The Impact of Social Associative Learning on Conscious Visual Awareness during Binocular Rivalry

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Background: When two dissimilar images are presented to the two eyes, they compete for conscious access with the two percepts alternating spontaneously over time. Dubbed binocular rivalry, this condition is known to be modulated by various factors including emotion (Yoon et al., 2009), attention (Mitchell et al., 2004), and learning (Kim et al., 2010). It has been also shown in a recent work that a socially relevant stimulus tends to predominate (Anderson et al., 2011). The current study further investigated the influence of social relevance on visual awareness during rivalry by exploiting the trust game with which social associative learning was built up for otherwise neutral faces.

Methods: Thirteen participants were tested on the experiment which consisted of three steps: pre-learning binocular rivalry, learning with the trust game, and post-learning binocular rivalry. During pre- and post-leaning rivalry, pairs of 12 male faces and 12 scenes were presented dichoptically. In the trust game, participants played the role of investor and interacted with 9 of the 12 faces presented during binocular rivalry. The rest 3 faces which did not appear in the game were considered as a control in binocular rivalry. Those 9 faces were categorized into 3 groups and assigned to “good”, “bad” or “neutral” condition. On each trial, the participant viewed a face and chose the amount of investment to that person, followed by an indication of “fair”, “unfair”, or “intermediate” amounts of return with a portion of the augmented amount of investment in “good”, “bad”, or “neutral” condition, respectively. Each face was repeated ten times and the order was pseudo-randomized.

Results: The investment performances from all thirteen participants in the trust game showed associative learning based on amounts of return; they tended to invest more to the “good” faces offering fair returns, but less to the “bad” faces offering unfair returns, as they played the game with the same partners repeatedly. In post-learning rivalry, the difference in predominance (i.e., the total duration of face dominance over scene) between “good” and “bad” faces correlated positively with the degree of investment toward “good” relative to “bad” faces.

Conclusion: These results suggest that socially significant information earned through associative learning influences conscious visual awareness during binocular rivalry.