How Target/Distractor Discriminability Affects Search Guidance Strategy
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ABSTRACT
A search template that guides attention toward visual targets can be adjusted according to experience. The present study manipulated the discriminability between target and distractor colors to determine whether difficult (low) discriminability elicits more precise representation of the target colors than easy (high) discriminability. It also explored whether participants shift away from color guidance when forced to make more difficult discriminations. One group searched through randomly mixed trials with easy- or difficult-discriminability arrays of colored T targets among colored Ls, and another group searched through easy-discriminability displays only. We compared fixation data from the easy-discriminability trials in both groups: participants with experience of difficult discriminability had more unguided fixations to distractors with very different colors from the target, suggesting that participants use color information less to guide search when color discriminability might be difficult. There was no evidence that difficult discriminability prompted participants to encode target colors more precisely.

BACKGROUND
A search template that guides attention toward visual targets can be adjusted according to experience.
- Bays and Husain (2008) show that precision of memory representations can vary across conditions.
- The search template can be adjusted to match different target features within a dimension (Navalpakkam & Itti, 2006).
- Observers can make different search templates for the same target in different contexts (Bravo & Farid, 2016).

RESEARCH QUESTION
Does the experience of difficult color discriminability elicit more precise representation of the target colors than easy discriminability? Or does it make participants less likely to use color to guide search?

STUDY DESIGN
Visual search task
Search for a T among Ls; T is one of two colors. Respond whether a target is present (Stroud et al., 2012). Color guidance can make search more efficient, but is not required to find the target.

Two type of trials
- 16-color trials: 16 colors were used for target and distractor colors. Also, distractors frequently appeared with target-similar colors.
- 8-color trials: 8 colors were used for target and distractor colors. All colors were equally likely to appear.

Two discrimination groups
Hard discrimination group: in half of the trials, participants experienced very difficult search.
- 50% 16-color trials (Hard16) + 50% 8-color trials (Hard08)
Easy discrimination group: participants did not experience difficult search.
- 100% 8-color trials (Easy08)

RESULTS
Did participants who experienced difficult color discriminability use color information more effectively than participants who did not?

- No main effect of group, p = .991.
- Main effect of target presence, p < .001.***
- No sig. interaction, p = .79.
- No main effect of group, p = .257.
- Main effect of target presence, p < .001.***
- No sig. interaction, p = .368.

The Hard group fixated more objects per trial than the Easy group did. Color guidance is less effective for the Hard group, so they fixate more objects.

REFERENCES

SUMMARY & CONCLUSION
We compared search performance between two different groups with and without the experience of hard color discriminability. The Hard group fixated more target-dissimilar distractors than the Easy group did, even in the search arrays that were identical for both groups. Also, the Hard group fixated more objects per trial than the Easy group.

In conclusion, the participants used color less effectively to guide search when target colors were difficult to distinguish from distractors on some trials.

Lab website: http://blogs.umass.edu/vcalab/research