Synergistic Attentional Effects Of Abrupt Onsets and Color Singletons

Feng Du and Richard A. Abrams
Washington University

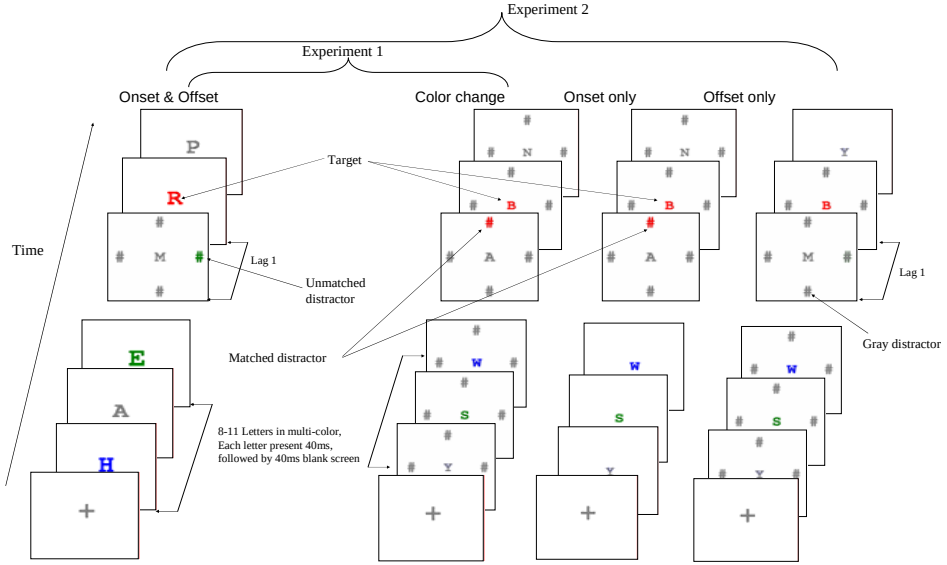
Introduction

Can subjects ignore peripheral distractors when they are certain about the location of a visual target? Folk, Leber and Egeth (2002) had subjects search for a letter with a specified color in a stream of rapidly presented letters at fixation. Peripheral color singletons that matched the target color attracted attention and impaired target detection performance. They called their phenomenon a "spatial blink", in reference to the detrimental effect of the peripheral distracter despite complete certainty regarding the location of the target item.

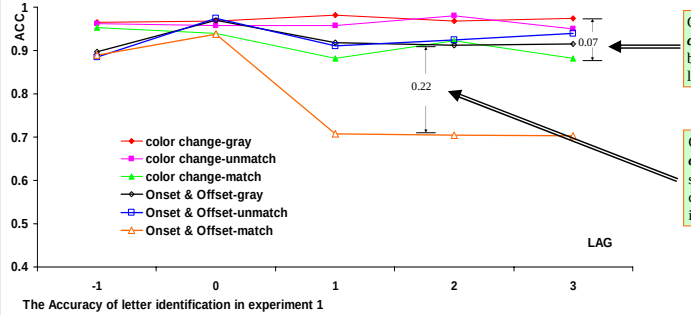
In their experiment the distracters were always accompanied by both an abrupt onset and an abrupt offset, since the distractors were visible only for one frame of the serially presented stream. As a result, it is not known to what extent the onsets and offsets modulated the effects of the contingent color singleton. We examined that question here by manipulating the presence of the abrupt onset and abrupt offset events.

Methods

The subject's task was to identify the centrally presented letter that was in the specified target color (either red or green). One critical frame on each trial contained a peripheral distracter that sometimes included a color singleton that either matched or did not match the target color, The conditions studied differed with respect to the presence of four gray placeholder #s that were present either before and/or after the critical frame.



Experiment 1

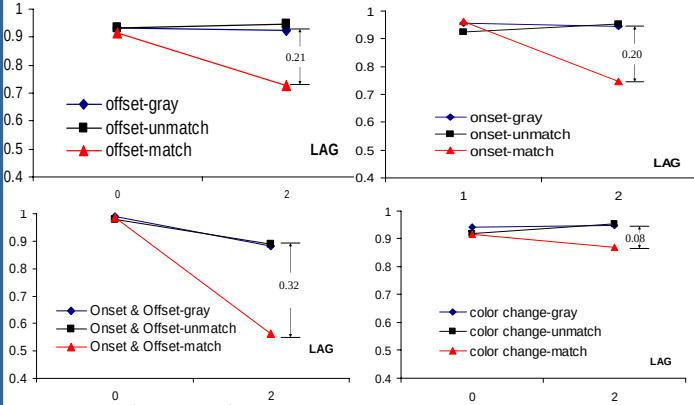


The Accuracy of letter identification in experiment 1

Color-matched distractors in the ***color change*** conditions produced a small spatial blink (Average reduction in accuracy over lag1-lag3 was 0.07)

Color-matched distractors in the ***onset & offset*** conditions produced a much larger spatial blink. Average reduction was 0.22, confirmed by a significant three-way interaction ($F_{(8,152)}$ =7.993, P<0.005).

Experiment 2



The accuracy of letter identification in experiment 2

Color-matched distractors in the ***onset-only*** or ***offset-only*** conditions produced a much larger spatial blink comparing to the ***color change*** condition (Average reduction at lag2 is 0.21 and 0.20 respectively). The spatial blink in the ***onset & offset*** condition is even larger (Average reduction is 0.32). The conclusions were confirmed by three-way interaction F(6,90) =5.626, P<0.005.

Color-matched distractor in the ***color change*** condition produced a small spatial blink (Average reduction is 0.08)

Conclusion

In the present experiments subjects searched for a letter with a particular color at a known location in a rapid stream. Color singletons in the periphery impaired target detection if they matched the target color. However, the effects of the distractors depended to a great extent on the presence of either an onset or offset associated with the distracter. Thus, goal-driven attentional mechanisms and stimulus-driven attentional mechanisms appear to have synergistic effects when producing a spatial blink.

Reprint available at http://rabrams.net

Poster presented at the meeting of the Psychonomic Society, Houston, TX, November 2006