Positions priming in briefly presented search arrays

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Position and color priming in briefly presented search arrays

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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).

**Figure 1:** (1) a trial (black arrow) and (2) between trial stimulus arrays (red arrow).

Results

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 memories, which will not suffice to describe PoP in detail. PoP has shown to be a cumulative effect, building up over several trials and decaying only relatively slowly (Maljkovic & Nakayama, 1994). The model also applies to postord, rather than individual data. However, the goodness of fit is quite promising. The model has 4 free parameters (K, alpha, cut-off, and pos.rep. weights) and a fixed C (processing speed). The C parameter is fixed at 50 (hemm, table 1).

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Accounting for repetition priming within TVA (Bundesen, 1990)

A Theory of Visual Attention (TVA) is a combined theory of selection and recognition. It has been mathematically formalized in a fixed capacity, independent race model (FIRM). The central assumptions of the theory are described by the rate and weight equations (Figure 2).

![](image)

In TVA selectivity is obtained by adjusting attentional weights for perceptual categories by differentiating their parameter values (K). Performativeness can be adjusted voluntarily by current goals or instructions, but involuntary factors can also affect it.

Here we treat K as a parameter that can be instantly affected from trial to trial by varying target identity during a task. The assumptions is that m-calculations are ongoing and the current importance of a target category is affected by its importance on the previous trial.

**Figure 2:** The weight equation as a rate equation.

**Table 1:** Parameter values for C (fixed), K (race), alpha, cut-off, weight and least square.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Fit (K, alpha, cut-off, and pos.rep. weights)</th>
<th>C parameter fixed at 50 (hemm)</th>
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</thead>
<tbody>
<tr>
<td>C (fixed)</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>K (race)</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
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<tr>
<td>alpha</td>
<td>0.19</td>
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<tr>
<td>cut-off</td>
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<td>0.8</td>
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<tr>
<td>weight</td>
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<td>0.96</td>
<td>0.96</td>
</tr>
<tr>
<td>Least Sq.</td>
<td>0.0327</td>
<td>0.0327</td>
<td>0.0327</td>
</tr>
</tbody>
</table>

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