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Finding the Change:
The Role of Working Memory and Spatial Ability in Change Blindness Detection

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Introduction

Change blindness, an inability to spot changes in a visual scene, occurs when normal motion transients are masked by factors such as blank screens, "cuts" from one camera to another, and the like (Simons, 2000). Rensink, O'Regan, & Clark (1997) employed a "flicker" technique to induce change blindness: two versions of an image are presented in alternation, but a blank visual screen is shown between each image. Under these circumstances subjects may take many seconds to notice even large changes in the image, especially if the change occurs in a background element.

Change blindness reveals important limitations in our ability to process visual scene information. Several explanations have been advanced to explain why change blindness occurrs. To date, no single explanation has gained broad acceptance (Simons, 2000).

In the current report, we consider a complementary question: given that change blindness occurs, what factors enable people to overcome it? Our methodology is to exploit the natural individual differences that appear between individuals in their ability to detect changes.

Method

Our methodology was to administer a broad variety of individual differences tests to a large set of subjects then perform correlational and regression analyses to determine the ability factors that predict change blindness detection.

Following the administration of a demographic questionnaire (not discussed further), subjects completed a battery of tests: Integrating details (Alderton, 1989); shape memory (Ekstrom, French, Harman, & Dermen, 1976); identical pictures (Ekstrom et al., 1976); perceptual speed (Guilford & Zimmerman, 1947); a change blindness test; and a measure of operations span (Hambrick & Engle, 2002).

The change blindness task included 20 trials. On each trial two different versions of a photograph were shown repeatedly in sequence, with a blank gray screen appearing between each pairing of the images. Subjects knew a change appeared in each trial and were allowed to view the images until they detected the change. After detection one version of the image reappeared with a set of 5 regions identified, and subjects selected one region to indicate where the change took place.

85 subjects completed the battery of tests during a 1-hour session for class credit. Data from 8 subjects were discarded due to computer errors.

Results

The correlational analysis showed that several ability tests correlated significantly with the *accuracy* of change blindness detection (Table 1), while other factors correlated with the *latency* of change detection .

Table 1: Correlations with Change Blindness Accuracy

	Int. Details	Shape Mem..	Indent Pictures	Percept. Speed	Op. Span
Change Blind. Accuracy	.448**	.406**	.240*	.472**	.493**

* sig at $\alpha < .05$; ** sig at $\alpha < .01$

A stepwise regression analysis revealed that only three factors independently predicted accuracy on the change blindness task: operation span, perceptual speed, and shape memory. The heavy involvement of operation span indicates an important role of working memory in successfully detecting changes in an image. Curiously, measures that are designed to measure spatial ability, such as integrating details, did not show an independent effect. A different set of factors correlated with the latency of change blindness detection, suggesting different mechanisms are involved.

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