Positions priming in briefly presented search arrays
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Position and color priming in briefly presented search arrays

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Introduction

In efficient visual search, *priming of pop-out* (PoP: Maljkovic & Nakayama, 1994, 1996) is usually reported as a speeded response when a target feature is repeated on consecutive trials.

Feature facilitation accounts: Sensitization to features via short-term memory. Priming at perceptual level.

Post-perceptual accounts: PoP affects response times, not accuracy, via response repetition benefits, decision bias or other “late” effects.

Questions:

1. Do color and/or position repetitions increase accuracy at brief exposure durations?
2. If so, is a category weighting account a viable explanation of the PoP when applied within a TVA-framework (Bundesen, 1990)?

The experiment

We tried to replicate perceptual priming effects in an accuracy based design (Yashar & Lamy, 2010) while generalizing to alphanumerical stimuli. Our design also has the advantage of multiple responses (15 consonants), which minimizes any effects of response repetition and visuomotor effects, leaving the results more readily interpreted as perceptual effects.

We presented subjects with a 3x3 consonant matrix where a target would always occupy one of the four corner positions. The displays where present for 10-180 msec.

The subjects’ task was to report the odd-one-out letter by pressing the appropriate key on a keyboard. The target identity was determined by color and varied randomly (Figure 1).

Methods

Participants were 8 students at the University of Iceland (3 male), ages 22-28. Each subject participated in at least 15 blocks of 100 trials. Trials following incorrect ones are discarded, since it may be meaningless to speak of repetitions/alternations from an experimental point of view.

Stimuli were either red or blue. This was determined randomly for each trial (P(red)=P(blue)=0.5). But only one sample of each letter could appear on a single trial. Targets and distractors were controlled for by making the start of each trial dependent on a specific letter or color. The start position of the target was randomized but only one target could appear on a single trial. 36 target positions were available for each display, 9 per corner.

Eye-movements were recorded using a Cambridge Research Systems Video Eyetracker.

Stimulus presentation and eye-movement control was examined by MATLAB, using the TVT and the Psychophysics toolbox.

Results

A 2x2 within subjects analysis revealed significant main effects of position and color repetition (p <0.001 and 0.003, respectively). No interaction was found between the two (p=0.619).

Position priming effects ranged from 2.5-114 pp, between subjects.

Color priming effects ranged from 1.7-118 pp, between subjects.

All subjects showed the same pattern of lowest accuracy under the “no-repetition” condition and highest accuracy under the “both repeated” condition. These within-subject differences ranged from 10-23 pp.

Conclusions

- PoP affects accuracy at very brief exposures.
- The effects cannot be explained by reference to response related mechanisms.
- The results suggest a perceptual component in PoP. This does in not exclude response related PoP.
- A simple additive TVA model can be fitted quite well to experimental data.
- Recent literature suggests that repetition are the result of two or multiple mechanisms (see Lamy & Yashar, in press; Kristjánsson & Campana, 2010).

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References