



## The Role of Dopamine in Value-Based Attentional Orienting



Previous research has shown that visual attention is captured by a stimulus when it has been previously rewarded. How dopamine and the striatum are involved in this behavior, however, is not understood as well. The striatum is a major source of dopamine and a component of the motor and reward systems. It also plays a role in the “learning and execution of habits.” Dr. Brian Anderson, a new member of the TAMU Psychology Department, recently conducted a study to explore the ways dopamine contributed to value-based attentional orienting. Dr. Anderson’s study received media coverage including CNN, The New York Times, and the TODAY show.

Anderson and colleagues posited that dopamine contributes to value-based attentional orienting, even when the reward is explicitly absent or the previously rewarded stimulus is no longer relevant. Their findings provide direct evidence linking dopamine signaling within the striatum to the involuntary orienting of attention, and specifically to the attention-grabbing quality of learned reward cues.

The design of the study to test their hypothesis consisted of a training and testing phase. In the training phase, 20 participants were given a visual search task where they searched for two color-defined targets associated with a monetary reward outcome. The following day, participants returned to complete an unrewarded search task while two PET scans were conducted. One scan was conducted during a distractor-absent search and the other during a distractor-present search. The difference in the two scans was that one had no stimuli rendered in a previously rewarded color, while the other had trials on which a distractor stimulus was rendered in a previously rewarded color. In the training phase, participants were faster to report the target associated with higher reward, “indicating learning of the stimulus-reward associations.” Anderson and colleagues used the PET scans to observe the “relationship between the attentional bias observed in behavior and the availability of D2/D3 dopamine receptors in the striatum.” The data taken from the scans in the test phase were used to test for a correlation between the participant’s visual-based attention bias and the participants’ dopamine released in the presence of a previously rewarded distractor. Results found significant correlations in the right anterior and posterior caudate, and the right posterior putamen. Each had a positive correlation with the percentage of dopamine released increasing the more a person was distracted.

This is important because the data collected from this study speaks to the neural basis of value-based distraction. Specifically, previously rewarded stimuli evoke more dopamine release, which predicts distraction. Furthermore, this direct evidence linking dopamine signaling within the striatum to the involuntary orienting of attention sheds light on the neurochemical basis of an individual’s susceptibility to form addiction. By better understanding how dopamine plays a role in value based attentional orienting, studies can provide us with information on understanding our habits and addictions.



**Brian Anderson**  
Texas A&M University

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Authors: Erin Cloud & Haley Williams

Erin and Haley are currently undergraduate psychology majors. They will be giving updates of the cutting-edge science occurring in the psychology department throughout the semester.