

Intermediate Level Medium-Span Configurations Can Mediate Past Experience Effects On Figure Assignment



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Abstract

Behavioral, computational, and physiological theorists have suggested that intermediate-level medium-span configurations (MSCs) play a role in shape perception. Which behavioral tasks probe MSCs rather than local configurations or global shapes? Figure-ground tasks show effects of experience with previously seen shapes only when representations are accessed quickly, consistent with intermediate-level representations. Here we show that the relevant representations are medium-span configurations by altering a paradigm used previously to assess past experience effects implicitly. We measured the time needed for figure assignment when past experience competes with, but does not dominate, other cues. Novel shapes with three straight and one (vertical) stepped edge were shown on prime trials. On probe trials subjects judged whether two vertically aligned shapes were the same as or different from each other. On experimental probe trials, the stepped edge of the prime was repeated but other cues (closure, small area) specified that the figure lay on the opposite side of the edge. Consequently, the perceived shape of the probe differed from that of the prime. On control probe trials the probe shapes were completely novel. Competition from past experience led to longer RTs for experimental probes. Thus repeating just the stepped edge of the prime activated the memory of where the figure was the first time the edge was encountered; repeating the whole prime was unnecessary. Here, we ask whether repeating a smaller span (only the top or the bottom portion) of the continuous stepped edge was sufficient to trigger the effects of past experience. For both portions, we found that RTs were longer on experimental than control probe trials, $p < .05$, with no difference between top and bottom probes. Surprise recognition trials showed that subjects were unaware that the experimental probes were related to the primes. The results are consistent with a distributed shape representation system with medium-span configurations lying at intermediate levels.

QUESTIONS

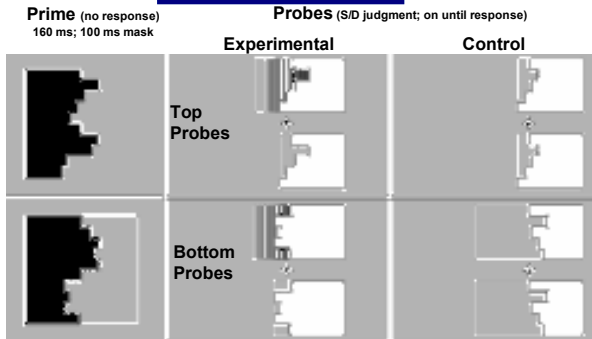
Must the entire complex edge be repeated or is a portion sufficient e.g., just the top or bottom half of the edge?

Experiment 3

To increase the likelihood that the bounded region would be seen as the figure on prime trials, we

- embossed the prime edges,
- added a striped background
- Exposed the primes 2X before experimental trials (cover task: judge if shape is top or bottom heavy)

Experiment 1



* "Same" probe trials are shown. In the experiment, half the probe trials were "different" trials
 * Shading on experimental probes is for illustrative purposes only

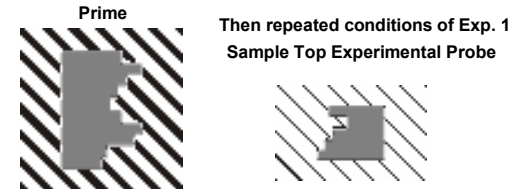


Figure Assignment

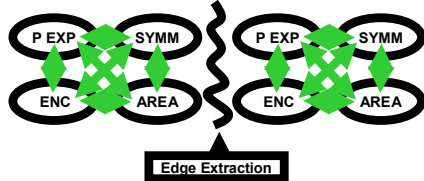
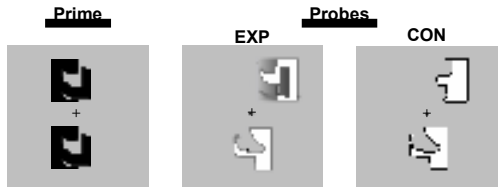


Figure assignment:
 Competitive
 Competition takes time
 Past experience (configuration of edge features) among cues

Past experience effects require only one prior exposure



Task: Same/different judgment on 2 black shapes on prime trial and on two white shapes on probe trials

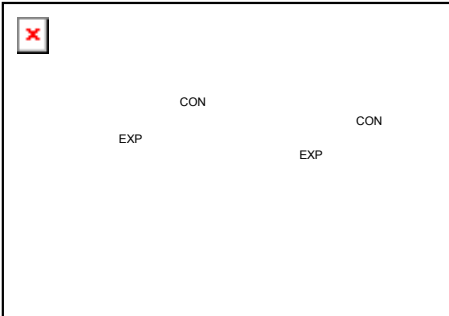
EXP Probes: Complex edge repeated from one of the prime shapes. Small, closed shape now on the complementary side of the edge.
 (*Shading on experimental probe is for illustrative purposes ONLY.)

CON Probes: Complex edge is novel.

Results: EXP > CON RTs reflecting increased competition from past experience

8 experiments: Peterson & Lampignano (2003; 3 exps.), Peterson & Enns (2002, 3 exps.), Treisman & DeSchepper (1996; 2 exps.).

Results



• **Top = Bottom**
 After a single exposure, past experience effects with a portion of edge.

• **CON > EXP RTs**
 Direction of difference unexpected.

Was black region = figure along entire complex edge in brief exposure?

In the elongated primes, perhaps the small, enclosed black region was not seen as figure. Horizontal excursions were $\leq 0.7^\circ$ but local differences in convexity may remain. If the gray side was more convex it may have been seen as figure, at least along part of the edge. On probe trials past experience would then cooperate (rather than compete) with area and closure.

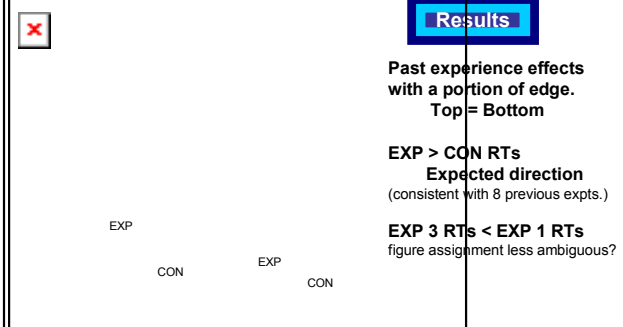
Experiment 2

6 observers reported which side appeared to be figure separately for the top and bottom half of each prime edge shown separating two equal area regions. Convexity was the only figure cue.



For 73% of the edges, the figure was perceived on the gray side along at least part of the edge, suggesting it was more convex than the black side (entire edge: 23%; top: 26%; bottom: 24%). Thus, for many primes, the gray side may have been seen as figure, at least along part of the edge. Faster RTs on experimental than control probes are then expected (Peterson & Enns, 2002).

Results



Past experience effects with a portion of edge. Top = Bottom

EXP > CON RTs
 Expected direction (consistent with 8 previous expts.)

EXP 3 RTs < EXP 1 RTs
 figure assignment less ambiguous?

Surprise recognition trials showed that subjects were unaware that the experimental probes were related to the primes.
 *Related" response: EXP probes: 52.6%; CON probes: 50%; Mirrored figure probes: 47.4%

Discussion

1. Repeating only the top or the bottom portion of the stepped edge of the prime triggered the effects of past experience. Hence, after one exposure to a novel shape, the configuration accessed during figure assignment can be medium in span, representing a portion of the complex prime edge.

Therefore, the configurations of edge features mediating past experience effects on figure assignment can originate in low or intermediate level levels of the shape pathway, where receptive fields are smaller than the whole object.

2. Small and enclosed stimuli cannot be considered unambiguous, especially when they have a long complex edge and the exposure is brief (consistent with a competitive model of figure assignment; cf. Kim & Peterson, C97, 343, Sat PM Perceptual Organization 1)

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