditory 0 ISI -> blink after highest ISI (since 2 simultaneous tones cannot be distinguished)



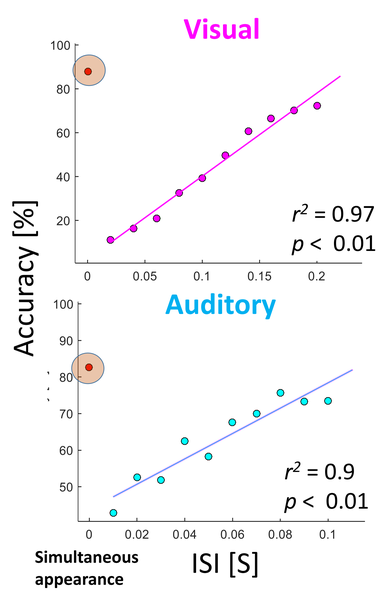
Time of motor response (RT)

No significant correlation between blink latency and RT



Task difficulty/demand (accuracy)

Increased ISI -> Increased Accuracy
Exception: 0 ISI



Conclusion

Cognitive influences related to the expectancy of sensory input suppress blinking similarly in the visual and auditory domain. Blink rate further increases after stimulus offset in both domains. Additionally, minute changes during ongoing sensory stimulation modulate blink latency. This influence is independent of the overall duration of the sensory input but pertains to the task relevant information.

Our study highlights visual-independent but temporally fine-grained influences of top-down defined task relevant information on blinking.