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Awareness in Contextual Cuing

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Introduction

The spatial contextual cuing paradigm is a visual search task in which participants are required to detect a target stimulus within a subset of distractor stimuli. The location of the target in half of the displays appears against a repeated arrangement of distractors. Participants indirectly express evidence of implicitly learning to use the context of distractors as a cue for the location of the target by making faster responses to repeated displays with this association compared to novel displays that do not contain this covariance.

Past results suggest that this contextual cuing effect occurs implicitly and outside of awareness, because when given a direct test of explicit knowledge, such as having to predict the location of a missing target during a generation test (Chun & Jiang, 2003) participants perform no better than they would through random guessing. This dissociation between unconscious learning and conscious retrieval has led researchers to conclude that the contextual cuing phenomenon illustrates the existence of a purely implicit processing mechanism. However, this inference of implicit learning rests on the null result in the awareness test, and the interpretation of such a null result depends critically on that test's power and sensitivity. Yet these awareness tests are rarely set up in such a way to guarantee adequate power/sensitivity. In typical contextual cuing experiments, the implicit task comprises many hundreds of search trials to measure contextual cuing, while only a small number of trials (e.g., 24) are presented on explicit tests. The present study was concerned with examining whether this failure to experimentally show conscious access to contextual cuing knowledge is a true effect, or if it is a result of inadequate power and sensitivity in the methods the previous studies have used.

Method

Forty participants took part in this study. The detection (implicit) task contained 24 blocks of 24 trials each. On each trial a configuration of 12 letters (11 L's and 1 T) was shown, and participants were asked to identify the orientation of the letter T as quickly as possible. Half of the trials in a block displayed the same 12 configurations (Repeated) throughout the task while the remaining configurations were shown only once (Non-Repeated). After the detection task, participants were given a generation (explicit) task and told they would see configurations similar to those seen previously, but this time the T would be replaced with an L and they must respond with the

location of this substitute L. We implemented a multiple-block design in the generation task, which increased the 24 trials (12 Repeated/Non-Repeated) used previously to 96.

Results and Discussion

Participants were faster at detecting targets in Repeated than Non-Repeated configurations during the detection task. This contextual cuing effect was confirmed in a repeated-measures ANOVA of detection data using Configuration and Block (within-subjects) with a significant main effect of Configuration, $F(1,39) = 12.24, p = .001$, and faster RTs in Blocks 21-24 for Repeated ($M = 733 \pm 31$ msec) compared to Non-Repeated configurations ($M = 836 \pm 31$ msec).

In the generation task, overall mean accuracy for Repeated configurations was higher (30.6%) than for Non-Repeated configurations (26.1%), $F(1,39) = 8.94, p = .005$, indicating that awareness ensued.

The small magnitude of the generation effect suggested that generation occurred for only one or two configurations learned, while contextual cuing might occur for many more. An analysis comparing the number of Repeated configurations showing contextual cuing (Repeated RT < Non-Repeated RT during detection) to the number of consistently generated configurations (3/4 correct responses during generation) in data for each participant showed that although the mean number of configurations for which high generation occurred was small ($M = 1.55, SD = 1.8$), contextual cuing also shown for about 1 or 2 configurations ($M = 1.55, SD = 1.47$). These results make it difficult to argue that more information was acquired during the detection task than was accessed during the generation task.

In addition, a reliability analysis confirmed that the inclusion of more trials produces a more reliable test, and is statistically more powerful than the single block design used previously. Calculations performed on the first block of trials revealed that reliability was weak and non-significant ($r = .09, p > .5$), yet when reliability was computed using all 48 Repeated trials a greater reliability coefficient was obtained ($r = .46, p = .003$).

The results observed indicate that participants are in fact consciously aware of their contextual cuing knowledge; accordingly, we interpret the null explicit results obtained by past experiments as a product of using an insensitive method to measure awareness, rather than as a genuine illustration of dissociation between implicit and explicit systems.

References

Chun, M. M. & Jiang, Y. H. (2003). Implicit, long-term spatial contextual memory. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, 29, 224-234.