The role of selection in motion-induced blindness – evidence from neuropsychology

Orna Rosenthal, Martin Davies, Anne Aimola Davies and Glyn Humphreys
University of Oxford, Department of Experimental Psychology
orna.rosenthal@psy.ox.ac.uk

Motion-induced blindness (MIB) is a perceptual illusion of repeated momentary disappearance of local static targets, when they are presented over a moving background. The mechanisms underlying this phenomenon are currently under debate (Bonneh et al., 2002).

Interestingly, visual attention and target saliency (e.g. Bonneh et al, 2001; Geng et al., 2007; Schölvinck & Rees, 2009) increase MIB – ruling out an account of reduced alertness and suggesting a role for stimulus selection. Bonneh et al. (2001) suggested that MIB reflects competition for attention between the targets and the moving background.

If MIB reflects competition for selection then increased interference from a distractor – e.g. due to a brain lesion – could increase MIB. To evaluate the role of competition for selection in MIB we investigated the effects of three different selection tasks on MIB in neuropsychological patients who varied in stimulus-selection ability.

Patients:
Overall: N=31 (28 males, 3 females); age: 39-80 (mean: 65).
Neuropsychological assessments – major impairments:
Spatial attention (N=10), hemianopia (N=3), visual agnosia/alexia (N=3), executive (N=6), memory (N=4), aphasia (N=6), sensory (N=1), motor (N=7).
Cortical lesion locations:
Parietal (left: N=7, right: N=8), Frontal (left: N=6, right: N=6), Temporal (left: N=4, right: N=5), Occipital (left: N=4, right: N=3), not obvious (N=4).
Inclusion criteria:
Ability to detect and report small targets and their disappearance at least in one hemi-field. Preserved comprehension.

Impaired selection processing tests:

Navon test: Distractibility by irrelevant visual context, measured as difference in the Congruency effect (ΔRT) when a distractor context is salient (DS) compared to when the target context is salient (TS).
6/29 patients showed high distractibility (>0.2 mean RT).

Auditory Attention test: Listening distractibility, measured as the frequency of false reports of irrelevant spoken words.
11/29 patients showed high distractibility (>3 (max: 18)).

Spatial extinction test: Difficulty in attending to the contralateral hemifield when brief targets appear simultaneously in both hemifields, measured as difference between report on single item vs. two item conditions.
8/30 patients showed severe extinction (>10 (max: 48)).

Conclusions:
- MIB frequency is strongly and positively correlated with distractibility by irrelevant visual context → Supporting selection of the moving background as an account for MIB
- Listening distractibility is associated with reduced MIB → Evidence against general distractibility as an account for MIB
- Both severe visual spatial extinction and divided spatial attention tend to diminish MIB → MIB may be modulated by the spread of spatial attention and/or the availability of sufficient attentional resources

References:

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