

Hand-eye correlation: Hand movements can alter color judgments

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Introduction

- Sensorimotor adaptation may occur when a body movement is systematically paired with a stimulus - a change in perception may "correct" for this correlation.
- Research has yet to determine whether sensorimotor adaptation occurs only for those cases where body movements are relevant to sensory input, or whether sensorimotor adaptation can also occur for those cases where body movements are irrelevant to sensory input.
- One example of sensorimotor adaption for relevant pairings comes from Bompas and O'Regan (2006). Their study consisted of adaptation phases and testing phases. During the adaptation phases, leftward saccades were paired with a red stimulus and rightward saccades were paired with a green stimulus. During subsequent test phases, subjects behaved as if stimuli were greener after leftward saccades and redder after rightward saccades compared to pre-adaptation testing.
- Bompas and O'Regan (2006) described their results as an entirely visual phenomenon. In the current research, we test this claim by pairing hand movement with specific color perception. Traditionally, hand movement is considered irrelevant for color perception. If the sensorimotor adaptation described by Bompas and O'Regan is contingent on a relevant pairing, then observers will not compensate for the contingency between hand movement and color perception. If, however, the adaptation is the result of a more general learning mechanism, then compensation should occur.

Methods

Experiment 1

- Red stimuli were paired with leftward hand movements and green stimuli were paired with rightward hand movements during the adaptation phase.
- The adaptation phase consisted of an incidental task (similar to "Simon Says") with red and green stimuli.
- All stimuli were presented on a white background.

Experiment 2

- This was a control experiment using the methods outlined for Experiment 1, save that two white stimuli were used during the adaptation phase.

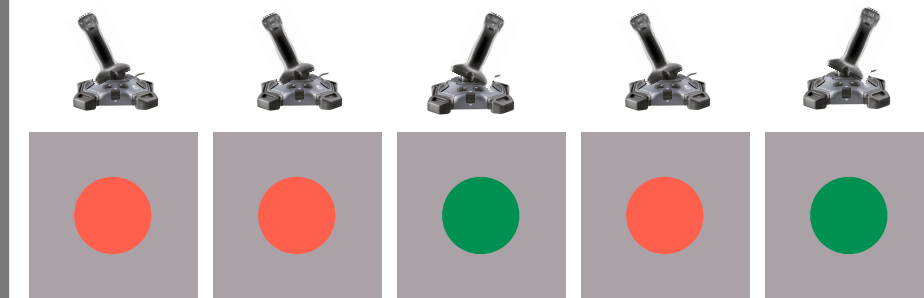
Procedure

The **adaptation phase** consisted of two steps:

1. Observer was given auditory "Simon Says" instructions.

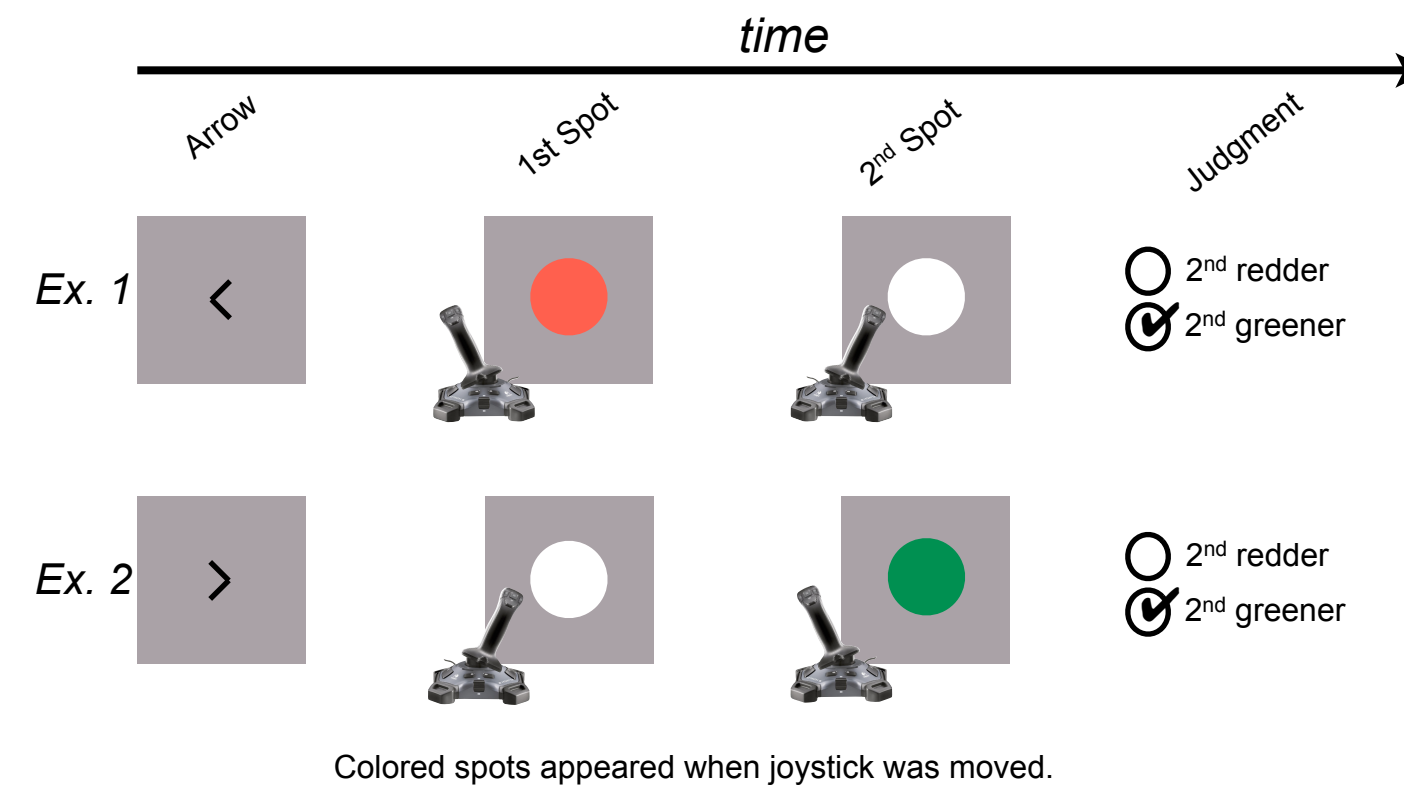


2. Observer responded with the corresponding joystick movements, thus creating five colored spots.



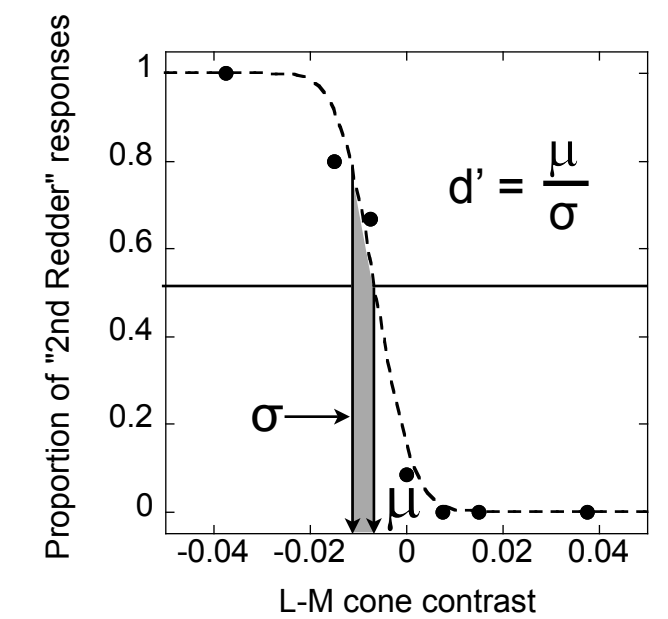
Steps 1 and 2 were repeated *ad nauseam*.

The **test phases** (before and after adaptation) consisted of the following:



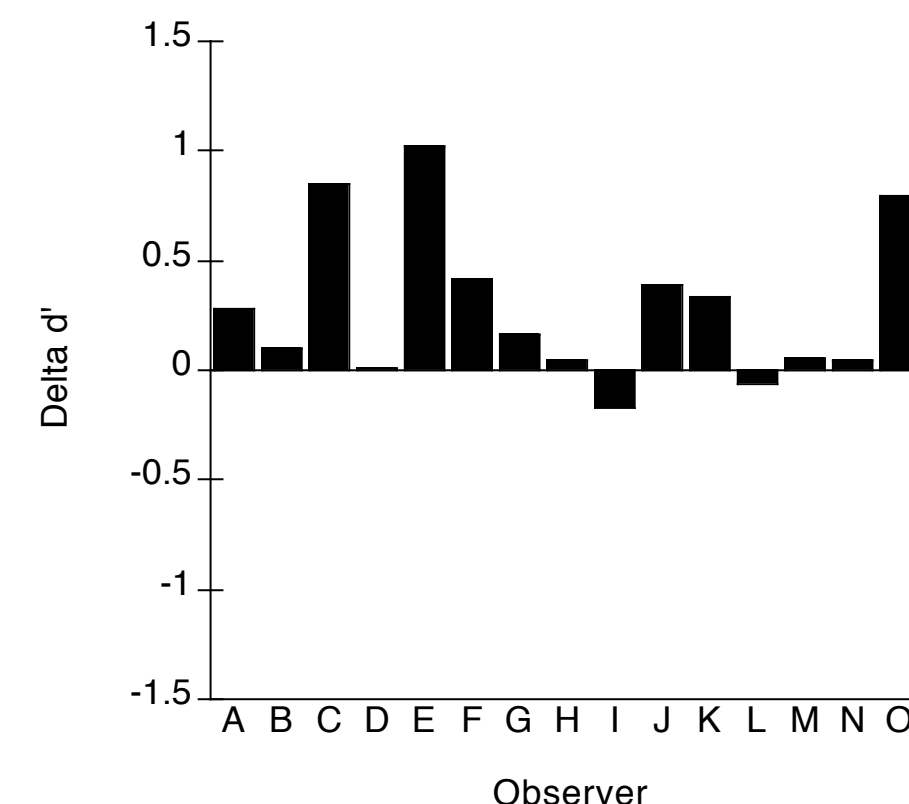
Colored spots appeared when joystick was moved.

These data represent performance during pre-test trials of the kind shown in Example 1. The abscissa is the red-green contrast of the first spot, and the ordinate is the proportion of "2nd redder" responses. The line is a fitted curve from which d' can be extracted.



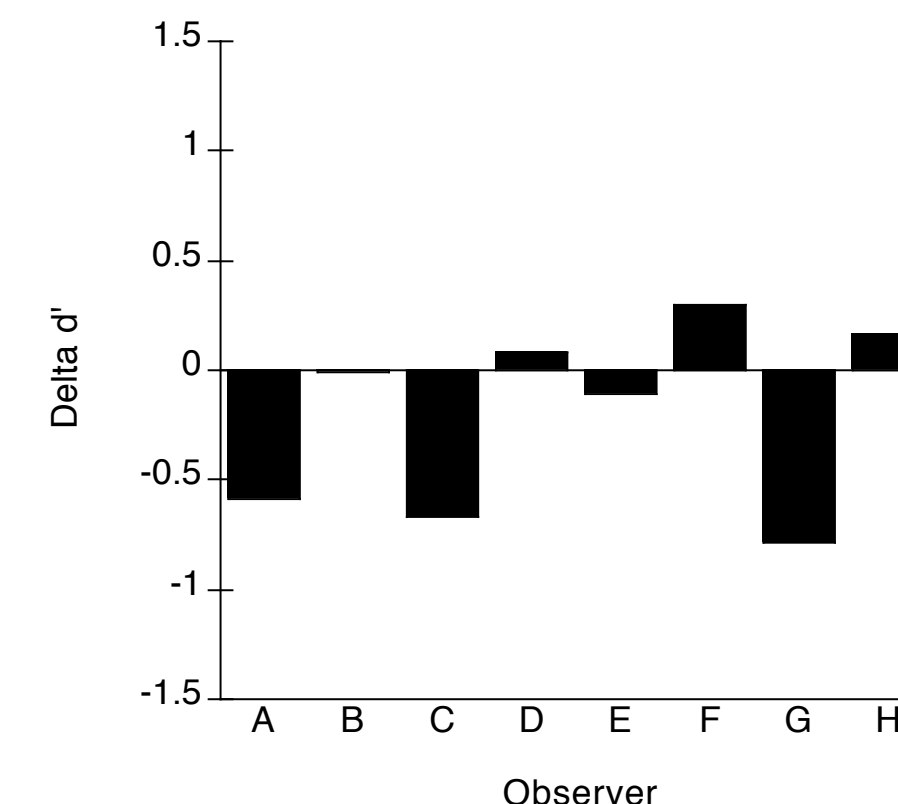
Results: Experiment 1

- The figure below shows the difference in d' at pre-test and d' at post-test for each observer.
- A positive difference indicates compensation, which was found for 13 of 15 observers.
- These results indicate that a sensorimotor contingency between hand movement and color perception will result in compensation.



Results: Experiment 2

- The figure below shows the difference in d' at pre-test and d' at post-test for each observer. A non-positive difference indicates a lack of compensation.
- These results indicate that observers behaved as if the spot looked redder when paired with a leftward hand movement in post-test compared to pre-test, which is in the opposite direction of compensation. This may be the result of repeated linguistic association between hand movement and auditory cue in the many adaptation trials.



Conclusions

- The sensorimotor adaptation effect reported by Bompas & O'Regan (2006) and replicated by Richters & Eskew (2007) can be observed even for irrelevant body movement and percept pairings as those used in the current research.
- It remains to be seen the extent to which contingencies between irrelevant body movements and percept results in sensorimotor adaptation. For example, will sensorimotor adaptation be observed for the pairing or hand movements and direction or motion, size, or contrast. Future research is aimed at exploring these possibilities.