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 viable of the explanation of the PoP when applied within a TVA-framework (Bundesen, 1990)?

Methods

Participants were 16 students at the University of Iceland (male: 10, female: 6), aged 19-25. Each subject participated in at least 6 blocks of 100 trials. Trials following incorrect trials and incorrect trials themselves were not included in the analysis.

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).

Results

A 2 x 2 within subjects analysis revealed significant main effects of position and color repetition (ps < 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.

We present least squares fits by a simple additive TVA based model of PoP. The model is only instrumental, since it is limited to one-trial-based priming, which will not suffice to describe PoP in detail. PoP has shown to be a cumulative effect, building up over several trials and decaying relatively slowly (Maljkovic & Nakayama, 1994).

The model also applies to pooled, rather than individual, data. However, the goodness of fit is quite promising. The model has 4 free parameters ($t_0$, alpha, CR weight, and the asymptote of the fitted curve).

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