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Refining the dual-stage account of intertrial feature priming: Does motor response or response feature matter?

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Abstract Numerous studies have shown that repetition of search-relevant attributes facilitates visual search performance. For example, Maljkovic and Nakayama (1994) showed that when observers search for a target defined by its color and report its shape, repetition of the target color speeds search, an effect known as *priming of pop-out*. While intertrial feature priming in search was initially thought to affect perceptual processes, the idea that it also affects postselection stages of processing is increasingly acknowledged. However, because in previous studies repetition of the motor response has typically been confounded with repetition of the response feature, it is not clear what mechanisms underlie the postselection effect of intertrial priming. In the present study, we dissociated the two repetition types. The results showed that repetition of the target-defining attribute from the previous trial affects selection of the motor response but not discrimination of the response attribute. The implications for current accounts of intertrial priming are discussed.

Keywords Visual search · Attention · Memory · Repetition effects · Response selection

In daily-life situations, observers are required to continuously search the environment and quickly extract relevant information from complex and detailed scenes. A simple example for this is when one searches for a desired product among the diversity of products on a supermarket shelf. At each moment during the search, one has to decide which items to ignore and which to attend to. Without some context of previous decisions the search process would be inefficient, because one would have to make the same decisions over and over again. A mechanism that may provide context and continuity during search is an implicit short-term memory store of previous attentional decisions.

Such a mechanism was first proposed by Maljkovic and Nakayama (1994). In their study, observers searched for a target defined as the uniquely colored item among homogeneously colored distractors and responded to its shape (i.e., the task was a compound search task; Duncan, 1985). Target and distractor colors switched unpredictably from trial to trial, such that observers had to perform their search with no knowledge of the upcoming target color. Reaction times (RTs) were faster when target and distractor colors happened to repeat on two consecutive trials than when they switched, an effect known as *priming of pop-out* (PoP) or *intertrial feature priming*. Intertrial repetition effects are also observed when the dimension on which the target is defined repeats (e.g., Found & Müller, 1996) and when target position repeats either in space (Maljkovic & Nakayama, 1996) or in time within a rapid visual stimulus presentation (RSVP) stream (Yashar & Lamy, 2010b).

Several accounts of intertrial priming have been suggested and can be coarsely classified as either selection-based or postselection (see Meeter & Olivers, 2006). According to the selection view (e.g., Maljkovic & Nakayama, 1994, 1996; Müller, Reimann, & Krummenacher, 2003; Wolfe, Butcher, Lee, & Hyle, 2003; Yashar & Lamy, 2010a), repetition of the target- and distractor-defining features either modulates the saliency of these features or facilitates attentional allocation. By contrast, the postselection view suggests that intertrial repetition facilitates processes that occur after focal attention has been allocated to the target (Cohen & Magen, 1999; Huang, Holcombe, & Pashler, 2004; Mortier, Theeuwes, & Starreveld, 2005). However, recently, several authors have

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suggested that the two types of accounts are theoretically compatible and that intertrial repetitions may affect search both during selection and during postselection processing (Lamy, Yashar, & Ruderman, 2010; Meeter & Olivers, 2006; Müller et al., 2003; Töllner, Gramann, Müller, Kiss, & Eimer, 2008). Although the notion that intertrial priming influences postselection processes is increasingly acknowledged (see Kristjansson & Campana, 2010, for a review), it is not yet clear what postselection processes are affected.

Huang et al. (2004) proposed an episodic retrieval (e.g., Logan, 1990; Neill, 1997) account. They suggested that after a candidate target has been located, the system seeks to verify that this element is indeed the target by matching the selected target with the episodic memory of the target selected on the previous trial. They further proposed that the matching process is not restricted to the search-relevant attribute, but is also influenced by other properties of the target (such as the response feature and/or any task-irrelevant feature). Responses are fast when the target properties cohere in their implications—that is, when they either all repeat or all change from the previous trial. Responses are slowed if some features of the current target match those of the previous target but others don’t, because in this case, the system needs extra time to double-check the status of the target.

Lamy et al. (2010) suggested that the postselection component of intertrial feature priming is related to response processes. Töllner et al. (2008; see also Müller & Krummenacher, 2006) also situated the postselection effect at the response stage, but in the context of dimension repetition priming. According to their view, even though there is no statistical relation between repetition of the target dimension and repetition of the response, observers implicitly assume such connection, and therefore reactivate the previous response whenever the previous display repeats. In contrast, if the target’s dimension changes, the system cancels any prior assumptions as to the expected response and starts processing from scratch. Thus, while some authors (Huang et al., 2004) have suggested that intertrial priming speeds the decision about whether the selected item is indeed the target, others propose a later locus for the effect and claim that intertrial priming affects response-related processes (e.g., Cohen & Magen, 1999; Lamy et al., 2010; Töllner et al., 2008).

The effect of intertrial repetition on postselection processes

The postselection view relies almost exclusively on one behavioral finding. In compound search tasks such as that used by Maljkovic and Nakayama (1994), the target-defining attribute is independent of the response-relevant attribute: For instance, observers might search for a color singleton target and respond to its shape. While repetition of the defining feature (color) speeds performance, repetition of the response attribute (shape) typically does not. These findings have initially led to the conclusion that intertrial priming facilitates only perceptual/attentional processes. However, later studies have shown that the two factors interact: The effect of repeating the target-defining feature or dimension (referred to as *intertrial feature priming* or *dimension repetition effects*, respectively) is larger when the response also repeats from the previous trial than when it does not (Huang et al., 2004; Lamy et al., 2010; Meeter & Olivers, 2006; Müller & Krummenacher, 2006; Töllner et al., 2008). This interaction is at the heart of the claim that intertrial priming modulates postselective processes.

It is important to note that in previous studies, a specific motor response was always associated with a specific response attribute. It follows that repeated motor-response trials were always also repeated response-attribute trials. Thus, it is not clear whether intertrial priming modulates postselection perceptual processing of the response attribute (Huang et al., 2004) or response selection/execution processes (Cohen & Magen, 1999; Lamy et al., 2010; Töllner et al., 2008).

Lamy et al. (2010) recently showed that while repetition of the target-defining attribute affects performance early during search (within 100 ms), the interaction of this effect with response repetition emerges only after 200–400 ms. Yet, this finding could reflect either late perceptual processes or response-related processes, because in their study response attribute and motor response were confounded.

Töllner et al. (2008) used event-related brain potentials (ERPs) to measure effects of dimension priming on selection and response. They focused on the N2-posterior-contralateral (N2pc) component, which is held to reflect attentional selection of target stimuli (e.g., Eimer, 1996), and the lateralized readiness potential (LRP), which is linked to the activation and execution of motor responses (e.g., Hackley & Valle-Inclán, 2003). The behavioral results showed that repetition of the target-defining dimension interacted with response repetition. To determine what mechanisms underlie this interaction, the authors examined which ERP component demonstrates the same interactive pattern of results as the RT measure, and found only the onset of the stimulus-locked LRP to do so. Töllner et al. concluded that “concerning processes between focal attentional selection and motor response generation, the stimulus-locked LRP effects… suggest that another part of the RT intertrial facilitation effect arises at the response selection stage” (p. 541).

However, while LRP differences reflect differences in motor-response processes when measured relative to response onset (*response-locked* LRP), when measured relative to stimulus onset (*stimulus-locked* LRP), they may reflect differences pertaining to any processing stage(s) occurring prior to response. Thus, the observed modulation of stimulus-locked LRP suggests that the interaction between dimension repetition and response repetition might reflect any processes occurring between target selection and response preparation. In particular, it might also reflect processes unrelated to response, such as discrimination of the response attribute.

In short, proponents of the response-based view of the postselection effect in intertrial priming predict that intertrial feature repetition should interact with repetition of the motor response, yet they have not yet provided conclusive evidence in support of their view. The objective of the present study was to address this issue within the context of intertrial feature priming.

In the present experiments, we dissociated repetition of the response attribute from repetition of the motor response by assigning each response to two different features. Thus, there were four different response features and two different motor responses. This design allowed us to measure the interaction of intertrial feature priming with repetition of the motor response independently of response-attribute repetition, and to measure the interaction of intertrial feature priming with repetition of the response attribute independently of motor-response repetition.

Experiment 1

The task was similar to that used by Maljkovic and Nakayama (1994). The search items were colored diamonds with one chipped side. Observers had to find the uniquely colored diamond (target) among homogeneously colored diamonds (distractors) and to report the direction of the chipped side by pressing one key with one hand when the chipped corner was directed either upward or downward, and a different key with the other hand when the chipped corner was directed to either the left or the right. The combinations of response-attribute repetition (chipped corner) and motor-response repetition (response key) created three response repetition conditions: (1) same response attribute and same motor response, (2) different response attribute and same motor response, and (3) different response attribute and different motor response. If the postselection component of intertrial feature priming speeds identification of the response feature, then color repetition should interact with repetition of the chipped corner (same response attribute/same motor response vs. different response attribute/same motor response). If the postselection component speeds processes related to the selection and/or execution of the motor response, then color repetition should interact with repetition of the motor response (different response attribute/same motor response vs. different response attribute/different motor response). We also expected to replicate the interaction originally reported by Huang et al. (2004)—that is, an interaction between color repetition and repetition of both the response attribute and the motor response (same response attribute and motor response vs. different response attribute and motor response).

Method

Participants The participants were 11 Tel Aviv University undergraduate students who participated in the experiment for course credit. All reported having normal or corrected-to-normal visual acuity.

Apparatus Displays were generated by an Intel Pentium 4 computer attached to a 17-in. CRT monitor, using graphics mode with 1,024 x 768 resolution. Responses were collected via the computer keyboard. A chinrest was used to set viewing distance at 50 cm from the monitor.

Stimuli An example stimulus display is presented in Fig. 1. The fixation display consisted of a gray 0.4º x 0.4º plus sign (+) in the center of a black background. The search display consisted of the plus sign with the addition of eight outlined colored diamonds (rotated squares 1.2º to a side and drawn

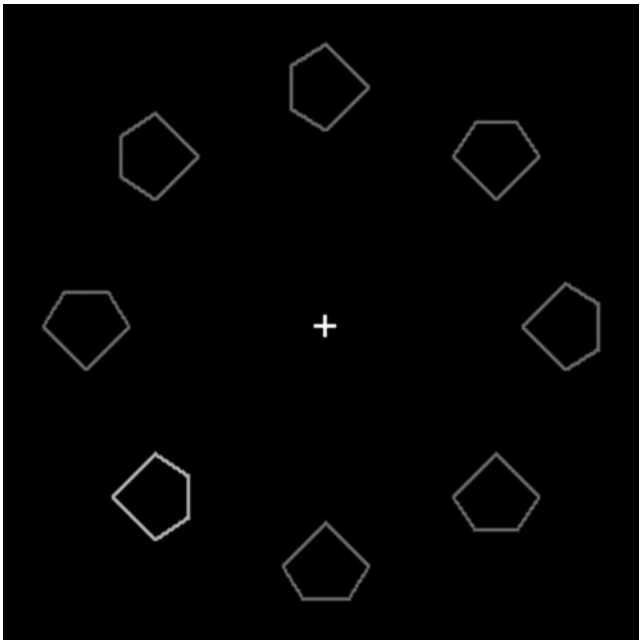

Fig. 1 Sample search display. Observers searched for the color singleton (here, the light gray diamond) and reported the direction of its chipped corner (here, right) by pressing one key if the chipped corner pointed to either the left or right, and another key if the chipped corner pointed either upward or downward. The background was black, and the diamonds were either red or green

with a two-pixel stroke). The left, right, top, or bottom corner of each diamond was chipped (by 0.3º). Each display consisted of two diamonds with each of the four chipped-corner directions. The diamonds were evenly spaced on the circumference of an imaginary circle with a radius of 4.3º. Each diamond was either red or green. In each trial, seven diamonds (the distractors) had the same color, and one diamond (the target) was uniquely colored. The target was randomly chosen to be either red among greens or green among reds.

Procedure and design Each trial began with the fixation display for 500 ms, followed by the onset of the search display for 10 s or until the participant made a response. The next trial began 500 ms after the participant's response. Participants were instructed to respond to the cut-off corner of the target. If either the left or right corner of the target was chipped, they were to press the "3" key. If either the top or bottom corner of the target was chipped, they were to press the "z" key. Error trials were followed by a 500-ms feedback beep sound. Eye movements were not monitored, but participants were explicitly requested to maintain fixation throughout each trial. The experiment included 540 trials, divided into 18 blocks of 30 trials each. The experiment began with 20 practice trials, and the participants were allowed a short rest after every block.

Results

Error trials (less than 4% of all trials) and outlier RT trials (in which the RT exceeded 2.5 standard deviations from the mean RT calculated for each participant—less than 3% of all correct trials) were removed from all RT analyses. The data from 1 participant were also removed because the percentage of errors exceeded the group mean by more than two standard deviations. Mean RTs and error rates are depicted in Fig. 2.

Motor-response repetition We first examined the interaction between color repetition and repetition of the motor response when motor-response repetition is not confounded with response-attribute repetition. To do that, we conducted an ANOVA with color repetition and motor response repetition as within-subjects factors, excluding same-response-attribute trials because they necessarily entail that motor response also repeats (dAdR vs. dAsR in Fig. 2).

Reaction times The main effect of color repetition was significant, *F*(1, 9) = 80.43, $p < .0001$, with faster RTs on repeated than on switch color trials (726 vs. 777 ms, respectively). The main effect of motor- response repetition was not significant, $F < 1$. The interaction between the two factors was significant, *F*(1, 9) = 9.33, $p < .02$, reflecting a larger color repetition effect when motor response repeated than when it changed (63 vs. 38 ms, respectively; both *p*s < .0001).

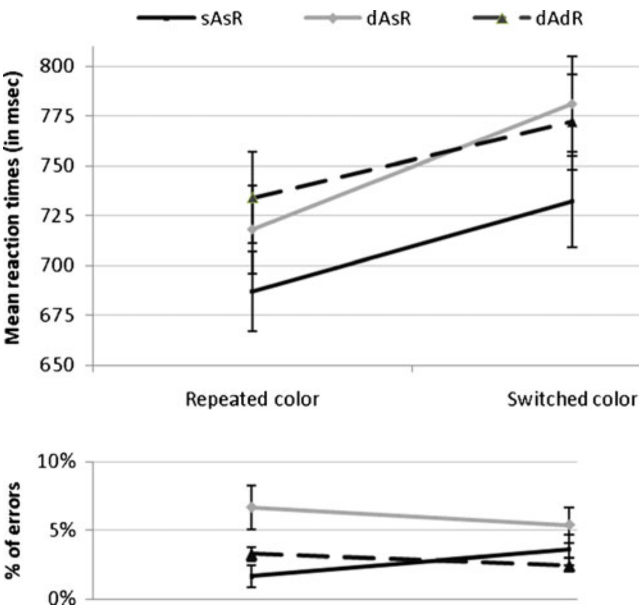

Fig. 2 Mean reaction times (upper panel) and percentages of errors (lower panel) for repeated and switch target color trials by conditions of response: sAsR = same response attribute and same motor response; dAsR = different response attribute and same motor response; dAdR = different response attribute and different motor response. In all graphs, error bars represent ± *SE*s

Accuracy The main effect of motor-response repetition was significant, with more errors on same- than on different-motor-response trials (2.9% vs. 6%, respectively), *F*(1, 9) = 6.30, $p < .04$. There was no other significant effect.

Response attribute repetition Next, we measured the interaction between color repetition and repetition of the response attribute when response-attribute repetition is not confounded with motor-response repetition. To do that, we conducted an ANOVA with color repetition and response attribute as within-subjects factors, excluding different-motor-response trials because they necessarily entail that the response feature also changes (sAsR vs. dAsR in Fig. 2).

Reaction times The main effect of color repetition was significant, with faster RTs on repeated relative to switch color trials (702 vs. 752 ms, respectively), *F*(1, 9) = 35.89, $p < .0003$. The main effect of response feature was also significant, *F*(1, 9) = 128.89, $p < .0001$, revealing that same-response-attribute trials were faster than different-response-attribute trials. However, the interaction between the two factors was not significant, *F*(1, 9) = 3.02, $p > .1$.

If anything, the color repetition effect was numerically larger on different- than on same-response-attribute trials (63 vs. 45 ms, respectively).

Accuracy The main effect of response-attribute repetition was significant, $F(1, 9) = 10.66$, $p < .01$, with fewer errors when the attribute repeated than when it changed (2.7% vs. 6%, respectively). There was no other significant effect.

Confounded repetition We also measured the interaction between color repetition and repetition of both the response attribute and the motor response (sAsR vs. dAdR in Fig. 2), originally reported by Huang et al. (2004), by conducting an ANOVA with the two variables as within-subjects factors.

Reaction times Again, the main effect of color repetition was significant, with faster RTs on repeated relative to switch color trials (710 vs. 752 ms, respectively), $F(1, 9) = 38.87$, $p < .0003$. The main effect of response repetition (response attribute as well as motor response) was also significant, $F(1, 9) = 22.62$, $p < .002$, with faster same-response than different-response trials (709 vs. 753 ms, respectively). However, the interaction between the two factors was not significant, $F < 1$.

Accuracy No effect approached significance. In particular, the interaction between color repetition and repetition of both the response attribute and motor response was nonsignificant, $F(1, 9) = 2.96$, $p > .1$.

Discussion

Experiment 1 yielded three main findings. First, intertrial feature priming interacted with repetition of the motor response, but not with repetition of the response attribute. This finding supports response-based accounts of the postselection component of intertrial priming and argues against an earlier locus of this component (namely, at the stage of verifying that a candidate target is indeed the target). Second, we found that repetition of the response attribute nevertheless speeded search and improved response accuracy. Finally, however, we failed to replicate the interaction initially reported by Huang et al. (2004) between intertrial feature priming and response repetition when the motor response was confounded with the response attribute.

This failure to replicate raises the question of whether the critical finding in this experiment (the interaction between feature priming and motor-response repetition) might be unrelated to the interaction we set out to account for. In fact, it might be exclusively driven by an unexpected result in one single data point: the high RTs in the switched color–different response attribute–same motor response condition (see Fig. 2).

Recent findings by Lamy, Zivony, and Yashar (2011) provide a possible account for this discrepancy between the present study and Huang et al.'s (2004). These results show that the critical interaction emerges only when the search is difficult (namely, when target–distractor discriminability is low). In the present Experiment 1, we used high target–distractor color contrast (red/green), whereas Huang et al. (2004) used relatively low size contrast. To test whether search difficulty may indeed be the critical difference, in Experiment 2 we used low target–distractor color contrast. We expected to replicate both the findings from Experiment 1—namely, (1) an interaction between color priming and repetition of motor response and (2) no interaction between feature priming and repetition of the response attribute—as well as the interaction between color priming and repetition of both response attribute and motor response reported by Huang et al. (2004).

Experiment 2

Method

Participants The participants were 12 Tel Aviv University undergraduate students who participated in the experiment for course credit. All reported having normal or corrected-to-normal visual acuity and normal color vision.

Apparatus, procedure, and design The apparatus, procedure, and design were the same as in Experiment 1, except for the target and distractor colors. Four different colors were used: faint red (CIE coordinates: .29/.27; 35.60 cd/m^2), faint blue (.26/.27; 36.20 cd/m^2), faint green (.28/.32; 42.10 cd/m^2), and faint yellow (.31/.33; 40.20 cd/m^2). Within each block, one of the six resulting possible color pairs was used to define the target and distractors, and the target and distractor colors switched unpredictably. The experiment included three 30-trial blocks for each pair of colors, resulting in 540 trials. Color pair orders were counterbalanced across participants. The experiment began with 20 practice trials, using the same color pair as in the first block of experimental trials.

Results

Error trials (less than 5% of all trials) and outlier RT trials (on which the RT exceeded 2.5 standard deviations from the mean RT calculated for each participant—less than 4% of all correct trials) were removed from all RT analyses, and so were the data from 3 participants, because their percentages of errors exceeded the group mean by more than 2 standard deviations. Mean RTs and errors rates are depicted in Fig. 3.

Motor-response repetition We first conducted an ANOVA with color repetition and motor response as within-subjects factors, excluding same-response-attribute trials (dAdR vs. dAsR, Fig. 3).

Reaction times The main effect of color repetition was significant, $F(1, 8) = 44.02$, $p < .0003$, with faster RTs on repeated than on switch color trials (894 vs. 1,087 ms, respectively). The main effect of response repetition was not significant, $F(1, 8) = .17$, $p > .3$. The interaction between the two factors was significant, $F(1, 8) = 6.3$, $p < .04$, reflecting a larger color-priming effect when motor response was the same than when it changed relative to the previous trial (218 vs. 167 ms, respectively).

Accuracy None of the effects were significant, $F < 1$.

Response attribute repetition Next, an ANOVA was conducted with color repetition and response-attribute repetition as within-subjects factors, excluding different-motor-response trials (sAsR vs. dAsR in Fig. 3).

Reaction times The color repetition effect was again significant, $F(1, 8) = 47.42$, $p < .0001$ (869 vs. 1,084 ms, respectively, for repeated vs. switch color trials). As in Experiment 1, the main effect of response attribute was also significant, $F(1, 8) = 37.62$, $p < .0004$, with faster RTs on same- than on different-response-attribute trials (955 vs. 998 ms, respectively). As in Experiment 1, the interaction between the two factors was not significant, $F < 1$.

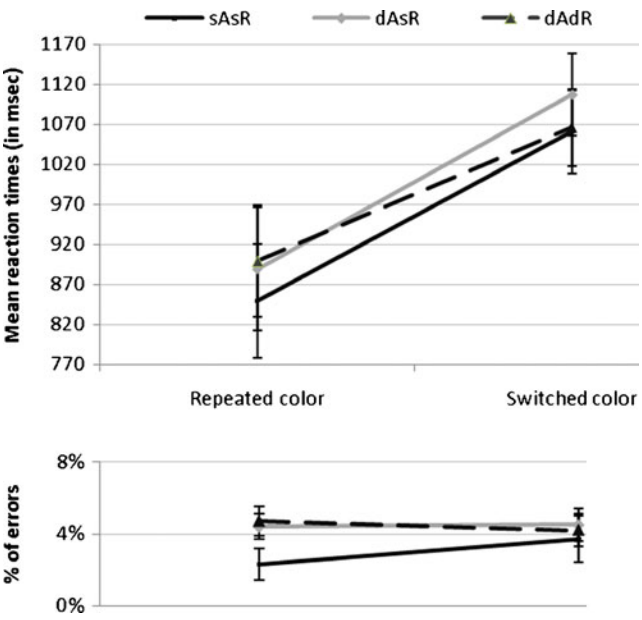

Fig. 3 Mean reaction times (upper panel) and percentages of errors (lower panel) for repeated and switch target color trials by conditions of response: sAsR = same response attribute and same motor response; dAsR = different response attribute and same motor response; dAdR = different response attribute and different motor response

Accuracy None of the effects were significant.

Confounded repetition Next, we conducted an ANOVA with color repetition and repetition of both the response attribute and the motor response (sAsR vs. dAdR in Fig. 3) as within-subjects factors, in order to determine whether the interaction reported by Huang et al. (2004) is replicated when search difficulty is increased.

Reaction times Again, the main effect of color repetition was significant, with faster RTs on repeated relative to switch color trials (874 vs. 1,063 ms, respectively), $F(1, 8) = 54.86$, $p < .0001$. The main effect of response repetition (response attribute as well as motor response) did not reach significance, $F(1, 8) = 3.52$, $p = .09$. In contrast to Experiment 1, the interaction between the two factors was close to significance, $F(1, 8) = 4.71$, $p = .06$, reflecting that color priming tended to be larger on same-response trials than on different-response trials (212 vs. 167 ms, respectively; both *p*s < .0001).

Accuracy Participants tended to make fewer errors on same- than on different-response trials (3.1% vs. 4.4%), $F(1, 8) = 5.22$, $p < .06$. There was no other significant effect.

Discussion

The results of Experiment 2 replicate the main findings of Experiment 1: (1) Intertrial feature priming again interacted with repetition of the motor response and did not interact with repetition of the response attribute. (2) Repetition of the response attribute facilitated search performance. The magnitudes of this effect were similar in the two experiments, suggesting that it is independent of search difficulty.

Crucially, in line with Lamy et al.'s (2011) claim that the postselection component of intertrial priming is enhanced by search difficulty, lowering target–distractor contrast allowed us to replicate the interaction reported by Huang et al. (2004) between color repetition and repetition of both the response attribute and the motor response. Taken together, these findings confirm that the interaction that is the marker of postselection effects of intertrial feature priming (e.g., Huang et al., 2004; Lamy et al., 2010) indeed reflects only response-related processes.

General discussion

Summary of the findings

The present study was designed to investigate the mechanisms underlying postselection effects of intertrial repetition priming in visual search. Specifically, we examined whether the interaction that is the marker of intertrial feature-priming effects on postselection processes reflects modulation of perceptual processes, response-related processes, or both. To do that, we dissociated repetition of the motor response from repetition of the response attribute. Our results show that intertrial feature priming interacts with repetition of the motor response and that, although repetition of the response attribute improves search performance, it does not modulate the magnitude of intertrial priming. Finally, our results replicate the findings reported by Lamy et al. (2011) by showing that the response-related component of intertrial feature priming is more likely to be observed when the search is difficult.

One may argue that although the task explicitly required the observers to discriminate between the four possible response attributes, our participants might have adopted an alternative strategy. Specifically, they might have perceptually categorized the response features according to the two categories of motor response by distinguishing between two different stimulus types: diamonds in which both the left and right corners were intact (vertical diamond) versus diamonds in which both the top and bottom corners were intact (horizontal diamond). If so, we cannot draw meaningful inferences from the finding that intertrial feature priming did not interact with repetition of the response attribute. However, this alternative account is incompatible with the finding that repetition of the response attribute improved performance: Such repetition both speeded RTs and reduced the number of errors, which indicates that observers did rely on discrimination between the four different response attributes in order to respond.

It should be noted that the response-attribute repetition effect does not necessarily reflect enhanced perceptual processing of the target's shape, but might instead result from response-related processes. The procedure used in the present study to dissociate the response attribute and the motor response entailed that when the response attribute repeated, the motor response necessarily also repeated, whereas when the response attribute changed, the appropriate motor response might either be the same or different relative to the previous trial. As a consequence, the response attribute was more strongly associated with the appropriate response when it repeated than when it did not, which might account for the better performance when the response attribute repeated than when it changed.

The dual-stage model of intertrial feature priming

The main thrust of Huang et al.'s (2004) findings was to show that intertrial feature priming does not only reflect a selection-based mechanism, but also includes a postselection effect that might (but does not necessarily; cf. Huang et al., 2004, p. 20) account for the whole effect. Our findings are consistent with this general conclusion, yet they do not support the specific episodic retrieval account proposed by Huang et al. (2004). This account suggests that responses are fast when the target properties either all repeat or all change from the previous trial, and slow in the case of partial repetition. It therefore predicts that intertrial feature priming should interact with repetition of the response attribute. However, this did not happen: In both experiments, intertrial feature priming was of equal magnitude whether the response attribute repeated or changed, but increased when the *motor response* repeated relative to when it did not. Thus, our findings suggest that the postselection effect of intertrial feature priming reflects response-related mechanisms (Lamy et al., 2010), and to the extent that similar mechanisms underlie dimension priming and intertrial feature priming, it is consistent with the response-based view advocated by Töllner et al. (2008).

According to our dual-stage model, intertrial feature priming facilitates attention-guiding processes early during search. We characterized this early component of feature priming in previous articles. We showed that it does not affect processes related to local contrast representation, but rather facilitates allocation of focal attention, by speeding either shifts of attention and/or attentional engagement with the target (Yashar & Lamy, 2010a, 2010b). The selection-based effect is followed by a postselection effect, manifested in the interaction between intertrial feature priming and response repetition (Lamy et al., 2010). In a previous study (Lamy et al., 2011), we showed that this late component emerges when the search is difficult, but also when the search is easy and the conditions of search difficulty are unpredictable (i.e., when easy and difficult search trials are mixed). This finding led us to conclude that the postselection component of feature priming reflects a heuristic strategy that observers tend to use when the search is difficult. The present finding that color repetition interacts with repetition of the motor response but not with repetition of the response attribute suggests that when the search context on the current trial (i.e., the target and distractor colors; see Lamy et al., 2011) is similar to that of the previous trial, participants are more likely to reactivate the motor response associated with the previous trial.

The present findings thereby resolve the theoretical ambiguity that has surrounded the mechanisms underlying postselection effects of intertrial feature priming in the extant literature.

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References

Cohen, A., & Magen, H. (1999). Intra- and cross-dimensional visual search for single-feature targets. *Perception & Psychophysics, 61,* 291–307.

Duncan, J. (1985). Visual search and visual attention. In (Eds.), *Attention and performance XI* (pp. 85–106). Hillsdale, NJ: Erlbaum.

Eimer, M. (1996). The N2pc as an indicator of attentional selectivity. *Electroencephalograpy and Clinical Neurophysiology, 99*, 225–234.

Found, A., & Müller, H. J. (1996). Searching for unknown feature targets on more than one dimension: Investigating a "dimension-weighting" account. *Attention, Perception, & Psychophysics, 58,* 88–101.

Hackley, S. A., & Valle-Inclán, F. (2003). Which stages of processing are speeded by a warning signal? *Biological Psychology, 64,* 27–45.

Huang, L. Q., Holcombe, A. O., & Pashler, H. (2004). Repetition priming in visual search: Episodic retrieval, not feature priming. *Memory & Cognition, 32,* 12–20.

Kristjansson, A., & Campana, G. (2010). Where perception meets memory: A review of repetition priming in visual search tasks. *Attention, Perception, & Psychophysics, 72,* 5–18.

Lamy, D., Yashar, A., & Ruderman, L. (2010). A dual-stage account of inter-trial priming effects. *Vision Research, 50,* 1396–1401.

Lamy, D., Zivony, A., & Yashar, A. (2011). Th*e role of search difficulty in inter-trial feature priming*. In press.

Logan, G. D. (1990). Repetition priming and automaticity—Common underlying mechanisms. *Cognitive Psychology, 22,* 1–35.

Maljkovic, V., & Nakayama, K. (1994). Priming of pop-out: 1. *Role of features. Memory & Cognition, 22,* 657–672.

Maljkovic, V., & Nakayama, K. (1996). Priming of pop-out: 2. The role of position. *Perception & Psychophysics, 58,* 977–991.

Meeter, M., & Olivers, C. N. L. (2006). Intertrial priming stemming from ambiguity: A new account of priming in visual search. *Visual Cognition, 13,* 202–222.

Mortier, K., Theeuwes, J., & Starreveld, P. (2005). Response selection modulates visual search within and across dimensions. *Journal of Experimental Psychology: Human Perception and Performance, 31,* 542–557.

Müller, H. J., & Krummenacher, J. (2006). Locus of dimension weighting: Preattentive or postselective? *Visual Cognition, 14*(4), 490–513.

Müller, H. J., Reimann, B., & Krummenacher, J. (2003). Visual search for singleton feature targets across dimensions: Stimulus and expectancy-driven effects in dimensional weighting. *Journal of Experimental Psychology: Human Perception and Performance, 29,* 1021–1035.

Neill, W. T. (1997). Episodic retrieval in negative priming and repetition priming. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 23,* 1291–1305.

Töllner, T., Gramann, K., Müller, H. J., Kiss, M., & Eimer, M. (2008). Electrophysiological markers of visual dimension changes and response changes. *Journal of Experimental Psychology: Human Perception and Performance, 34,* 531–542.

Wolfe, J. M., Butcher, S. J., Lee, C., & Hyle, M. (2003). Changing your mind: On the contributions of top-down and bottom-up guidance in visual search for feature singletons. *Journal of Experimental Psychology: Human Perception and Performance, 29,* 483–502.

Yashar, A., & Lamy, D. (2010a). Intertrial repetition affects perception: The role of focused attention. *Journal of Vision, 10*(14).

Yashar, A., & Lamy, D. (2010b). Intertrial repetition facilitates selection in time. *Psychological Science, 21,* 243.