The control of attention is altered in the absence of subjective awareness

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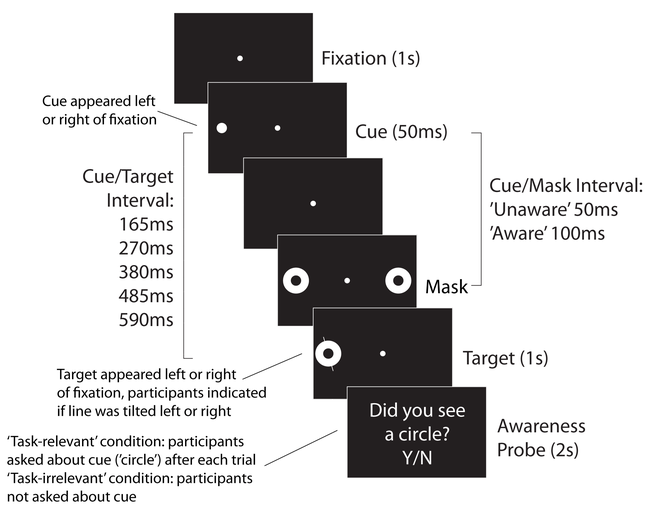
Introduction

- Many cognitive functions can be carried out in the absence of subjective awareness[1]. It is thus unclear what role, if any, subjective awareness plays in brain function.
- We recently proposed that one function of subjective awareness is as part of a model-based control mechanism for attention[1].
- Many recent studies have shown that awareness and attention are dissociable[1,2,3], suggesting that awareness is not necessary for attention.
- Nevertheless, it is not known whether and how awareness affects the control of attention.
- We hypothesized that the control of attention would be enhanced in the presence of subjective awareness.

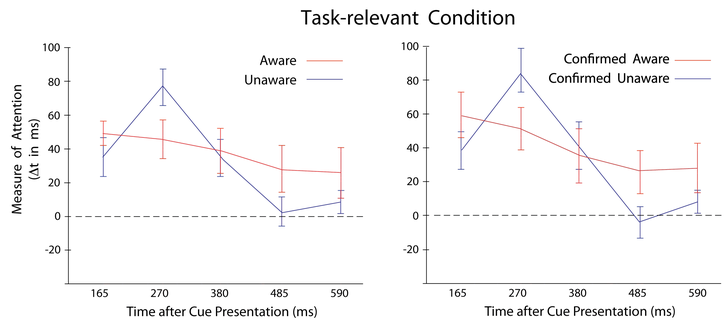
Aim: Directly compare attention in the presence and absence of awareness.

Experiment 1 - Materials & Methods

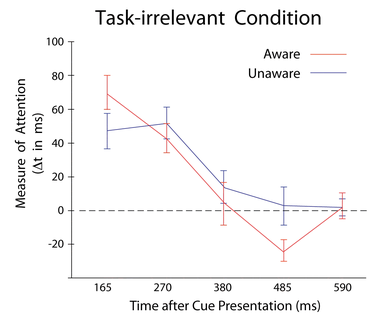


- Participants aware of cue on ~80% of trials in 'aware' condition and ~30% of trials in 'unaware' condition.
- Cue appeared at opposite location as target (misaligned trial) and same location as target (aligned trial) with equal probability. Average response time difference between misaligned and aligned trials used as measure of attention.
- There were 15 participants tested at each of 5 timepoints, and in each of the 2 task-relevance conditions (cue task-relevant, cue task-irrelevant), 150 participants in total.

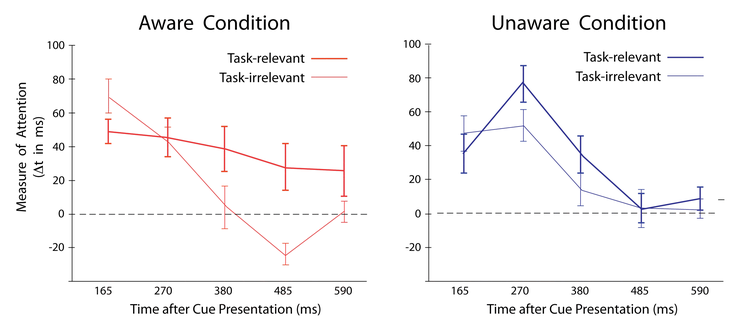
Experiment 1 -Results



Main effect of time ($p = 0.005$), interaction between time and awareness condition ($p = 0.02$).
Same effects observed when trials limited to 'confirmed aware' and 'confirmed unaware'.

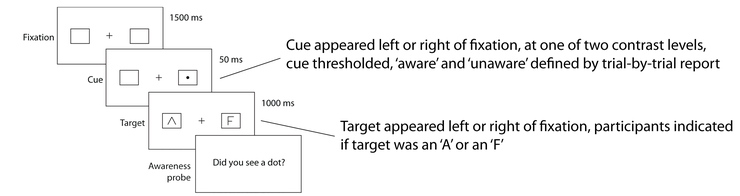


Main effect of time ($p < 0.001$), interaction between time and awareness condition ($p = 0.02$).

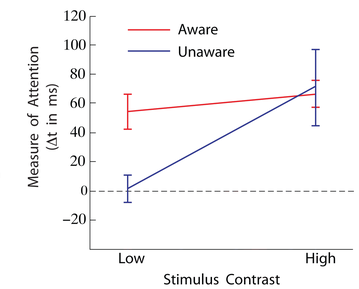


3-way interaction between time, awareness condition, and task-relevance ($p = 0.01$).

Experiment 2



- Cue appeared at opposite location as target (misaligned trial) and same location as target (aligned trial) with equal probability. Average response time difference between misaligned and aligned trials used as measure of attention.
- N = 26
- Main effect of stimulus contrast ($p = 0.005$), interaction between stimulus contrast and awareness ($p = 0.02$).



Conclusions

- The timecourse of attention was different in the absence of attention.
- The difference was not a simple decrease in attention. At one timepoint, attention was actually greater without awareness.
- With awareness, attention to a task-relevant cue was sustained, attention to a task-irrelevant cue was inhibited.
- Without awareness, attention was still possible, but did not change according to the demands of the task.
- Without awareness, attention was more susceptible to external perturbation.
- The results suggest subjective awareness is not an epiphenomenon. The control of attention was enhanced in a specific way in the presence of awareness.

References

1) Webb, T. W., & Graziano, M. S. A. (2015). The attention schema theory: a mechanistic account of subjective awareness. Frontiers in Psychology, doi:10.3389/fpsyg.2015.00500.
2) Koch, C., & Tsuchiya, N. (2007). Attention and consciousness: two distinct brain processes. Trends in Cognitive Sciences, 11, 16-22.
3) Kentridge, R. W. (2011). Attention without awareness. Attention: Philosophical and Psychological Essays, 228.

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