

# Reward elicits unconscious learning in humans

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A new study challenges the prevailing assumption that you must pay attention to something in order to learn it. The research, published by Cell Press in the March 12th issue of the journal *Neuron*, demonstrates that stimulus-reward pairing can elicit visual learning in adults, even without awareness of the stimulus presentation or reward contingencies.

"Recent studies have raised the question of whether visual skill [learning](#) requires an active goal directed process or whether learning can occur automatically without any task, stimulus awareness, or goal directed behavior," says study author Dr. Aaron Seitz from the Department of [Psychology](#) at the University of California, Riverside. Dr. Seitz and colleagues Drs. Dongho Kim and Takeo Watanabe from Boston University designed a novel experimental paradigm to take the "task" out of [perceptual learning](#).

Study participants were asked to view a computer monitor, maintain their gaze on a central spot and enjoy the occasional drop of water that was delivered to their mouths through a tube. The drop of water was considered a reward because subjects were required to abstain from eating and drinking for five hours before the experimental session. The [visual stimuli](#) that were paired with the liquid rewards were viewed with one eye and were imperceptible to the subjects because contour rich patterns were continuously flashed to the other eye.

"The use of this procedure allowed us to examine the specific hypothesis that reward-related learning signals are sufficient to cause improvements

in [visual sensitivity](#) for visual stimuli paired with rewards," explains Dr. Seitz. The researchers found that stimulus-reward pairing was sufficient to cause learning, even when the subject was not aware of the learned stimuli or stimulus-reward conditions. The learning effects were specific to the eye receiving the stimuli, a condition indicative of an early, monocular stage of visual processing.

These results suggest that automatic reinforcement mechanisms (such as those released at times of reward), rather than directed attention, determine improvements in sensory skills.

"Our findings support the suggestion that visual skill learning is generally an unconscious process and that goal-directed factors, such as directed attention, serve mostly to bias how learning takes place rather than actually gating the learning process," hypothesizes Dr. Seitz. The authors are careful to acknowledge that future studies are required.

Source: Cell Press

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