



Cognitive Neuroscience of the Motivation-Learning Interface

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Introduction:

Behavior is motivated by a desire to approach positive and avoid negative outcomes. Neuro-anatomically and functionally distinct memory and learning systems interacts with these motivational influences to determine behavior. Although generally studied separately, motivation and learning are intimately connected and should be studied in concert.

Projects:

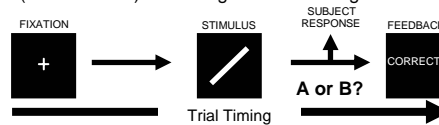
We examine the motivation-learning interface within a research framework that blends behavioral studies of healthy and brain damaged participants with brain imaging and mathematical modeling. Two large scale projects are currently active:

1) Behavioral and neural dissociations between a frontal-mediated hypothesis-testing and basal ganglia-mediated procedural learning based classification systems.

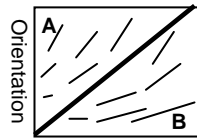
2) Motivational influences on learning including regulatory fit, stereotype threat, choking under pressure, etc.

Classification Task-Systems:

•Human participants view hundreds of images (one at a time) and categorize each image

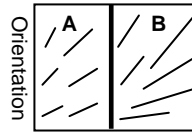
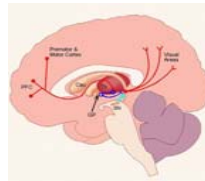


Two Types of Classification Tasks



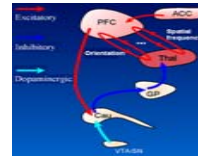
INFORMATION-INTEGRATION

- Not Verbalizable
- Implicit
- Does not require WM and attention
- Mediated by the basal ganglia



RULE-BASED

- Verbalizable
- Explicit
- Requires WM and attention
- Mediated by frontal brain regions



Representative Findings:

- 1) Rule-based but not information-integration learning is impacted by working memory and attention manipulations.
- 2) Information-integration but not rule-based learning is impacted by category representation, stimulus-response compatibility and feedback timing manipulations.

For Additional Information

concerning the research conducted in our lab and for reprints visit <http://homepage.psy.utexas.edu/homepage/groupmaddoxlab/> or email Todd Maddox at maddox@psy.utexas.edu.

Motivation-Learning Interface:

Working Hypothesis: A “fit” between a person’s regulatory focus and the state of the environment leads to more flexible explicit rule-based processing. Fit leads to good rule-based learning but poor information-integration learning.

Two Regulatory Foci:

- 1) Promotion Focus/Approach Mode: “Do well in the task and earn an entry into a raffle for \$50.”
- 2) Prevention Focus/Avoidance Mode: “Do well in the task or lose an entry into a raffle for \$50.”

Two States of the Environment:

- 1) Gains: Correct Response: 3 points; Error: 1 point
- 2) Losses: Correct Response: -1 point; Error: -3 points

State of environment	Regulatory focus	
	Promotion	Prevention
Gains	Fit	Mismatch
Losses	Mismatch	Fit

Representative Findings:

- 1) A regulatory fit improves rule-based learning, whereas a regulatory mismatch improves information-integration learning.
- 2) Pressure improves information-integration learning, but worsens rule-based learning.
- 3) “Stereotype threat” is a form of prevention focus.