Motion Induced Blindness: Where Does the Yellow Dot Go?

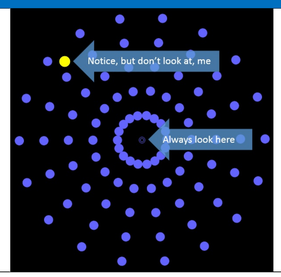
Sara Wetter
Advisor: Dr. Greg Elvers PhD

Introduction

Motion Induced Blindness (MIB) is visual illusions in which visual stimuli, or targets, disappear as if erased in front of an observer's eyes when masked with a systematically changing background.

The current study sought to investigate this visual illusion by investigating two competing theories of motion induced blindness – attention (target blindness is due to a lack of attention) vs scotoma / perceptual filling-in (target blindness is due to the visual system misinterpreting the target as a damaged part of the retina [scotoma] and the area is perceptually filled-in with the surround) (Schölvinck & Rees, 2009; New and Scholl, 2008).

Method



Participants:
Participants were 11 undergraduate students at a Catholic university in the Midwest with ages ranging from 18-22 (*M* = 19.36, *SD* = 1.239).

Procedure:
Participants answered four questions: age, sex, whether they had normal or corrected to normal vision including color vision, and whether they have ever had a seizure or seizure related disorder such as epilepsy.

Participants saw rotating lavender dots (see image above). They always looked (fixated) at the center, where there were two concentric circles. They directed their attention to, but did not move their eyes toward, the yellow dot. If the yellow dot perceptually disappeared (it never physically disappeared), they held down the space bar until it perceptually reappeared.

On different trials, the yellow dot either was stationary, moving below the motion detection threshold (moving at a visual angle of approximately 0.03 degrees per second) or moving above the motion detection threshold (moving at a visual angle of approximately 0.3 degrees per second). Each trial lasted 30 seconds and had a 30 second break between trials.

Using an ABCCBA counterbalancing scheme, the participants experienced each condition twice.

Results

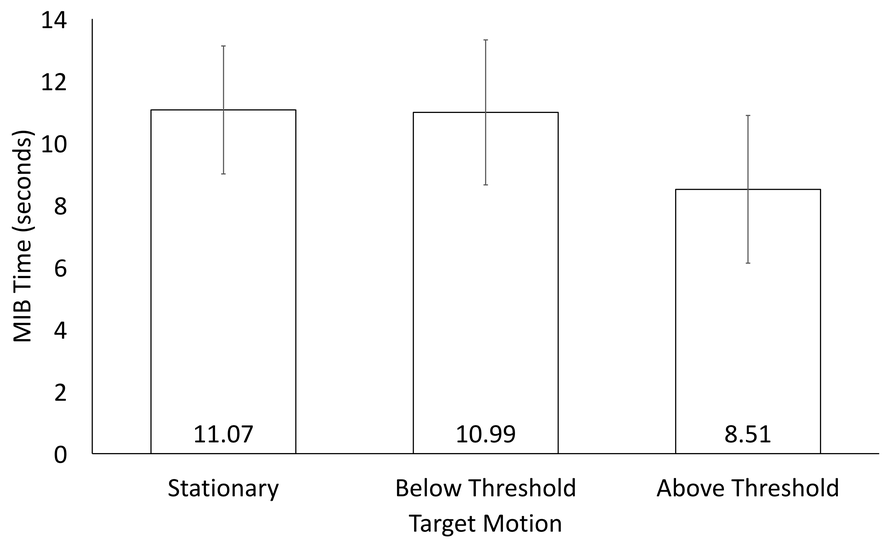
There was a significant main effect of time for target motion, $F(2,20) = 6.95$, $p = .005$, $\eta_p^2 = .410$.

Tukey HSD multiple comparisons revealed that the stationary condition ($M = 11.07$, $SE = 0.92$) was not significantly different from the below threshold condition ($M = 10.99$, $SE = 1.05$), $q(20) = 0.14$, $p = .994$, but was significantly different from the above threshold condition ($M = 8.51$, $SE = 1.07$), $q(20) = 4.64$, $p = .010$.

There was also a significant difference between the below threshold condition and the above threshold condition, $q(20) = 4.49$, $p = .013$.

See Figure 1 for relevant means. Error bars are 95% confidence intervals.

Figure 1. *Means and 95% confidence interval error bars for stationary, below threshold, and above threshold conditions.*



Discussion

Attention theory:
The experiment tested two theories of MIB. Attention theory says that things that attract attention (such as a clearly moving target) should lead to *more* MIB. The current study observed *less* not more MIB in the above threshold condition.

Perceptual filling-in theory:
Scotoma / perceptual filling-in theory predicts that there should be more MIB in the stationary target condition than in the others. The target can be interpreted as a scotoma only if it is stationary as scotomas cannot move. This effect was also not observed in the current study.

Future research:
When testing the attention theory, Schölvinck & Rees (2009) asked participants to report when the two target images, in the left and right fields of view, changed hues and when they disappeared from view, resulting in more frequent disappearance of the target image in the directed field of view. Future research involves utilizing more than one target image, which would potentially significantly increase MIB.

In New & Scholl's (2008) research on perceptual scotomas and MIB, they tested the hypothesis that when the target disappears, any surrounding texture should fill in that region of the visual field. They did so by contrasting a typical MIB display that had a textured target on a black background with a new display in which the target was a ''hole'' in a densely textured background. Each observer viewed images that alternated between *hole* intervals, in which the target was a circular hole in a grid of vertical and horizontal lines, and *object* intervals, in which the target was a circular grid consisting of lines of the same dimensions. Participants experienced significant MIB in which the hole in the grid was filled in by the surrounding textured pattern. Future research on this concept may involve this alternating technique to increase MIB due to perceptual scotomas.

References

New, J. J. & Scholl, B. J. (2008). "Perceptual scotomas": A functional account of motion-induced blindness. *Psychological Science, 19*, 653-659. http://dx.doi.org/10.1111/j.1467-9280.2008.02139.x

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Contact: Sara Wetter, wetters1@udayton.edu