Peripheral Visual Information Halves Attentional Choice Biases

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Introduction

Visual attention causally influences choices.

- An increase in the relative attention received by a desireable option increases the frequency with which it is chosen [1–3].

We do not know the channels through which covert visual attention influences choices.

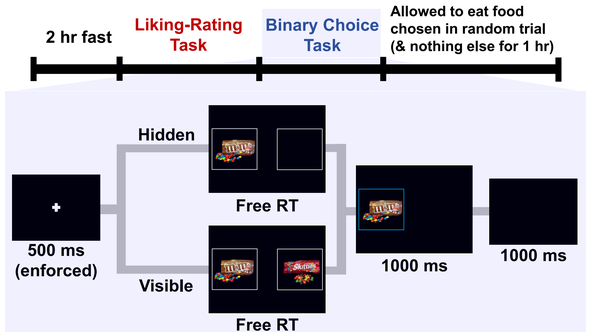
- Overt attention increases the tendency to overweight the value of fixated options [4–8].
- Covert attention influences early vision (selective attention) [9].

How does peripheral visual information impact choices?

H0: No impact on choice.
H1: Affects choices by altering fixation patterns.
H2: Affects choices by influencing the relative weighting of the value of the nonfixated item (θ).
H3: H1 + H2.

Eye-Tracking Task

- $N = 50$.
- 360 - 400 choices per subject.
- 4 blocks, 2 conditions:
  - Visible: standard binary food choice task.
  - Hidden: nonfixated options hidden.



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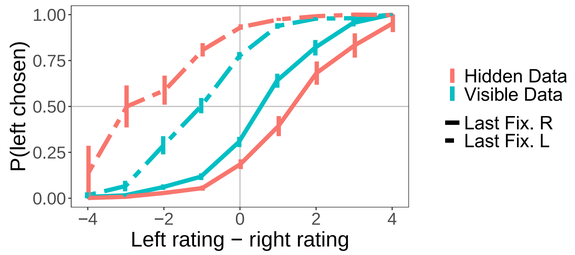
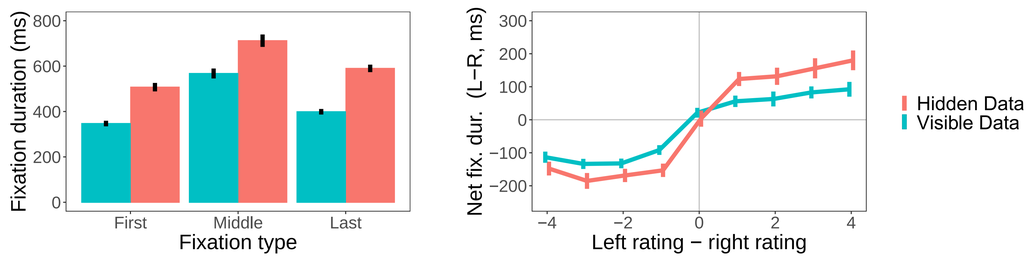
Data and code avail. on lab website.

Results

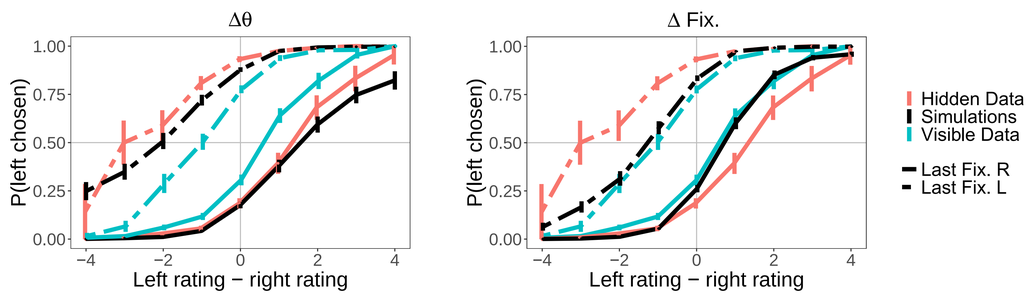
Attentional choice bias When items are equally valued, people are 2.5 times more likely to choose the last fixated item. When peripheral visual information is removed ("hidden" condition), they become 5 times more likely.



Fixation patterns In the hidden condition, fixation durations grow by about 40% and more time is spent looking at the better item.



aDDM $\theta_{\text{Visible}} = 0.52$ $[.44, .61]$. $\theta_{\text{Hidden}} = 0.29$ $[.17, .39]$. Using the aDDM to simulate behavior, we found that only changes to attentional discounting (not changes to fixation patterns) result in attentional choice biases that mimic observed behavior in the hidden condition.



Hypotheses

H0: No impact on choice. (Results, Attentional choice bias)	UNSUPPORTED
H1: Affects *choice biases* by altering fixation patterns. (Results, aDDM right)	UNSUPPORTED
H2: Affects *choice biases* by altering attentional discounting. (Results, aDDM left)	SUPPORTED
H3: H1 + H2. (see manuscript, QR code)	SUPPORTED

Model

Attentional Drift-Diffusion-Model (aDDM)

$$\text{Evidence}_t = \text{Evidence}_{t-1} + \mu_t + \epsilon_t$$

- Fixated left: $\mu_t = d(V_L - \theta V_R)$.
- Fixated right: $\mu_t = d(\theta V_L - V_R)$.
- Noise: $\epsilon_t \sim N(0, \sigma^2)$.
- Attentional discounting: $\theta \in (0, 1)$.
- Evidence accumulation to decision bounds fixed at ± 1.

Discussion

Removing peripheral visual information:

- slows down the fixation and decision process considerably.
- approximately doubles the magnitude of attentional choice biases.

Changes to fixation patterns in the hidden condition could be facilitated by:

- changes to the priority map that controls fixation durations and locations [10].
- increased difficulty of generating value samples for nonfixated stimuli [11, 12].

Our results suggest that individuals might be influenceable by settings in which only one item is shown at a time, such as e-commerce.

References

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