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Asgeirsson, Arni Gunnar; Kristjánsson, Árni; Kyllingsbæk, Søren; Fjóla Hrólsfdóttir, Kristbjörg; Hafþórsdóttir, Heiðrún; Bundesen, Claus

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Position and color priming in briefly presented search arrays
Árni Gunnar Ásgeirsson¹, Árni Kristjánsson², Søren Kyllingsbæk¹, Kristbjörg Floa Hrólfsdóttir², Heiðrún Hafþórsdóttir² and Claus Bundesen¹

1: Center for Visual Cognition, Department of Psychology, University of Copenhagen.
2: Laboratory for Visual Perception and Visuomotor Control, Faculty of Psychology, University of Iceland.

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 viable to explain 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 generating 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 from 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 20-26). Each subject participated in at least 16 blocks of 16 trials. Trials following incorrect responses were repeated until a correct response was obtained. The order of the blocks was random. Our version was designed to suit the limited time available for eye-tracking equipment.

We divided trials into four categories: no repetition, color only, position only, and color plus position. As we are interested in the comparison between the conditions, the number of trials per block was adjusted for each condition according to the number of correct responses. This was done to control for response repetitions.

Eye-movements were recorded with a Gusto model 2000 eye-tracker at 200 Hz. Magnetic-band recorders were used for timing the experiment, with a clock rate of 32 kHz.

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 2.5-11.4 pp, between subjects.

Color priming effects ranged from 1.7-11.8 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).

References

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