GOAL ORIENTED SEARCH IN

CONTEXTUAL CUEING

by

ALLISON THOMAS

EDWARD C. MERRILL, COMMITTEE CHAIR
JASON SCOFIELD
BEVERLY ROSKOS

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ABSTRACT

Much research has shown contextual cueing effects in which target location reaction times were faster due to the implicit learning of repeated predictable displays. The current research seeks to employ this traditional method of search by using goal-directed top-down strategies to locate two separate targets predicted by the same distractor layouts to produce contextual cueing in passive search, testing the flexibility of implicit learning in contextual cueing. There were two groups of 30 participants in the study recruited from the University of Alabama psychology 101 subject pool. One group searched for two targets in two different contexts while the second group searched for two targets in the same context in two independent learning phases. During the test phase both the learned predictable displays and novel, unpredictable displays were presented. Response times for the predictable displays were compared to the response times for the unpredictable displays for each group, determining the degree of contextual cueing. Response times were faster for the predictable displays during the test phase compared to the unpredictable displays, a result of contextual cueing. There was a large main effect of predictability for the target T $F(1, 58) = 183.96$, $p < .000$, with a partial eta squared of .760 and a large main effect of predictability for target L $F(1, 57) = 32.350$, $p < .000$ with a partial eta squared of .362. These results suggest that it is possible for contextual cueing to be sensitive to current goals.

DEDICATION

This thesis is dedicated to everyone who helped me and guided me during the creation of this manuscript. In particular, I would like to thank my family.

LIST OF ABBREVIATIONS AND SYMBOLS

SD Standard Deviation

F Fisher's F ratio: a ratio of two variances

M Mean: the sum of a set of measurements divided by the number of measurements in the set

p Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value

t Computed value of *t* test

< Less than

= Equal to

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Chapter 1: Introduction

Implicit learning is a type of learning that occurs without consciousness or intention. The learning of grammar occurs through this form of learning. This is evident in the fact that an individual does not consciously learn the structures of sentences prior to being able to use language effectively. In early studies of implicit learning, Reber (1967) found that participants were able to distinguish between strings of letters that were constructed in accordance with a previously experienced grammatical structure and those that were not although they could not determine the rules by which the grammar operated. Implicit learning helps individuals pick up cues from regularities in the environment that help them accomplish common activities without full awareness of rules used to produce the information they are processing. Implicit learning is contrasted with explicit learning which involves conscious awareness of what is being learning and how. Common examples of explicit learning include how to drive a manual transmission vehicle, how to spell a certain word, or the directions to baking a cake. It is likely that most learning activities involve some combination of implicit and explicit learning (see Sun, Zhang, Slusarz, & Mathews, 2007).

One form of implicit learning that has received a great deal of research attention in recent years is referred to as contextual cueing (Chun and Jiang, 1998). Contextual cueing occurs when the location of a predetermined target is predicted by the spatial context although no awareness of this relationship between the context and target exists (Chun and Jiang, 1998). Contextual cueing involves attentional guidance mechanisms that assist in the search for a target in a previously experienced visuo-spatial scene (Jiang & Chun, 2001; Merrill, Conners, Roskos, Klinger, M. & Klinger, L., under review), although the level of attentional impact is often debated (Lleras & Von Mühlenen, 2004). However, actively trying to memorize the layouts through explicit learning seems to remove contextual cueing effects. Chun and Jiang showed participants several displays containing a target (T) rotated 90 degrees and distracter items (L) also rotated 90 degrees and set off-center so as to eliminate a "pop-out" effect. Participants were asked to indicate the direction that the target T was facing. Although they were not aware of it, participants were viewing displays where the locations of the distracter items predicted the location of the target (predictable display condition) multiple times. In this condition when the distracter items were arranged in a certain way, they would predict that the target was located in a particular spot. Conversely, participants also viewed displays where there was no relationship between the target and distracter items (unpredictable condition). In these displays the distracter items were randomly placed in the displays and did not predict the location of the target. As participants experienced the predictable slides where the L's predicted the location of T they became faster at finding the target than for the unpredictable displays, implying a learning of the context of the target although they were not explicitly aware of the repeated displays or the relationship between the distracters and target in those displays. Chun and Jiang preformed explicit tests to insure that learning was implicit by asking participants to identify where the target should be when it was absent from a display. When participants were unable to do so, it was assumed that the learning of the predictable displays was relatively implicit in nature.

Why is implicit learning in general and contextual cueing more specifically important forms of learning? Contextual regularities help an individual understand the organization of the world and promotes adaptive behaviors by guiding visual attention towards the aspects of the environment that are important (Goujon, Didierjean, & Marmèche, 2007). Implicit learning of spatial locations provides an unconscious map that individuals can follow according to their particular goal. When visualizing a scene, this map is a complex system of top-down processing that constantly guides an individual's attention to important areas in the environment. These processes efficiently limit attention to uninformative aspects of the environment and allow the individual to focus on the areas of current interest (Goujon, Didierjean, & Marmèche, 2007). Individuals must be constantly aware of the important aspects of an environment. Although consciously unaware of the environmental map located within one's head, using the implicit knowledge of important signals of danger and areas of safety that are consistent in several different environments (such as the location of a fire escape) helps an individual in times of emergency when actions must be quick and automatic. This mental map implicitly guides an individual towards an important area within an environment. Traffic signals typically occur within the same areas of most environments. Although an individual may be new to an area of town, implicitly knowing where street names are located may help to find a way back to a familiar part of town. Also, learning the location of a new friend's house may be easier when one is already implicitly familiar with the environment although that environment is also tied to a previous area of interest. Perhaps a life-long friend lives within a mile of a new friend's house; the implicitly learned environment may be able to guide one to both houses with ease due to the previous experiences with that environment whereas encountering a completely new environment may require much more thought to navigate.

Contextual cueing is influenced by many different variables. The amount of attention used when viewing displays may affect the level of contextual cueing. Too much attention may eliminate the implicit processes necessary for contextual cueing and employ the use of more explicit processes. However, when a target is too easily found amongst distracters and no attention is required for locating it, this eliminates the need for contextual cueing. The length of exposure to the displays may also influence the magnitude of contextual cueing. Although sometimes seen within the first few trials of predictable displays, participants usually have faster reaction times to the displays they have seen multiple times, with a decrease in reaction times as they view the same displays.

Often in the everyday environment, different environments can mean different things at different times. Perhaps the time of day could cue someone to make coffee while another time in that same environment may cue a person to become more diligent in completing office work due to the unconscious cues that the boss will soon be arriving. While the cues all take place within the same environment, the time influences when certain activities are important. Even in the animal kingdom squirrels can be seen foraging for acorns at about the same time every day. As everyday life suggests, it is possible for the same environment to mean different things at different times.

Contextual cueing has been shown to be greatly reduced when search involves multiple target locations. One study found that contextual cueing is greatly reduced when the same target is presented in different locations in the same distracter layout (Zellin, Conci, van Mühlenen, & Müller, 2011b). However, this manipulation actually reduces overall predictability between the distraction locations and the target location (because the target location moves). Other manipulations that reduce overall predictability between the distracters and the target also reduce the likelihood of contextual cueing being observed. For example, decreasing the percent of distracters in the display that predict the location of the target from 75% to 50% can also eliminate contextual cueing under some conditions (Couperus, Hunt, Nelson, & Thomas, 2011; Merrill & Yang, 2011).

In this research I am also interested in the possibility that contextual cueing can be exhibited to more than one target location in the same contextual layout. However, unlike Zellin et al., I am looking for contextual cueing to be distributed across two targets in two different locations within the same context. In this scenario, the layout predicts the target location 100% for each target, which should greatly increase the likelihood that contextual cueing may be observed. Further, this scenario is also more consistent with real world experiences where an individual may wish to locate two different items in a single context depending on current goals. Hence, the general hypothesis for the current research is that top-down, goal-directed search processes may allow individuals to exhibit selective contextual cueing to different targets located in the same context at separate time. If this is the case, then a similar magnitude of contextual cueing should be observed for displays in which two targets are presented relative to those in which one target is presented.

An initial study designed to address this question was conducted by Thomas, and Merrill (2012). In that study, which was patterned after Jiang and Chun (2001), participants searched for either red or blue T's amongst red and blue off-centered L's. Both targets were located within the same displays and participants alternated between searching for the two targets in different blocks of exposure to the displays. Comparing predictable to unpredictable displays, contextual cueing effects were shown for both targets. Further, participants who searched for both targets exhibited the same magnitude of contextual cueing as did participants who searched for only one target. One important difference between that study and the one presented here was that the distracters formed two distinct sets (red and blue) in the Thomas and Merrill (2012) study. Hence, it is reasonable to consider that participants may have attended to one set of distracters to predict the location of one of the targets (red distracters predict the red target) and the second set of distracters to predict the location of the other target (blue distracters predict the blue target). In fact, participants may have been able to preattentively ignore the irrelevant context when searching for the goal-directed target by using the basic feature of color. In the current study, participants' ability to do this was limited by removing the color cue and using different letters to serve as targets and distracters in the displays.

Current models of visual search allow for individual goals to influence implicit aspects of the visual search process (Cave & Wolfe, 1990; Treisman & Sato, 1990; Wolfe, Cave, & Franzel, 1989; Wolfe, 2007; Zellin, Conci, van Mühlenen, & Müller, 2011a) For example, Wolfe's Guided Search Model (4.0) includes processes in the initial visual search phase that allows for top-down processes to adjust initial parameters of visual search to allow the goal of search to modify which visual features receive most processing during initial, preattentive processing. The GS4 model is comprised of a parallel initial stage where information for all the objects in the display are processed at the same time, followed by an attentional bottleneck which may be guided on the basis of certain attentional guidance mechanisms such as current goals. The bottleneck has a serial selection rule in which each item is individually examined. This system helps to achieve the goal of determining whether a particular stimulus is a target or a distracter. Top-down search mechanisms allow for different features of the target to be processed based on expectations and goals. This aspect of information processing provides a measure of flexibility in guided search. In contextual cueing, similar mechanisms may operate to guide search to different targets in the same context by prioritizing participants' responses on the basis of top-down initiated goal states.

In the current study, I am interested in whether or not participants can employ the use of multiple goals to search for one or another of two targets to exhibit contextual cueing to those two different targets in at different times in a single context. Participants were randomly assigned to one of two groups. One group completed a traditional contextual cueing task learning two targets in two different contexts. A second group completed a contextual cueing task in which two different targets were presented in the same context. Participants were instructed to locate one of the two targets on any given trial. It was expected that the response times will be faster for the predictable slides than for the unpredictable slides overall. Response times will get faster as participants have more exposure to the displays, as previously shown in many contextual cueing studies (Chun & Jiang, 1998). It was also predicted that the response times for the predictable layouts will be comparable for the two groups, with contextual cueing effects evident in both. In addition, if participants are able to exhibit goal directed contextual cueing, I should find equivalent contextual cueing effects in the single context condition relative to the two context condition.

Chapter 2: Methodology

Participants

Participants were recruited through the introductory psychology subject pool. There were a total of 59 participants with 29 participants randomly assigned to the single target group and 30 participants randomly assigned to the double target group. Participants received course credit for completing the study.

Stimulus Material

Stimulus displays were presentations of 16 letters arranged in a 5 x 5 grid pattern on a computer monitor. Two letters in each display were designated as targets (T and L) and the remaining letters were designated as distracters. In the 'double target' condition both target T and target L were presented in the same context. The predictive contexts had the same distracter layouts predicting the location of both target T and target L, although the two targets were not be placed in the same location. There were 6 predictable displays. The unpredictable displays had random distracter locations that were not predictive of either target's location, with a total of 24 unpredictable displays for each target. In the 'single target' condition target T and target L were presented in two separate contexts. As in the Single Context condition, the predictable displays predicted the location of the targets via the distracter layouts. The unpredictable displays had randomly placed distracters that did not predict the location of the targets. Examples of the stimulus displays are presented in Figure 1.

Design

The independent variables were Predictability (predictable or unpredictable display) and Number of Targets (single target or double target). The dependent variable was the reaction times (RT) to locating the target in the slides. In the double target condition, participants received the displays that include both targets in the same context. In the single target condition, participants received the displays that include only L's and only T's.

Procedure

Data was collected by undergraduate as well as graduate students. Undergraduate assistants were instructed on what to say to participants to make sure that procedures are identical for all experimenters. This research was conducted using Superlab experimental lab software with reaction times being recorded automatically. Participants were asked to find a particular letter of the English Alphabet located within one of the four quadrants as quickly as possible without making errors (See Figure 1). Reaction times were recorded to the nearest millisecond. Each quadrant contained 4 letters each, all printed in black ink. Each display was presented on a 10x12 inch laptop screen. Participants were asked to identify the quadrant which contains the target by pressing 1, 2, 4, or 5 on a keyboard number pad. At the start of each trial a fixation cross appeared in the center of the screen to take participants' attention back to the middle of the screen. If participants gave an incorrect answer, the computer indicated this through an audible beep.

Figure 1- Experimental Stimuli

A	F	X	Y
T	M	E	I
R	Z	H	K
W	N	L	V

Half of the participants were randomly assigned to each of two possible groups. For the single target group the sequence was 8 blocks of learning trials, 2 test blocks, 8 learning blocks, and 2 test blocks. For the double target group 4 learning blocks for L, 4 learning blocks for T, 4 learning blocks for L, 4 learning blocks for T, 2 test blocks for L, 2 test blocks for T. Trials in the learning phase consisted of only predictable displays in which the distracter items predict the location of the target. The test phase consisted of predictable and unpredictable displays and was used to measure the level of implicit learning of the target location in the predictable displays. In each block, the 6 predictable displays being repeated 4 times. Participants were instructed to search for either target T or L before each block, alternating between targets across blocks during the learning phase.

After the learning phase, each participant completed a test phase consisting of new unpredictable displays and the predictable displays that were presented in the learning phase. The test phase consisted of two blocks. T was the target in one test block and L was the target in the other test block. Participants completed a total of 48 trials for each target with each predictable slide repeated 4 times mixed with 24 unpredictable displays.

Chapter 3: Results

Mean response times for predictable and unpredictable displays were calculated for each target in the single and double target conditions. Contextual cueing effects would be evidenced by faster RTs to the predictable than to the unpredictable displays of the test blocks. Further, mean RTs for predictable versus unpredictable trials for the single and double target conditions were compared to determine the extent to which implicit learning can be efficiently guided by the use of top-down goal oriented search processes.

Preliminary Analyses

Preliminary inspection of the data indicated that reaction times differed for the two target letters T and L. Subsequent analysis confirmed that difference for the one target condition t (57) = 2.96 , p=.004 , d=. 133. Therefore, I chose to analyze the data obtained for the two letters separately in the primary analyses. In addition, there was no difference in testing for Time 1 or Time 2 for the Single Target group. Therefore data were collapsed across this variable for the primary analyses. Error rates for the single target condition were 1.7% and for the double target condition were 2.0%. Further inspection of the error data indicated that most errors occurred in the learning phase and with the unpredictable displays of the test blocks for both conditions. However, because errors were so rare, error data were not considered further. Participants in both target conditions showed a decrease in RTs across blocks during the learning phase with a significant difference in reaction times between the learning blocks F (1, 57) =50.711, p<.000

(see figure 2). As participants viewed the predictable displays, they became faster at locating the target during the learning phase.

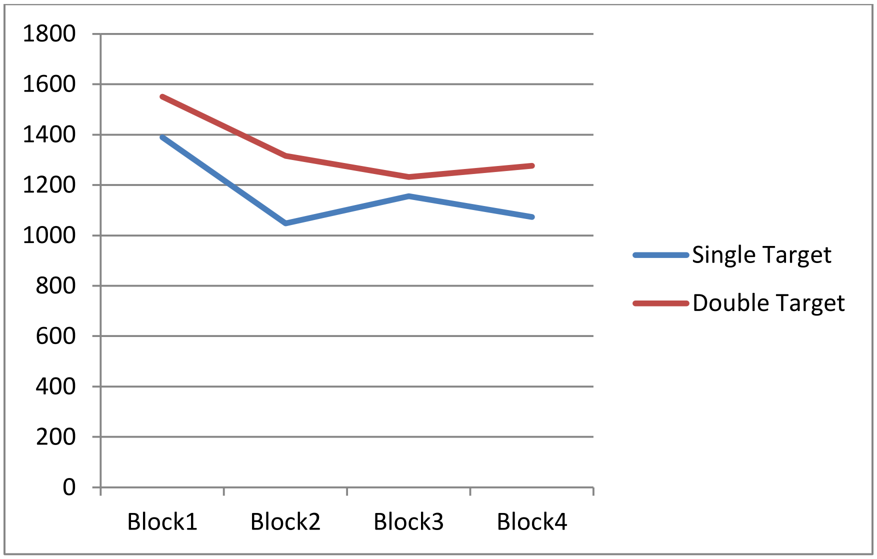

Figure 2- Learning phase reaction times for both conditions

Primary Analyses of Contextual Cueing Effects

Target T. The primary analysis was a mixed 2 (number of targets: Single vs Double Target) x 2 (Predictability vs. Unpredictable) ANOVA. Number of targets was treated as a between subjects factor and predictability was treated as the within subjects factor. There was a large main effect of predictability for the target T F (1, 58) =183.96, p<.000, with a partial eta squared of .760. This shows that participants responded much faster to predictable displays than to the unpredictable displays (see Figure 3). There was also a main effect of number of targets, F (1, 58) = 4.082, p=.048, suggesting a difference between the two conditions (single vs. double target) where participants had a much faster RTs for locating the target in the single target condition compared to the double target condition. There was also a significant predictability x number of targets interaction *F* (1, 58) =51.43, *p*<.000. The magnitude of the predictability effect was much greater in the one target condition than in the two target condition. Hence, the participants exhibited significantly greater contextual cueing effects in the single target condition than in the double target condition.

Target L. The primary analysis was a mixed 2 (number of targets: Single vs Double Target) x 2 (Predictability vs. Unpredictable). Again, number of targets was treated as a between subjects factor and predictability was treated as the within subjects factor. There was a large main effect of predictability for target L, *F* (1, 57) =32.350, *p*<.001, partial eta squared = .362. Participants had much faster RTs to the predictable displays than to the unpredictable displays. There was also a significant predictability x number of targets interaction, *F* (1, 57) = 6.938, *p*=.011, partial eta squared = .109 with participants in the single target condition exhibiting a greater effect of predictability than did the two target group. There was no significant effect of group (single vs. double target), *p*= .413. Taken together, the results of these analyses also indicate that the participants exhibited significantly greater contextual cueing effects in the single target condition than in the double target condition.

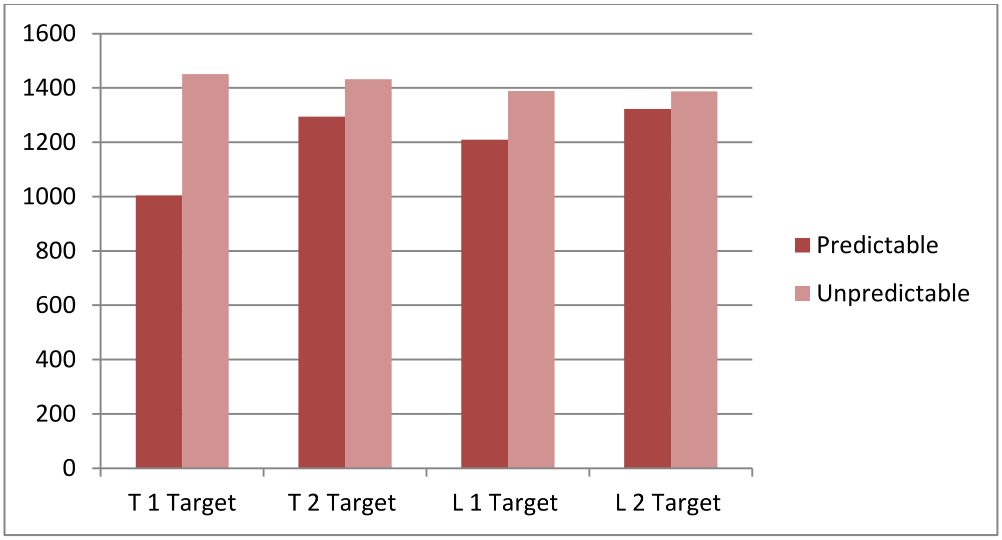

Figure 3- Reaction times to predictable and unpredictable displays for T and L for one and two target

Chapter 4: Discussion

The goal of this study was to evaluate participants' ability to engage goal directed search processes to modify the way that context guides attention in contextual cueing. More specifically, I was interested in whether the attentional guidance effect of context was purely stimulus drive (a given context promotes looking in a particular location) or can be influenced by a current goal (a given context with a particular goal is responsible for looking in a particular location). I was particularly interested in whether participants would exhibit similar magnitude contextual cueing effects when searching predictable displays with a single target relative to searching displays with two different targets when the goal was to search for one or the other (but never both) of the targets. In both conditions (single target and double target) participants responded faster to the predictable displays than the unpredictable displays, indicating contextual cueing. However, it is evident that there was a different magnitude of contextual cueing in the single target and double target conditions with the single target condition showing larger contextual cueing effects. Overall, it seemed that learning is different for participants when the context includes two targets as has been shown in previous research (Zellin, Conci, van Mühlenen, & Müller, 2011b). In my research, this was true even though the two targets were distinct and each specific target and location was 100% predictable in the repeated context slides.

The general hypothesis for the current research was that top-down, goal-directed search processes should allow individuals to exhibit selective contextual cueing to different targets located in the same context as a function of current search parameters. This hypothesis was not supported. While participants did exhibit contextual cueing in both conditions, the amount of facilitation was reduced for the condition in which there were two targets located within the same context or display. Contextual cueing was approximately twice as big in the one target group. Zellin et al. showed a similar reduction in learning when adding two or three targets within a single display. Although Zellin et al. used a single target that moved within the displays, participants in the two target group in our study may have processed the two target displays in the same way that the participants did in Zellin et al. More specifically, participants may have used the context in a stimulus driven fashion with the context guiding attention to the most likely locations of the target. In the two target displays, two different locations were likely and attention was guided to both locations an equal percent of the time. Hence, facilitation to either target was reduced, on average, by about half the amount relative to the single target displays. The essence of this explanation is that the effect of the regular context on attention is not subject to modification by participant goals.

An alternative explanation for the present results based on goal directed search is possible. For example, participants may have simply viewed the two targets in a manner that was analogous to a single target that moved within the display. If so, then instead of changing their "goal" to searching for the current target participants may have simply had the goal of finding a target, whether it is T or L, and combined the targets into the same goal. If this was the case, then the relation between a specific target identity and the context may never have been learned. Endo and Takeda (2004; see also Takeda, 2008) have shown that object identity and location for context stimuli are often learned independently. If this is also true for target identity and location, it is reasonable to suggest that target identity did not reflect an important participant goal and therefore did not influence contextual cueing.

The results of my thesis are in contrast to the results of an earlier study (Thomas & Merrill, 2012). Thomas and Merrill (2012) used a two target design similar to the one used in the current study. However, they reported equivalent contextual cueing effects were observed in the one and two target conditions. One important difference between the two studies was that participants may have been able to segment the context into two distinct subsets in the Thomas and Merrill (2012) study. In that study, half of the distracters were blue and half were red. In addition, the two targets were distinguished by color (red or blue) rather than identity. Jiang and Chun (2001) effectively demonstrated that contextual cueing is not typically observed for the different color context when participants are told the target color prior to initiating their search. Hence, participants may have focused on a subset of the displays that separately predicted the location of one of the targets in each display. Searching for the red target focused attention on the red distracters and the predictable relation between the blue distracters and red target was ignored. Similarly, search for the blue target focused attention on the blue distracters and the predictable relation between the red distracters and blue target was ignored. In essence, each red and blue display was treated as two different contexts: one red context and one blue context. Therefore, similar magnitudes of contextual cueing were observed for the two targets. The current study used similar letters all displayed in black ink. As a result, in the current study participants could not spontaneously ignore one subset of distracters and focus on the other. Hence, the entire display automatically encouraged the search for both targets with which it was paired and did not allow participants to selectively focus on one or the other.

Finally, it is reasonable to consider that having two targets in each display may have interfered with overall learning of the context or the expression of contextual cueing. When searching for the T, participants may have found it difficult to ignore the L (because it was a previous target). If this is the case, then participants may be learning the relation between the context and both targets whenever the display is presented. As a result, overall learning is reduced by the presence of both targets because it is difficult for participants to ignore the other target. It may also be the case that response times to locate one target during the test phase was slowed by the presence of the second target and impacted the expression of contextual cueing. More specifically, the context may have been learned equally well in the one and two target conditions but facilitation was disrupted by the attraction of attention to the second target. One way to evaluate this possibility would be to eliminate the second target during test trials. Alternatively, eye tracking technology may also help to decipher if participants are distracted by the target not currently the goal. If perhaps participants are still distracted by the target that is not currently relevant within the context of this study, this could also be evident within the natural world. Sometimes places or things that are no longer relevant still hold important meaning to individuals. Although not currently an individual’s goal, attention may still be captured by these irrelevant items.

One important limitation of the current design was that it was not possible to both amount of exposure to the context and number of times participants searched for the target for the one target and two target conditions. I chose to equate for exposure to the context. As a result, the participants in the one target group searched for the same letter twice as many times as the participants in the two target group. Preliminary analysis indicated this was not the full reason we found a difference in contextual cueing between conditions. Nevertheless, it is possible that doubling the number of search trials and increasing the exposure to both letters in the two target group may increase the magnitude of contextual cueing to the two targets. A future direction for research could be determining the exposure needed for participants in the two target group to meet the contextual cueing level of the one target group. Perhaps adding a second target means a participant needs twice the exposure to the displays, and adding a third target may require three times the amount of exposure to the displays for equivalent contextual cueing to be observed.

In the future, researchers should focus on adding additional trials to studies involving more than one target to increase the robustness of the contextual cueing observed in this study. Doubling the amount of exposure to the two target displays may give participants a better chance of fully learning the layout and the location of both targets. In the current study contextual cueing was found, but it was small compared to the contextual cueing found in the group that only searched for one target. Adding trials may also decrease the possible interaction between the two targets. There is also the possibility that grouping would allow for goal-directed attention to be effective. While one target may be surrounded by a certain set of distracter items, the other target would be surrounded by a different set of distracter items, thus the same context could be processed as two separate contexts (similar to the red and blue Ts and Ls). Adding numbers into the displays may also help to separate the context into two separate contexts. A numerical target surrounded by numerical distracters may create enough distinction from an alphabetical target to reduce the possible interference effect. While the current study involved only alphabetical stimuli, adding dissimilar stimuli would be interesting. Eye tracking technology may help to better understand participants' focus on the displays and to determine if there is an interference with the target not currently relevant.

Every day individuals use contextual cueing to help guide them through their environments. Knowing that the cash registers are typically located at the front of a grocery store is helpful when it is time to purchase the groceries, but what if the current goal is finding the vegetable section to buy broccoli? Locations rarely hold just one target of interest. These interactions occur often and throughout individuals' lives. This research indicates that contextual cueing is possible with more than one target but, perhaps, just like life, it takes more experience to fully learn these associations. Or, perhaps in real life, it is possible to use other cues to focus attention when multiple targets are available.

CONCLUSION

I investigated how the use of multiple goals affects contextual cueing. The results suggest that although contextual cueing is possible when there are two targets, the effect is significantly reduced when compared to the contextual cueing effects of those searching for one target. Future studies should employ the use of more trials to ensure adequate learning opportunities for the displays containing more than one target.

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APPENDIX

Appendix: IRB certificate

May 11, 2012

Office for Research

Institutional Review Board for the
Protection of Human Subjects

THE UNIVERSITY OF
ALABAMA
RESEARCH

Edward Merrill, Ph.D.
Department of Psychology
College of Arts and Sciences
Box 870348

Re: IRB # 12-OR-168, "Relations between Contextual Cueing and Goal-directed Search"

Dear Dr. Merrill:

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your application has been given expedited approval according to 45 CFR part 46. You have also been granted the requested waiver of informed consent. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your application will expire on May 10, 2013. If the study continues beyond that date, you must complete the IRB Renewal Application. If you modify the application, please complete the Modification of an Approved Protocol form. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, please complete the Request for Study Closure form.

Should you need to submit any further correspondence regarding this application, please include the assigned IRB application number.

Good luck with your research.

Sincerely,

Stuart Usdan, Ph.D.
Chair, Non-Medical IRB
The University of Alabama

358 Rose Administration Building
Box 870127
Tuscaloosa, Alabama 35487-0127
(205) 348-8461
FAX (205) 348-7189
TOLL FREE (877) 820-3066

IRB Project #:

MAY 04 2012 PM03:40

UNIVERSITY OF ALABAMA
INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS
REQUEST FOR APPROVAL OF RESEARCH INVOLVING HUMAN SUBJECTS

I. Identifying information

	Principal Investigator	Second Investigator	Third Investigator
Names:	Dr. Edward Merrill	Allison Thomas	
Department:	Psychology	Psychology	
College:	Arts and Sciences	Arts and Sciences	
University:	University of Alabama	University of Alabama	
Address:	Box 870348		
Telephone:	205-348-1932		
FAX:	205-348-8648		
E-mail:	emerrill@gp.as.ua.edu	althomas2@crimson.ua.edu	

Title of Research Project: Relations between Contextual Cueing and Goal-directed Search

Date Submitted: May 2012
Funding Source: None

Type of Proposal	☒ New	☐ Revision	☐ Renewal Please attach a renewal application	☐ Completed	☐ Exempt
			Please attach a continuing review of studies form		
		Please enter the original IRB # at the top of the page			

UA faculty or staff member signature: ______________________________

II. NOTIFICATION OF IRB ACTION (to be completed by IRB):
Type of Review: ______ Full board _X_ Expedited

IRB Action:
___ Rejected Date: _________
___ Tabled Pending Revisions Date: _________
___ Approved Pending Revisions Date: _________
_X_ Approved-this proposal complies with University and federal regulations for the protection of human subjects.

Approval is effective until the following date: 5/10/13

Items approved:
_X_ Research protocol (dated 5/11/12)
___ Informed consent (dated ________)
_X_ Recruitment materials (dated 5/11/12)
___ Other (dated ________)

Approval signature ______________________ Date 5-11-12