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Vision Research

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2006) and that AI is a key region in representing subjective salience (Uddin, 2015), our results suggest that reward-associated stimulus captures attention because of its increased salience.

Despite that a stimulus can gain attentional priority through an extensive reward learning phase, recent evidence suggests that such an extensive learning phase is not necessary for reward-based attentional capture to occur. Le Pelley, Pearson, Griffiths, and Beesley (2015) showed that a task-irrelevant distractor could capture attention by simply signalling the availability of reward, even though attending to this distractor impairs task performance and hence is detrimental to obtaining reward. The authors used an additional singleton task (Theeuwes, 1991a, 1992), in which participants searched for a shape singleton while the colour of an irrelevant singleton, which has a higher bottom-up perceptual salience than the shape singleton (Wang et al., 2013; Wei & Zhou, 2006), signalled the amount of reward that could be earned on that trial. That is, the amount of reward participants would receive after a correct and fast response in the current trial was predicted by the colour singleton, with one colour being predictive of high reward and the other colour being predictive of low reward. Although directing attention to the colour singleton would impair task performance and thus lower the probability of obtaining reward, the distractor that signalled a high reward nevertheless more severely interfered with target processing than the distractor that signalled a low reward. A similar pattern was observed in an oculomotor version of the task where the colour singleton signalling a high reward attracted more saccades than the colour singleton signalling a low reward, even though these eye movements resulted in reward omission (Failing, Nissens, Pearson, Le Pelley, & Theeuwes, 2015; Le Pelley et al., 2015; Pearson, Donki, Tran, Most, & Le Pelley, 2015).

Although attentional capture by reward availability shows a pattern of interference with target processing similar to the pattern observed in paradigms with reward learning, it remains unclear whether they are driven by the same mechanism. One possible account is that, like the reward association through a task-relevant learning process, the task-irrelevant information of reward availability also increases the subright index fingers. Each trial had a critical distractor whose colour (red or blue) was unique among the other black items and was either associated with high or low reward. For half of the participants, the red distractor was associated with high reward, and the blue distractor was associated with low reward; for the other half, the association was re-

the distractors appeared.

3.1. Method

3.1.1. Participants

Eighteen university students (12 females, mean age 25 years) with reported normal or corrected-to-normal vision and normal colour vision participated in Experiment 2. They were not tested for Experiment 1. They all provided written informed consent prior to the experiments in a manner approved by the Ethics Committee of the VU University, Amsterdam. The payments of these participants were between €12 and €15.2 (mean payment €14.3).

3.1.2. Stimuli and design

The design in Experiment 2 was the same as that in Experiment 1 except that the target diamond and distracting circles without the line segments were presented for 200 ms prior to the task frame. The target was always presented at the bottom location in the lower visual field. Specifically, in the cue frame, the diamond at the bottom location was presented together with the other black circles. After 200 ms, the colour singleton distractor replaced one of the black circles, and a line segment was presented inside each stimulus item. This task frame remained on the screen until a response was given or the time limit (1300 ms) was reached. Note here RTs were recorded relative to the onset of the task frame rather than the onset of the cue.

3.1.3. Data analysis

4.3. Discussion

In Experiment 3, the reward modulations showed dramatically different patterns of results depending on whether the target location was cued prior to the appearance of the distractor, versus the condition in which the target location was uncued and hence unpredictable. Specifically, as in Experiment. 2, the high-reward distractor caused interference to the processing of the target when it was adjacent to the target relative to when it was far away whereas the low-reward distractor showed no effect. However, there was a reward-induced attentional capture effect at two locations (Location 1 and Location 3) near the target when the target location was not cued in advance. The reversed reward effect at Location 4 in the uncued block may indicate the active suppression of high versus low salient distractor (Geng, 2014; Sawaki, Luck, & Raymond, 2015). Given that the strength of this active suppression is determined by the representational distance between the target and the distractor (Geng, 2014), the distractor located far away from the target (Location 4) was more effectively suppressed than the distractor near the target (Locations 1, 2 and 3). According to the normalization model of attention (Herrmann, Montaser-Kouhsari, Carrasco, & Heeger, 2010; Reynolds & Heeger, 2009), distractor could be more effectively suppressed when there is spatial uncertainty than when there is no spatial uncertainty. Thus, the active suppression was observed in the uncued block (with spatial uncertainty), but not in the cued block (without spatial uncertainty) in Experiment 3.

Across three experiments, we replicated the finding that a task-irrelevant stimulus captures attention and interfere with target processing by merely signalling the availability of reward even when attending to this stimulus is detrimental to gaining reward (Failing et al., 2015; Le Pelley et al., 2015; Pearson et al., 2015). In an extension, we demonstrated that the reward-associated distractor still captures attention even when it falls outside the attentional focus, regardless of whether attention is endogenously (Experiment 1) or exogenously (Experiments 2 and 3) narrowed down to the target location.

The occurrence of reward-based attentional capture when the target location is known in advance has been reported in previous studies using other paradigms (MacLean et al., 2016; Munneke et al., 2016).

demonstrating that the influence of reward availability on oculomotor capture decreased as a function of time (see also Pearson et al., 2016). Taking together these studies and the current one, we suggest that re-