Writing Introduction and Method sections
QALMRI

Question

Alternatives

Logic

Method

Results

Inferences

Sections of a paper

Introduction

Method

Results

Discussion

See QALMRI document on web page.

See lab manual for sample introduction and method sections.
American Psychological Association (APA) Format

See the sample chapter in the textbook and details in the style sheet on the course web page.
Memory scanning assignment

Details of assignment in lab handout.
Grading sheet can help guide your writing.
Citation/Reference Style

1. Cite using author’s last name(s) and year of publication. As noted by Smith (2001)… (See APA format rules for more details.)

2. Cite previous works in order to establish a line of reasoning, or to support a claim.

3. Include in reference list only references cited.

4. Never cite anything you haven’t read. (with some rare exceptions)

5. Quotations should be minimal.
   But not as a way to indicate a quotation or paraphrasing.
Find examples here:

- Attention, Perception & Psychophysics
- Psychonomic Bulletin and Review
- Memory & Cognition
INTRODUCTION

starts broadly

ends narrowly
Introduction: Past, present, future

Past: What is “it” and what has been done.

Present: How is our present state of knowledge inadequate?

Future: What do you intend to do to advance our knowledge?
Introduction: Brief overview

Past

- General area of interest
- Brief (usually) history of research on the topic.

Present

- A specific result that is the point of departure for your study
- An unresolved issue, an unanswered question that you hope to resolve/answer.

Future

- The specific approach you plan to take to address the question. (General method but very little detail.)
Introduction: Past

What is the general phenomenon or behavior of interest? Is there a long history of research on it? Is it important? Often you need to make a case for its importance. (If there has been a lot of research on the topic then it may be assumed to be important.)

Basic terms may need to be defined.
The spread of attention to hidden portions of occluded surfaces

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Visual attention refers to the mechanism by which some visual information in a scene is selected for deeper or more efficient processing than other information is. A central question has concerned the representational basis for visual selection. Two contrasting, although not mutually exclusive, possibilities have been considered. One is that attention is allocated to a subset of spatial locations within the visual field (e.g., Eriksen & Hoffman, 1972; Posner, 1980). The second is that an object is selected from a scene that has been perceptually parsed into multiple object representations (e.g., Duncan, 1984).

A method developed by Egly, Driver, and Rafal (1994), which we will refer to as the *two-rectangles method*, has been used extensively to demonstrate that visual atten-
Just like new: Newly segregated old objects capture attention

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In navigating our environment, we are faced with a steady stream of perceptual objects entering and exiting our visual field. As a result, we must determine which objects are to receive attentional priority and be processed first. An observer’s goals play an important role in this process. For example, a person may choose to search for their green coupe in a parking lot filled with a variety of cars, and, as a result, green coupes might be assigned a high priority. This type of attentional selection is referred to as goal directed.

Importantly, the priority with which we select objects in our environment can also be affected by bottom-up, automatic processes that are driven by low-level stimulus properties or events. For example, the black-and-white sedan with the flashing lights and pulsating siren may attract our attention despite the fact that it might not be the sought-for color or style. In contrast to goal-directed attention, this stimulus-driven attentional capture occurs largely independent of the viewer’s intentions (for a review, see Rauschenberger, 2003a).

One event that has been shown to capture attention in a stimulus-driven manner is the appearance of a new perceptual object. This conclusion has been reached in part
Attentional Capture by Irrelevant Color Singletons

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In visual search tasks, observers must search for a predefined target among multiple nontargets and respond according to some attribute, such as presence-absence or identity. It is well established that a target that is defined by a simple featural difference from the nontargets can be detected or identified rapidly, with relatively little effect of the number of nontargets (Neisser, 1963; Treisman & Gelade, 1980). For example, looking for an O among Ks, Xs, and Ls is faster than looking for an O among Cs, Qs, andGs. Under some conditions, a nontarget that is made especially salient by a featural difference from other nontargets—an irrelevant singleton—may also affect visual search time. For example, Theeuwes (1992) found that search for a particular shape was slowed if one nontarget was colored differently from the rest of the array items. Such effects are often described as an attentional capture by singleton stimuli (for reviews, see Yantis, 1996, 1998).
Is there some specific result that you will be focusing on? Describe that result.
1. a result inconsistent with other results
2. a new finding with broad implications that requires additional support
3. an unanswered question that will clarify an existing result
The spread of attention to hidden portions of occluded surfaces

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Moore, Yantis, and Vaughan (1998) noted that if the object-specific effect that is observed in the two-rectangles method reveals characteristics of selecting object representations, it should be observable even when the objects in question require perceptual completion behind an occluding surface. They tested this prediction by presenting two parallel rectangles, with a third, orthogonal rectangle presented in front of the first two, thus requiring that the first two be perceptually completed in order to exist as perceptual objects. Despite the need to perceptually complete the two rectangles, both location-specific and object-specific cueing effects occurred, just as in the unoccluded two-rectangles experiments. Behrmann, Zemel, and Mozer (1998) tested the same idea, using a same–different matching task. They found that stimuli that were perceived as part of the same object were compared more efficiently than were comparable stimuli that were perceived as parts of different objects, even when the object required perceptual completion behind an occluding surface (see also Pratt & Sekuler, 2001; Zemel, Behrmann, Mozer, & Bavelier, 2002). Thus, object-specific effects appear to extend to objects that require perceptual completion.
Recently, we investigated the role of motion and motion transients in attentional selection (Abrams & Christ, 2003, 2004a, 2004b, 2005). In our experiments, subjects searched for target letters among moving and stationary objects that had undergone several different types of motion transitions. We found that movement per se did not capture attention, but the onset of movement did capture attention. In light of that finding, an alternative explanation for Hillstrom and Yantis’s (1994) results is possible: Given that the segregation of the soon-to-be-new element in their experiments was always accompanied by a motion onset, it is possible that attention was captured by the motion onset and not by the newly segregated object. In fact, it seems possible that either the motion onset or the new perceptual grouping alone would each have been sufficient to attract attention in Hillstrom and Yantis’s experiments. Whereas motion onset alone has been shown to capture attention (Abrams & Christ, 2003, 2004a, 2004b, 2005), the possibility of capture generated solely on the basis of a new grouping remains untested, and this was the focus of the present experiments.
Introduction: Future

What specifically is the purpose of the experiment you are about to describe? (What is the question you will attempt to answer?)

In general terms, how will you attempt to address the issue?
The present study was designed to determine if a newly segregated preexisting object, in the absence of a motion onset (or any other transient event known to capture attention), is capable of attracting attention. If it is, that would further bolster theories that stress the priority given to new objects. In our first experiment, we attempted to replicate the Hillstrom and Yantis (1994) result in a modified visual search paradigm with new stimuli. Then, we used the new stimuli to examine attentional capture by newly segregated objects in the absence of motion onset.
The spread of attention to hidden portions of occluded surfaces

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The present study extends the question of the spread of attention within occluded objects to ask whether a within-object selection advantage can extend to hidden regions of occluded objects. Specifically, we ask whether a cuing advantage can spread from one part of an occluded object to an invisible part of the object—invisible insofar as it is behind the occluder and only implied in the perceptual representation of the object. This question is of interest because an occluded part of an object is a meaningful construct only at a level of representation in which the scene has been perceptually parsed into objects; it does not exist as such in the image. To the extent that
Attentional Capture by Irrelevant Color Singletons

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The present experiments were designed to address some persisting ambiguities in the results reported by Gibson and Kelsey (1998). To begin, it may be noted that observers’ foreknowledge of a red versus a white target array, between experiments, was confounded with the presence or absence of a physical color match between the color singleton and the target array. Thus, it is possible that the advantage to the color-singleton location in the first experiment was due not to attentional capture by the distractor-array singleton but to the detection of a color match between the distractor and target array at that location. In other words, attentional capture may have occurred during the target array rather than during the distractor array. To test whether a color singleton can attract attention to a location independently of a color match, we varied whether the singleton was in fact in the same color as the target array.
Method

General principle: Include all information that would be needed if someone were to attempt to recreate your experiment. Describe anything likely to have affected the results.
Method

• Subjects (Participants)
• Apparatus (Materials, Stimuli)
• Procedure
• Design

Subsections can be combined
Order somewhat flexible
The spread of attention to hidden portions of occluded surfaces

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its original position and then retraced its steps in both conditions. In the occluder-removed condition, it slipped to the other two rectangles, whereas in the occluder-removed condition, it slipped back in front of the two rectangles into its original position. The occluder-removed condition in both experiments allowed us to determine whether the participants were aware of the occluded portion of the cue object and if so, the occluder-removed condition provided a control in which no cuing advantage was noted because the location was on the occluding object on the cue object.

... preview results, object-specific cuing effects did extend to the occluded portions of cue objects. In both experiments, there was a cuing advantage for what had been occluded portions of the cue object in the occluder-removed condition. No reliable advantage for the same object locations was observed when the occluder had been rotated back into place in the occluder-returned condition.

METHOD

Subjects
Fifty individuals, ranging from 18 to 27 years of age, were tested in two experiments, 25 in each. All the subjects reported normal or corrected-to-normal visual acuity, and all were naive to the purpose of the experiment.

Equipment
Stimuli were presented on a 21-in. Nuovo FlexScan F2-21 EX color monitor. Trial events and data collection were controlled by a PC with a Pentium II processor. Responses were collected on a standard keyboard.

Stimuli
Initial displays consisted of two 12.8 x 3.3 degrees of visual angle (dva) rectangles that were oriented vertically for half the trials and horizontally for the other half. These rectangles were positioned so that the outer edge-to-center distance was 12.4 dva, the same distance as the length of the rectangle. A third 18.0 x 3.8 dva diagonal rectangle, oriented at 45° for half the trials and -45° for the other half, occluded opposing ends of the two rectangles (see Figure 1). There was also a red 0.8 dva fixation circle centered on the occluder in the center of the display. Cues consisted of the outline of one end of one rectangle changing from gray to white and thickening by 1 pixel. It extended along the length of the rectangle for 3.3 dva.

Occluder motion in Experiment 1A. In the occluder-removed condition, the occluder rotated around its corner point away from its original position in eight steps. The steps were approximately 5.6° each, so that the occluder ended up parallel with the other two rectangles, occluding no part of them. In the occluder-returned condition, the occluder rotated around its corner point away from its original position in four 5.6° steps and then returned to the same steps, so that it ended up back in its original position. Each frame was presented for 100 msec, and the interstimulus interval was zero; the rectangle was in motion for a total of 300 msec in both conditions.

Occluder motion in Experiment 1B. The occluder-removed condition was identical to that in Experiment 1A. The occluder-returned condition was the same as the occluder-removed condition.
Method

Subjects. Ten undergraduates participated in the experiment. All were experimentally naive and received course credit in return for their efforts.

Apparatus and Procedure. The subjects were seated in front of a video display in a dimly lit room, and they were encouraged to maintain fixation at the center of the display throughout the trial. The sequence of events on each trial is shown in Figure 1. At the beginning of each trial, a vertically aligned row of five placeholder stimuli was presented at the center of the display. Each placeholder was an “8” that was 1° high and 0.5° wide. The placeholders were equally spaced, with a 0.25° gap between adjacent placeholders.

Following a delay that varied randomly between 1,667 and 5,000 msec, one of the placeholders (excluding the top and bottom ones) began to move toward the right side of the display. The movement was accomplished by displacing the relevant item at a rate of 1 pixel per video display refresh (16.7 msec). The resulting speed was approximately 3°/sec.

The onset of motion coincided with the presentation of the search display. At that time, segments from each placeholder were removed to reveal letters. One of the placeholders became the letter “S” or “H,” representing the target stimulus. All remaining placeholders were replaced by distractor letters (either all “E”s or all “U”s). The subjects were instructed to respond to the target’s identity as quickly as possible by pressing one of two keys (“z” or “/” key) on the keyboard.

The search array remained visible until the subject responded or 3,000 msec had elapsed. If the subject responded incorrectly, a brief tone followed by the message “Wrong Response” was presented. A tone and relevant message (i.e., “Too Early” or “Too Slow”) was presented if a subject responded less than 300 msec after array onset or failed to respond within 3,000 msec, respectively. The intertrial interval was 1,000 msec.

Design. Following 20 practice trials, the subjects served in 240 experimental trials. Trial presentation was balanced such that the target was equally likely to appear in each of the five items. Thus, on one fifth of the trials, the target appeared in the item that moved away from the group; on the remaining trials, it appeared in one of the items included in the original grouping. Furthermore, the target was equally likely to be an “S” or “H,” and the distractor letters were equally likely to be “E” or “U” for each type of target. The target-to-response key mapping was counterbalanced across subjects. Trial types were randomly mixed. At intervals of 40 trials, the subjects were given the opportunity to take a break.

Results and Discussion
Subjects

- Who participated?
- How many?
- Describe key demographics (if relevant).
- How were subjects recruited?
- How long did they serve?
- How were they compensated?
- Were there any screening criteria used?
Subjects

Sixteen Johns Hopkins University undergraduate and graduate students (8 male) were recruited for the 50-min experiment. Each subject reported normal or corrected-to-normal visual acuity and normal color vision. The subjects were paid $5 for their participation.

Participants. Eighteen university students with normal or corrected-to-normal vision took part in the experiment. The data from 2 participants were discarded because of high error rates (more than 25% errors in one of the conditions).

Participants. Seventeen undergraduate psychology students (11 female, 6 male) from the University of York took part in exchange for course credit. All the participants had normal or corrected vision.

Subjects. University at Albany undergraduates participated for partial fulfillment of course requirements in introductory psychology courses. All reported normal or corrected-to-normal vision. In Experiments 1, 2, and 3 we tested 30, 40, and 28 naive subjects, respectively. Each subject was tested individually in a session lasting approximately 40 min.

Participants. Eleven undergraduates each participated in one 30-min session in exchange for course credit. One participant was replaced due to an excessive number of errors (>40%), resulting in usable data from ten participants. The participants were naive with respect to the hypotheses under investigation and had not previously served in any experiments in which hand proximity had been manipulated.
Apparatus

• Describe the equipment used in the experiment. Often the equipment is minimal and this section can be omitted or combined with *Procedure*.
Apparatus. Displays were generated by a Zeos 486SLC computer on a Zeos VGA color monitor, using 640×480 resolution graphics mode. Responses were collected via the computer keyboard.

Apparatus and Stimuli. A microcomputer provided millisecond timing and controlled stimulus presentation and response acquisition. The stimuli were presented in white on a black background. Target letters were the letters X and N; distractor letters were E, T, H, A, and W for the high-load condition and the letter O for the low-load condition. Compatible or incompatible letters (X or N) served as flankers. At a viewing distance of 55 cm, each letter subtended 1.1° in height and 0.8° in width. The letters were presented at 45°, 90°, and 135° of arc on an imaginary circle of 3.1° radius. The center-to-center distance between the letters was 3.0°. The flanker was presented either left or right from the fixation point at an eccentricity of either 4.2° or 6.2° (center to center). In the close-flanker condition,
Apparatus. We used PC-compatible microcomputers running Micro-Experimental Laboratory (MEL; Schneider, 1995) to present stimulus displays and collect performance data. Subjects used the “Z” and “/” keys on the computer keyboard to register their responses. Each subject was tested individually in a quiet, moderately lit room, seated approximately 50 cm from the computer monitor.

Apparatus and procedure Participants viewed the CRT display binocularly from a distance of 35 cm (fixed by a chinrest). The two postures used in all of the experiments are shown in Fig. 1. In the hands-near blocks, participants placed their hands on 6-cm-diameter buttons attached to each side of the monitor, with their elbows resting on foam cushions. In hands-far blocks, participants placed their hands on the same two buttons resting on a board on their lap. The sequence of events on each trial is shown in Fig. 2. All of the stimuli were
Stimuli (Materials)

• Use these sections if the stimuli used in the experiment were complex or elaborate and require a detailed explanation.

• “Materials” could refer to paper-and-pencil standardized tests.
Stimuli. Stimulus displays consisted of five, seven, or nine colored shapes presented equally spaced along, and centered on, the circumference of an imaginary circle (3-cm radius) centered at fixation. Thus, display density varied with number of shapes. At a typical viewing distance of 50 cm, the centers of the shapes were 3° 4′ from fixation. The target shape was a circle 1° 4′ in diameter, presented in green (CIE coordinates .290/.599). Nontarget shapes were diamonds (45° rotated squares) 1.6° on a side, presented in the same color. In the distractor condition, one of the nontarget diamonds was presented in red (CIE coordinates .640/.330). These colors were selected so as to be equiluminant by the flicker criterion (Ives, 1912). Centered inside each shape was a white horizontal or vertical line segment (0.5° in length). Fixation was marked with a small (each segment 0.2°) gray plus sign. Sample displays (with display size 7) are shown in Figure 1, for both the no-distractor and the distractor conditions.
Stimuli. Three types of display were presented on each trial. A fixation display consisted of five light gray (MEL color 7), unfilled boxes, as shown in Figure 1. Each box was 12 pixels wide × 18 pixels tall and had a border 1 pixel thick. One box was positioned in the center of the display screen and contained a light gray plus (+) sign (standard MEL 12-point font). The remaining four boxes were positioned in a cross-type display, such that the distance from each edge of the center box to the nearest edge of each adjacent box was 20 pixels. The distractor display was similar, except that the edges of the four perimeter boxes were 2 pixels thick instead of 1 pixel thick. One of the boxes was either red (MEL color 12) or green (MEL color 10), whereas the remaining three boxes were white (MEL color 15). The target display was similar to the fixation display, except that capital letters (standard MEL 12-point font) occurred in each of the perimeter boxes. Three of the letters were always E, P, and S; the fourth was either H or U. Within a single target display the letters were either all red or all green.
Procedure

• Describe the sequence of events that occurred on each trial of the experiment.
• It is sometimes helpful to describe a ‘generic’ trial and then explain the different variations.
• Often figures can be helpful.
• Be sure to describe the subject’s task.
• What aspect(s) of the subjects behavior were measured?
• What happened if subject made an error?
• What happened after a trial? (Intertrial interval?)
Procedure. The subjects were instructed to determine the orientation (horizontal or vertical) of the line segment inside the green circle, and to respond by pressing designated keys on the computer keyboard as quickly as possible, while maintaining very high accuracy. Right-handed subjects pressed the ‘‘Z’’ key for vertical and the ‘‘/’’ key for horizontal; this response mapping was reversed for left-handed subjects, so that all subjects responded to horizontal lines with their dominant hands. The subjects were informed of the shapes and colors of the target and nontarget elements, both verbally and through sample displays showing a typical trial in the no-distractor and distractor conditions. Eye movements were not monitored, but the subjects were encouraged to maintain fixation throughout the trial and reported no difficulty doing so. Trial presentation was force paced. Each trial began with the presentation
**Procedure.** Prior to starting the experiment and during the rest period, certain aspects of the instructions were emphasized. First, the participants were told to fix their eyes on a central asterisk. Second, speedy and accurate responding was encouraged. Finally, the participants were told that the direction indicated by the arrows did not, in any way, predict the location of the response stimulus.

An example of the trial sequence is displayed in Figure 1. Each trial began with a central fixation asterisk. The central fixation asterisk remained present throughout each trial. After 675 msec, the arrows appeared for a duration of 75 msec. Following the arrows, there was an interval of either 25 or 225 msec, during which the asterisk remained on the screen. Following the interval, a target letter appeared to either the left or the right of the asterisk. The target remained present until a response was made. With respect to the target response, the participants made a forced-choice target discrimination by pressing the H key or the spacebar for the X and O targets, respectively (O and X labels were placed on the appropriate keys). Responses were made with the dominant hand, using the index finger (for X targets) and the thumb (for O targets). Feedback for correct (+) and incorrect (−) responses were presented after the target response. The feedback appeared in the same location as the asterisk, thus encouraging the participants to stay fixated in the center throughout each trial. The feedback display was presented for 675 msec before the fixation asterisk indicated that a new trial had begun.
Design

- How were subjects assigned to treatment conditions?
- How were trials organized into blocks?
- Did the order of conditions vary between subjects?
Randomization?

• Distinguish between a factor selected randomly vs. order of trials determined randomly.

• For example in some experiments there are an equal number of trials of each condition, but they are presented in a random order.

• That is different from the condition for each trial being selected randomly (because true random selection might result in slightly unequal numbers of trials in each condition.)
Design

Design and Procedure. The participants received 384 experimental trials. In separate blocks, they received 192 trials in the high- and 192 trials in the low-load condition. Half of the participants started with the high-load condition; the other half started with the low-load condition. There were equal numbers of compatible and incompatible trials and equal numbers of close and far flanker trials. There were 96 practice trials.

Each trial began with the presentation of a fixation cross for 1,000 msec followed by the search display (see Figure 1), which was presented for 200 msec (see Figure 1). If an X was presented, the observers had to press the “z” key; if an N was presented, the observers pressed the “/” key. When an error was committed, an audible tone was presented for 300 msec. The participants received feedback about their performance (RT and error rates) every 48 trials. The participants were instructed to respond to an X or an N appearing in the primary search array. They were instructed to maintain fixation on the central cross.

Design. The participants undertook 10 blocks of 16 trials. The first block was treated as practice and was excluded from the data analysis. Each block consisted of equiprobable factorial combinations of SOA (100 or 300 msec), cue direction (left or right), target position (left or right) and target type (O or X). Within each block, the trials were presented in a different random order for each participant. After the practice trials, the participants were allowed a brief rest before starting the main block of trials.
Design After 16 practice trials, participants served in two blocks of 64 trials in one hand posture, followed by two blocks in the other posture. Within each block, equal numbers were presented of each combination of spatial frequency (2.1 or 4.2 cpd), presentation side (left or right), and orientation (tilted or vertical). Half of the tilted gratings for each presentation side and spatial frequency were tilted clockwise; the others were tilted counterclockwise. Posture order was counterbalanced across participants.

Design

The participants performed ten practice trials, followed by four blocks of 48 test trials each, with breaks between the blocks. Within each block, each display size (four or eight letters) appeared equally often, and each of the target letters appeared equally often with each display size. The trials within each block were randomly ordered, and the identity of each distractor was chosen randomly on each trial. The location of each target was also chosen randomly on each trial, with the constraint that all letters must be separated by at least 0.6°. At the end of the second test block, the experimenter moved the response buttons to accommodate the alternative postural condition. All participants performed two test blocks with the hands near the stimuli and two with the hands far away (the initial hand position and response key assignments were counterbalanced across participants).