

Experience with Difficult Dual-Color Search Can Promote a Shift to a Single Range Target Representation

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BACKGROUND

- Certain kinds of visual experience can influence the guidance of attention on a subsequent search (e.g., priming, value-driven attention, contextual cueing)¹.
- Attentional guidance based on experience can interact with top-down control, improving or impairing search performance.

AIMS

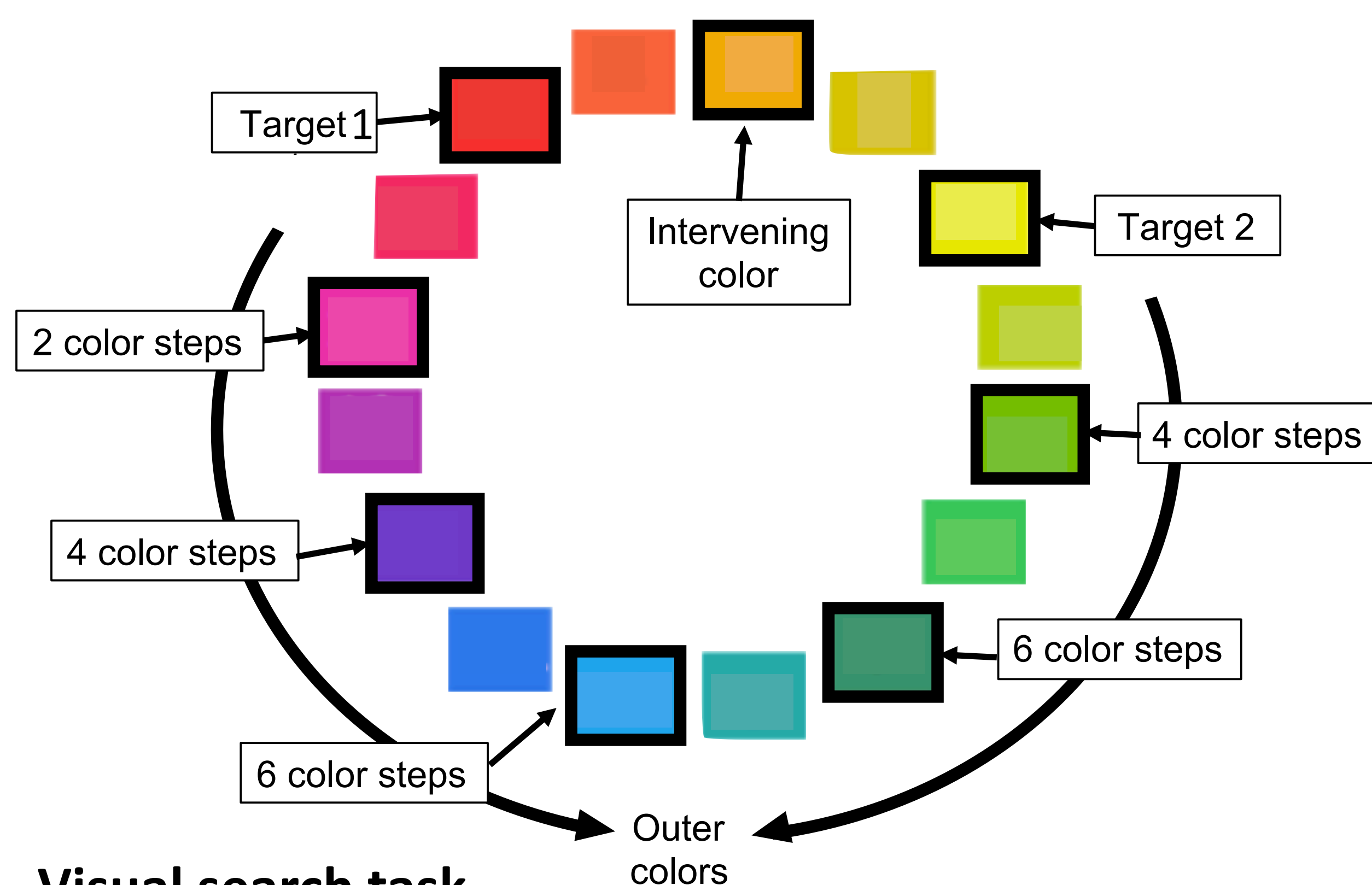
- Explore the effect of experience with *difficult search* on top-down guidance of attention.

RESEARCH QUESTIONS

- Does experience with difficult color search modulate observer's search strategy?
- If so, what is the most effective search strategy?

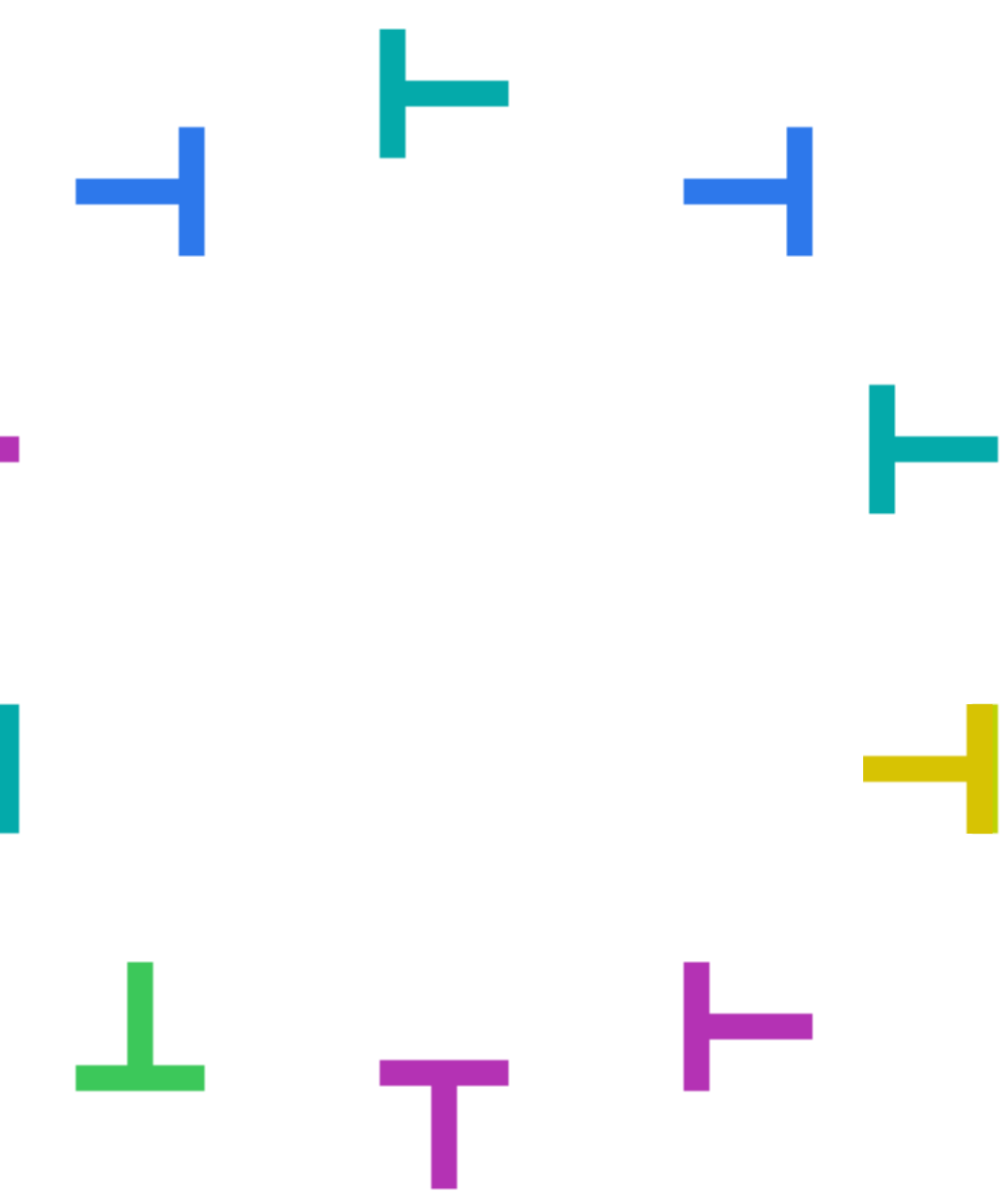
STUDY DESIGN

Colors Used in Search Stimuli



Visual search task

Search for either of two colored Ts among other colored Ts. Respond indicating target presence or absence.²



Two subject groups

EASY search experience group

- 100% easy search trials (8 colors used).

HARD search experience group

- 50% difficult search trials (16 colors used and target-similar colors frequently used as distractor colors.) + 50% easy search trials (8 colors used)
- These two different search trials were intermixed.

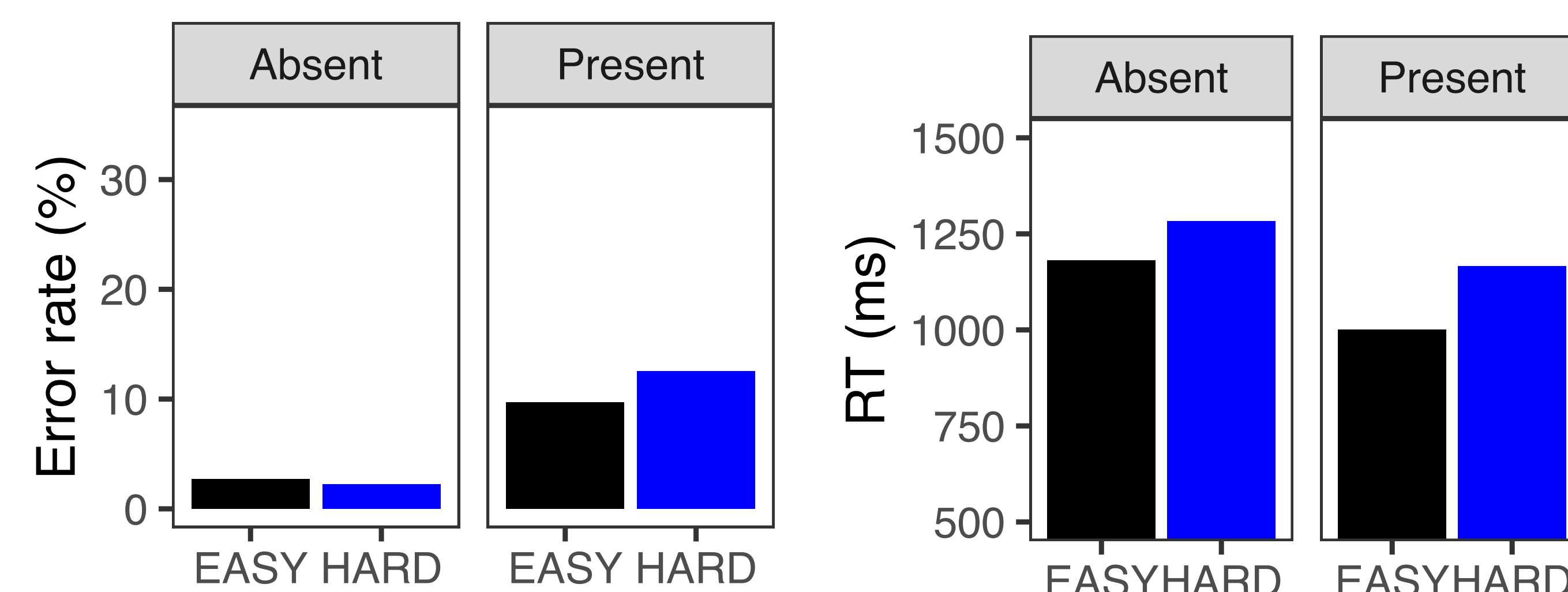
RESULTS & DISCUSSION

How does experience with difficult dual-color search affect search strategy and performance?

(Only easy search trials were used for statistical analyses)

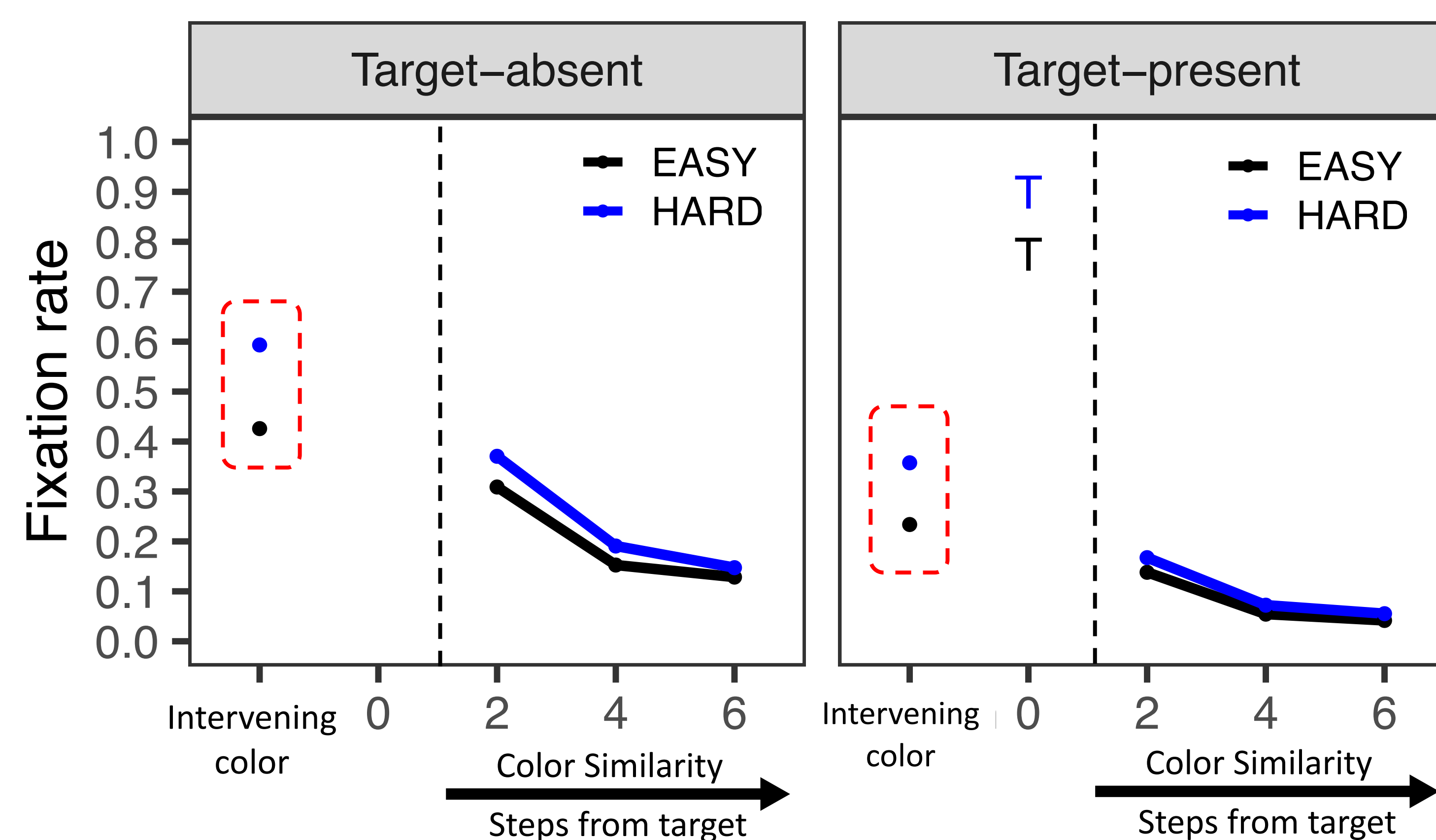
Experiment 1: Consistent targets (n = 64)

Behavioral Data



- No group difference in both error rate and RT, $ps > .05$

Eye Movement Data



- Intervening color: Higher fixation rate for the **HARD** group than the **EASY** Group, $ps < .01$
- Outer colors: no significant difference between the groups, $ps > .1$.
- Target: Higher fixation rate for the **HARD** group than the **EASY** group, $p < .05$.

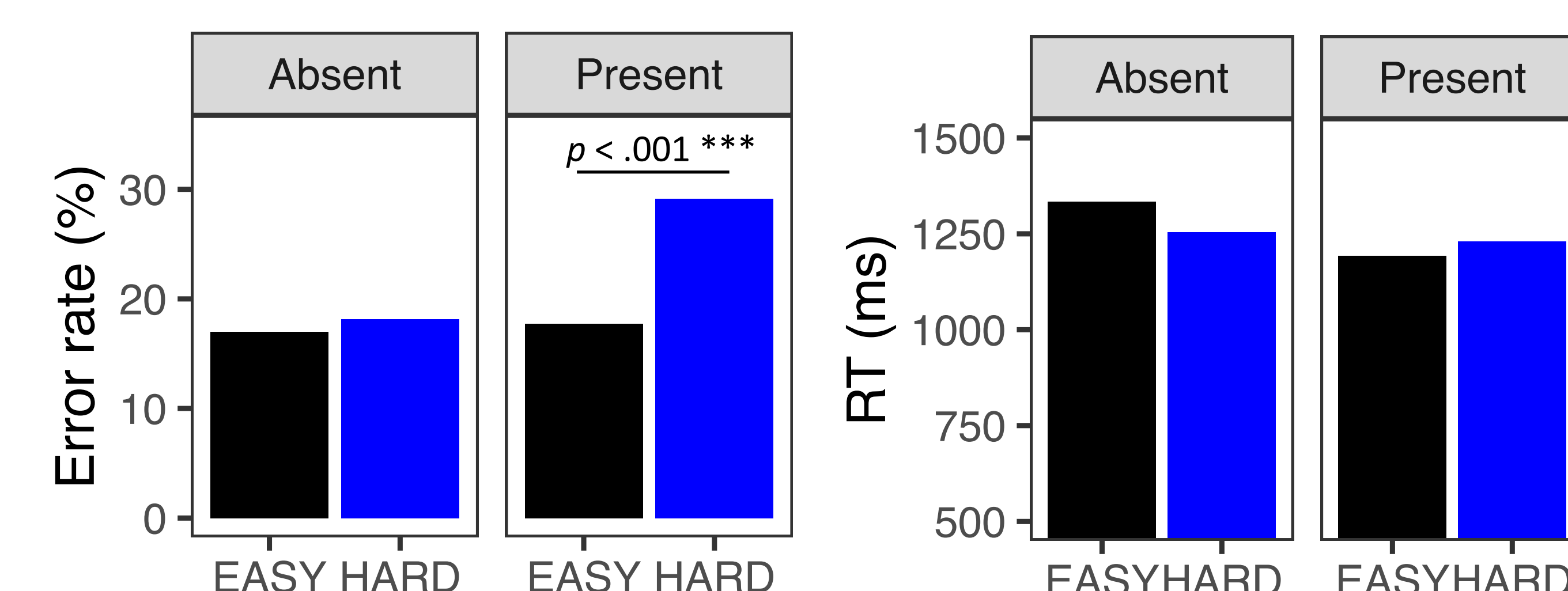
Group	Preparation	Guidance	Target verification
EASY	194ms	306ms	517ms
HARD	166ms	354ms	625ms

$p < .01^{**}$ (Preparation), $p < .05^*$ (Target verification)

WHEN TARGET COLORS WERE CONSISTENT, the **HARD** group showed 1) higher fixation rate for the intervening color and targets and 2) longer target verification time. These results indicate that the **HARD** group was more likely to represent the two target colors as a single range, including the intervening color.

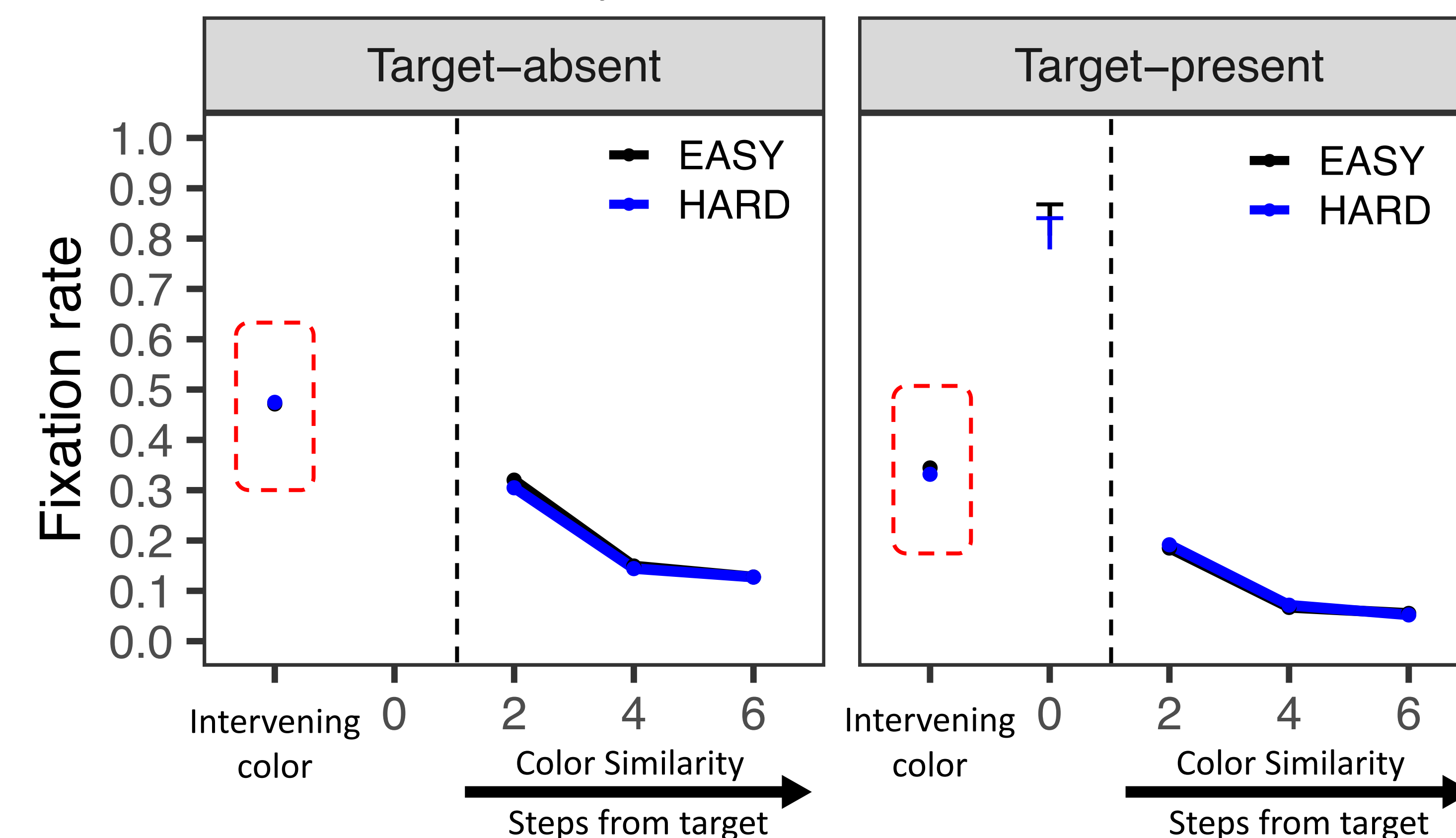
Experiment 2: Varied targets (n = 64)

Behavioral Data



- Higher error rate for **HARD** group than **EASY** group in target-present trials, $p < .001$.

Eye Movement Data



- Intervening color: no significant difference between the groups, $ps > .5$
- Outer colors: no significant difference between the groups, $ps > .6$.
- Target: no significant difference between the groups, $p = .23$.

Group	Preparation	Guidance	Target verification
EASY	186ms	352ms	610ms
HARD	184ms	326ms	679ms

WHEN TARGET COLORS WERE VARIED, we could not find any significant effect on eye movement data, but found higher target miss rate for the **HARD** group than the **EASY** group.

The experience with difficult dual-color search encouraged observers to build a single range target representation, leading to poorer attentional guidance and target verification, but this range target representation only occurred when that representation could be stored in Long-Term Memory.

REFERENCES

- Theeuwes, J. (2018). Visual Selection: Usually Fast and Automatic; Seldom Slow and Volitional. *Journal of Cognition*, 1(1), 1–15.
- Stroud, M. J., Menneer, T., Cave, K. R., & Donnelly, N. (2012). Using the dual-target cost to explore the nature of search target representations. *Journal of Experimental Psychology: Human Perception and Performance*, 38(1), 113–122.