THE CONSEQUENCES OF EFFECTS OF SALIENCY ARE LONG-LIVED (AND STUBBORN)

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General task design (Constant & Liesefeld, 2021)



(14-3000 ms)

(no response deadline)

METHOD. Saliency is manipulated independently from the to-be-remembered stimulus feature (color) via the degree of tilt in three steps (12°, 28°, 45°). Vertical bars are completely irrelevant and are easy to ignore (Liesefeld et al., 2016).

One of the three tilted target bars is probed at the end of the trial and its color has to be reproduced. The absolute distance between reproduced and actual color of the probed bar (recall error) is our dependent variable of interest.

BACKGROUND. Donk & van Zoest (2008) found that saliency is represented in the visual system for only a few hundred milliseconds after stimulus onset. This has been interpreted as indication that saliency plays a role for visual cognition only within a very narrow time interval and that there is little temporal overlap between top-down and bottom-up processes so that these can hardly interact.

Constant & Liesefeld (2021) found massive effects of saliency more than 1,300 ms after display onset in a newly designed visual-working-memory task.

GOAL. In a series of experiments, we examined how long effects of saliency remain and what it takes to overcome these effects.

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References

Constant, M., & Liesefeld, H. R. (2021). Massive effects of saliency on information processing in visual working memory. *Psychological* Science, 32(5), 682-691. https://doi.org/10.1177/0956797620975785

Donk, M., & van Zoest, W. (2008). Effects of salience are short-lived. *Psychological Science*, 19(7), 733–739. https://doi.org/10.1111/j.1467-9280.2008.02149.x

Liesefeld, H. R., Moran, R., Usher, M., Müller, H. J., & Zehetleitner, M. (2016). Search efficiency as a function of target saliency: The transition from inefficient to efficient search and beyond. Journal of Experimental Psychology: Human Perception and Performance, 42(6), 821–836. https://doi.org/10.1037/xhp0000156

Liesefeld, H. R., Liesefeld, A. M., Sauseng, P., Jacob, S. N., & Müller, H. J. (2020). How visual working memory handles distraction: Cognitive mechanisms and electrophysiological correlates. Visual Cognition, 28(5–8), 372–387. https://doi.org/10.1080/13506285.2020.1773594 Wolfe, J. M. (2021). Guided Search 6.0: An updated model of visual search. *Psychonomic Bulletin & Review, 28*, 1060–1092. https://doi.org/10.3758/s13423-020-01859-9





Experiment 1: How long does it take for an effect of saliency to dissipate?

METHOD. We manipulated presentation time in between 14 ms and 2000 ms (without masking). **RESULTS** (*n* = 16):



CONCLUSIONS. Performance improves (falling lines) and the effect of saliency decreases over time (approaching lines), but is still present after 2000 ms presentation time. That is, saliency affected behavior more than 3000 ms after display onset.

Experiment 2: Can people overrule an effect of saliency when this is incentivized?

METHOD. We tried to bias participants against the effect of saliency by probing less salient objects more often (prevalence; Exp. 2a) or by assigning a higher reward for good performance when less salient objects are probed (reward; Exp. 2b).

POTENTIAL OUTCOMES:





No control

Immediate Control



CONCLUSIONS. Incentives did not alter the effect of saliency with short presentation durations.

With 2000 ms presentation time they managed to compensate for the effect of saliency, but even with 3000 ms presentation time the effect did not reliably reverse.

Apparently, neither task goals nor experience (prevalence, reward) have the power to overrule saliency, but they have an effect and their influence increases over time. See Liesefeld et al. (2020), for a biasedcompetition-based theoretical framework that can account for these dynamics.





Experiment 3: Does the time course differ between effects of relative vs. absolute saliency?

BACKGROUND. The effect of saliency is due to a mix of absolute saliency and relative saliency (relative to the other targets in the display).

A target of higher (relative) saliency is a stronger competitor for limited ressources.

The effect of relative saliency results in an disadvantage for 12° targets and an advantage for 45° targets in mixed displays with respect to same displays.

METHOD. We ran two types of displays (mixed vs. same) and two presentation times (350 vs. 2000 ms).



mixed display



CONCLUSIONS. The effect of relative saliency is present at 350 ms presentation time as evidenced by the cross-over pattern, but has dissipated at 2000 ms. The effect of absolute saliency remains even at 2000 ms presentation time. This pattern can be explained in terms of limited-capacity parallel encoding with saliency-dependent start time similar to Guided Search 4.0+ (e.g., Wolfe, 2021; model in development).



12°-same display



45°-same display

Probed Target

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