Brief article

Errors, efficiency, and the interplay between attention and category learning

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[a]

2.3. Procedure

We used a Tobii X50 sampling at 50 Hz to collect direct and fine-grained spatial and temporal information about participants' gaze. The experiment consisted of a series of categorization trials. Participants began each trial by clicking a fixation cross that appeared in the center of the screen, after which a stimulus was displayed. Participants decided the category to which the stimulus belonged, then clicked the mouse button. This removed the stimulus and revealed response boxes in the four corners of the screen. The category labels (A1, B1, etc.) were randomly assigned to boxes in different corners on each trial to avoid biasing fixations during stimulus presentation. Once a box was clicked, it either turned green to indicate that the response

reflects the aggregate trend of continuous, gradual improvement throughout the post-criterion trials.

There was no external feedback indicating errors during the post-criterion phase and therefore models of attentional learning that require an external error signal cannot account for the observed error-free optimization. It is possible, however, that an internally generated error signal might allow performance error a role in driving attentional change. If this were happening, then we would expect optimization to occur only in those participants who made performance errors during the post-criterion stage. To investigate this possibility we examined just the 14 participants who made no errors at all during the final 96 trials

to 0.31 (SD = 0.29) for the six post-learning trials: $t(21) = 3.53$, $p < .01$. This jump in optimization centered on the learning point of each category is numerically larger than the increase in optimization shown in the entire post-criterion phase of the experiment. These results indicate that on trials where participants were presented with stimuli whose category membership they were unsure of, they did not optimize at all, but within one trial of learning a category they began optimizing to a significant extent.

The dip in optimization one trial before the learning point may be interesting. Optimization on this trial is significantly lower than the average of the five previous trials: $t(21) = 2.27$, $p < .05$. The definition of learning points guarantees that this trial will be incorrect, and it could be that before learning there is a very slight correlation between optimization and accuracy. Given the sample size, how-

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