

# The striatal feedback response reflects goal updating

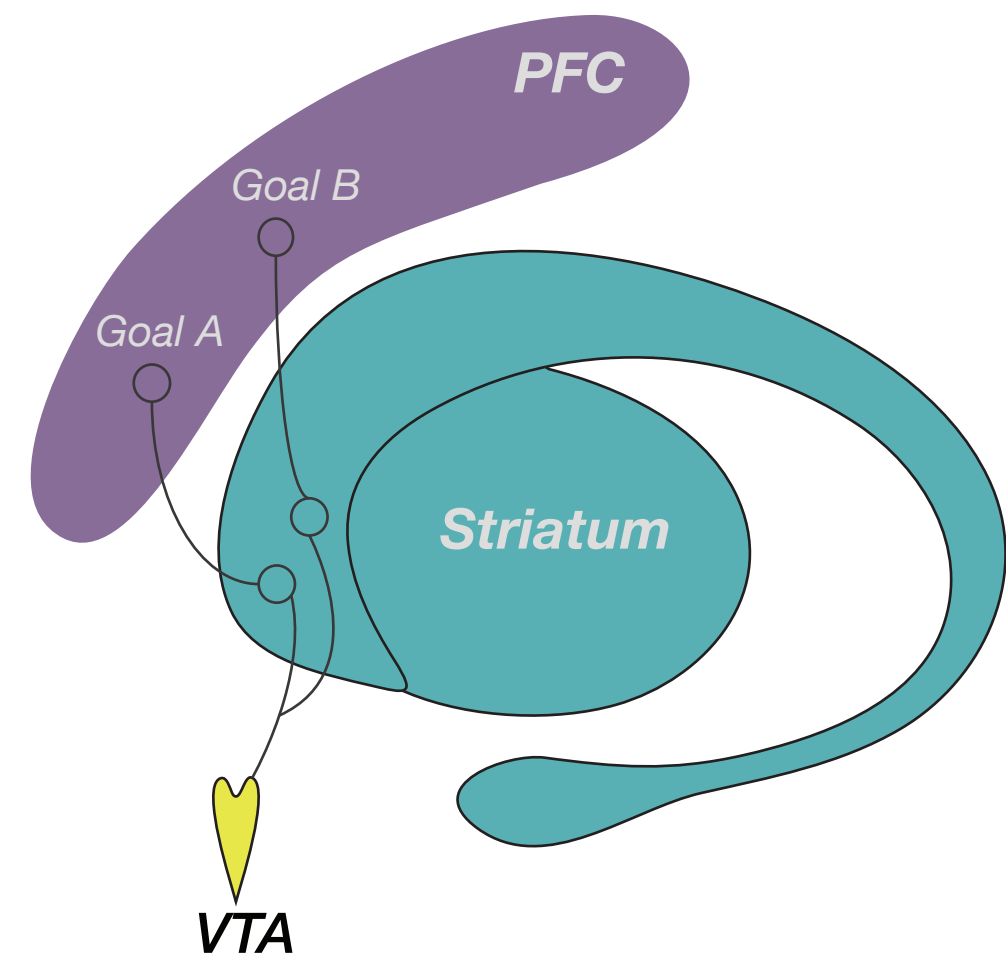
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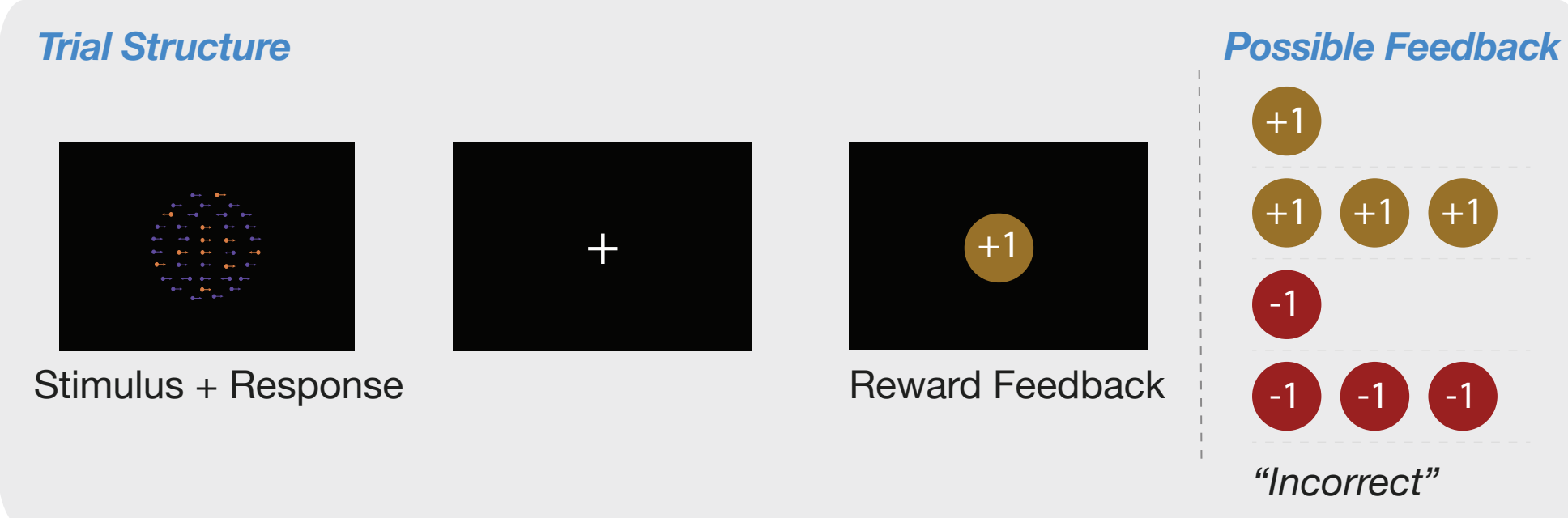
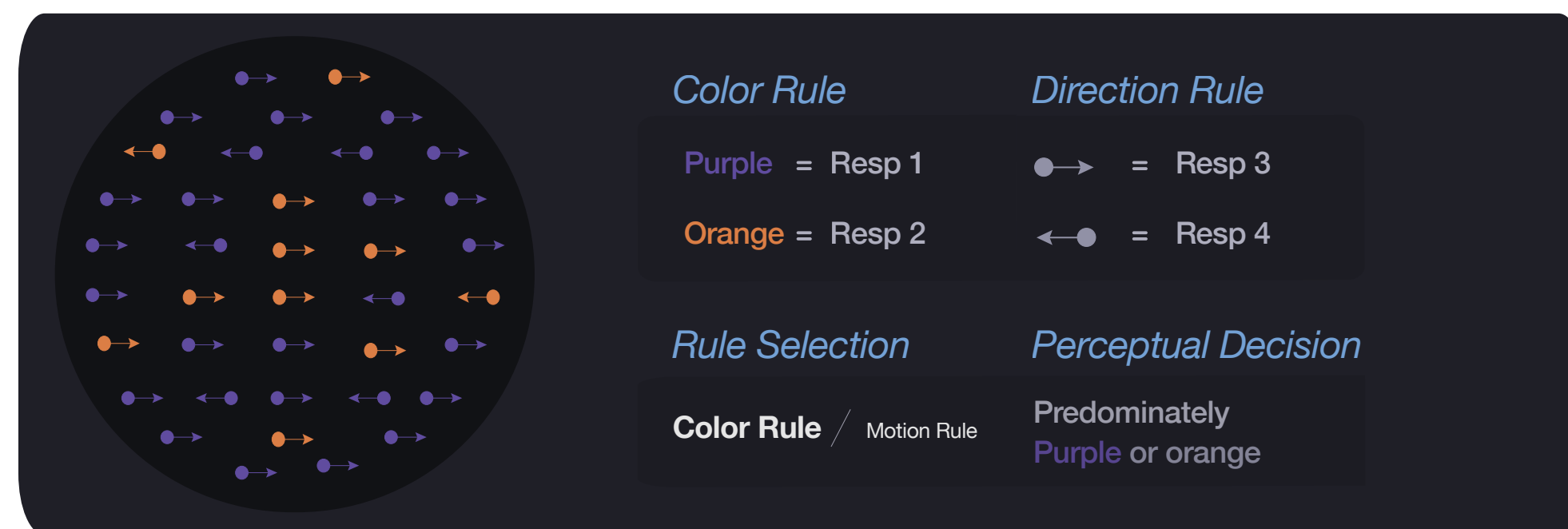
## Motivation

- 1) The striatum is thought to be involved in reward, affect, and the gating of information into cortical circuits.
- 2) Regions of the striatum targeted by prefrontal cortex could gate abstract goals based on their reward values
- 3) Testing this hypothesis is challenging because gating is often confounded with prediction error



## Task

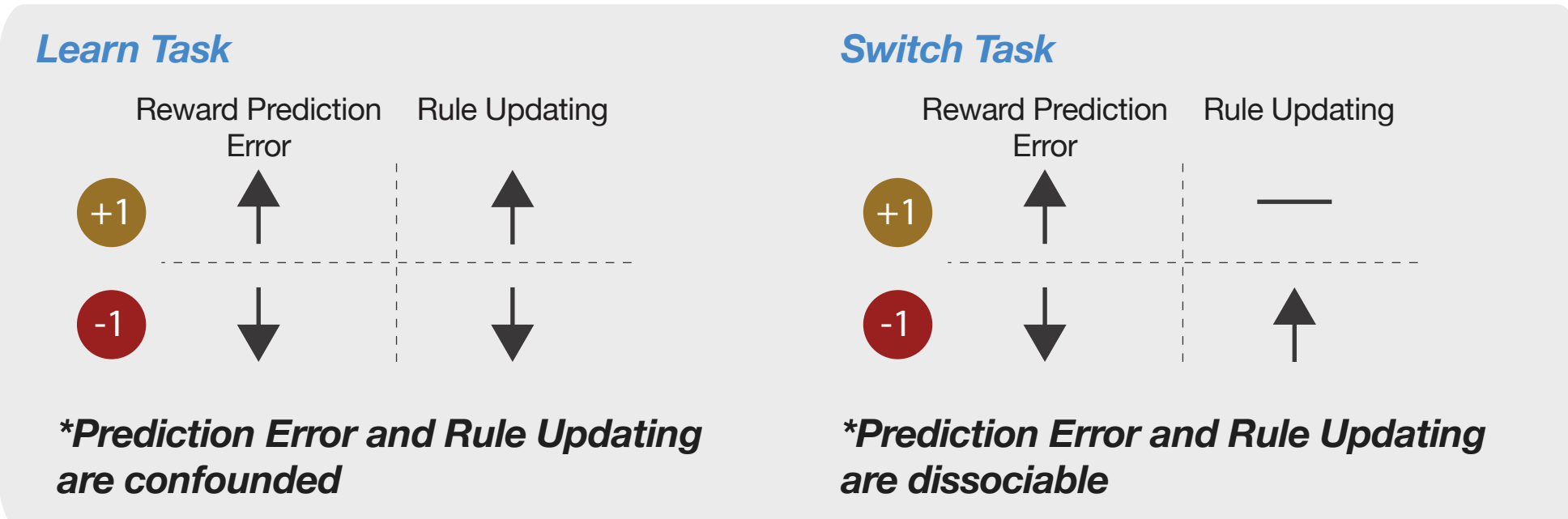
**Key Idea:** The task dissociates goal updating from reward processing



**Task Instructions** \*Actual sequence of reward feedback was identical between tasks

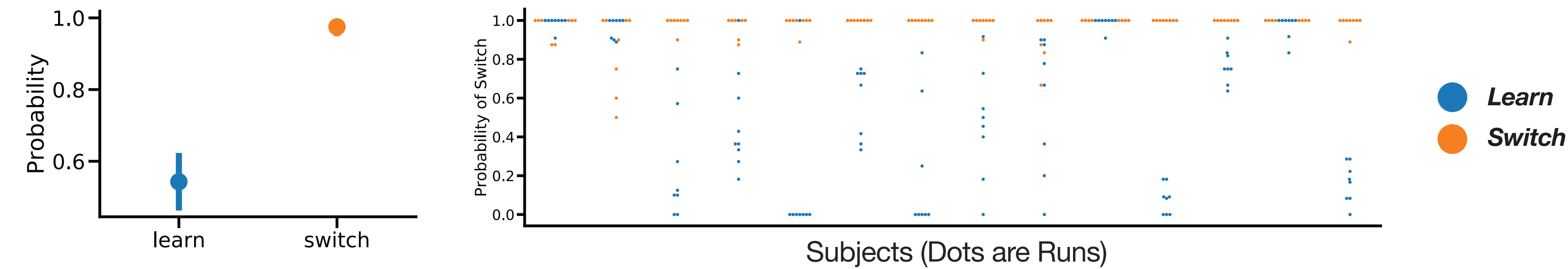
**Switch Task**  
 There is a good rule and a bad rule. The good rule always gives coins and the bad rule always loses coins. Unpredictably, the identity of the good and bad rule switches. When a good rule starts losing coins, that means that it is no longer good and you should switch rules.

**Learn Task**  
 There is a better rule and a worse rule. The better rule usually wins gold coins but sometimes loses gold coins, and the bad rule usually loses coins but sometimes wins coins. Select the rule that earns you more coins more often, and loses you fewer coins less often. The better rule now may not be the better rule later.



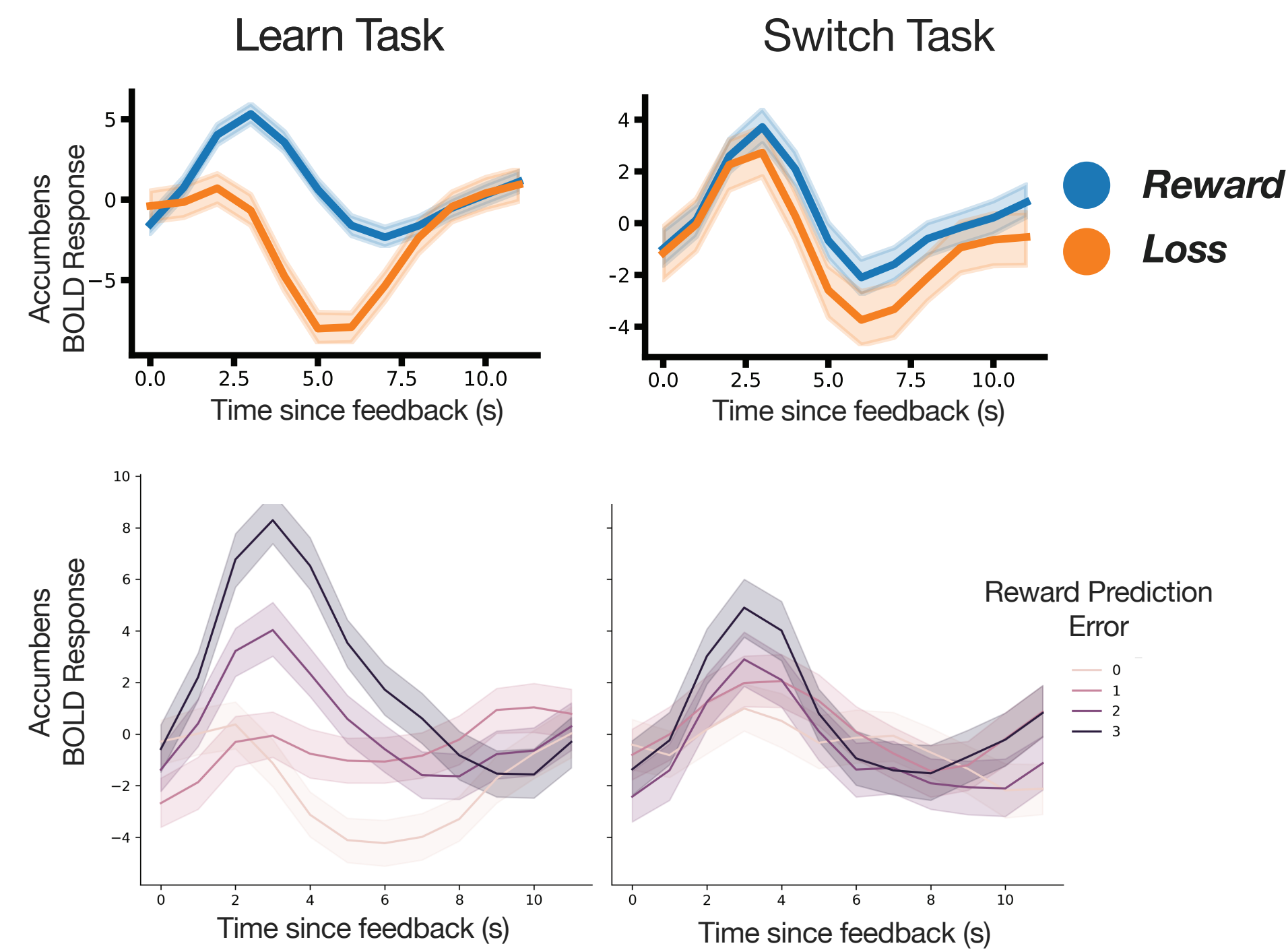
## Behavioral Results

Probability of Switching Rules After Negative Feedback

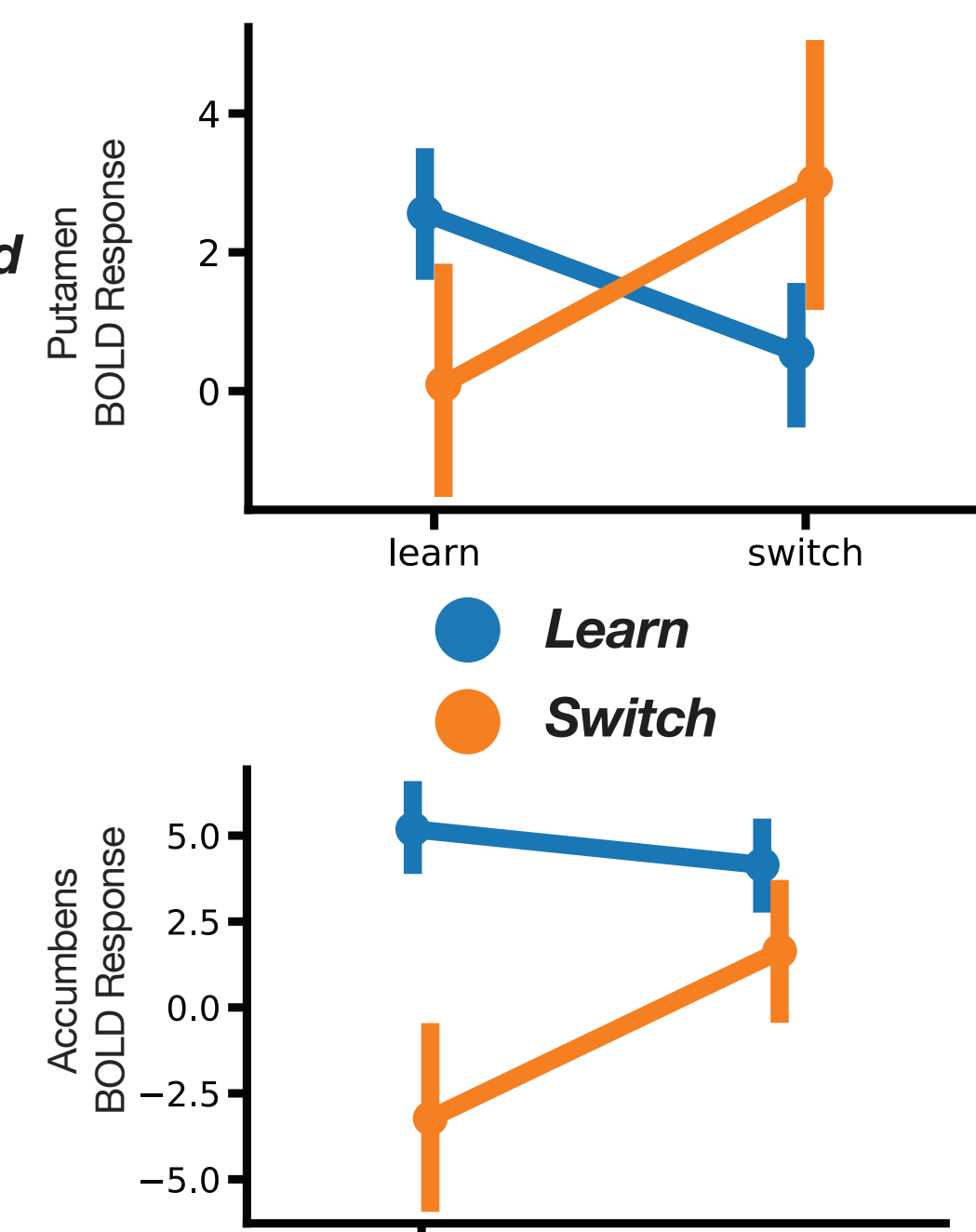


## fMRI Results

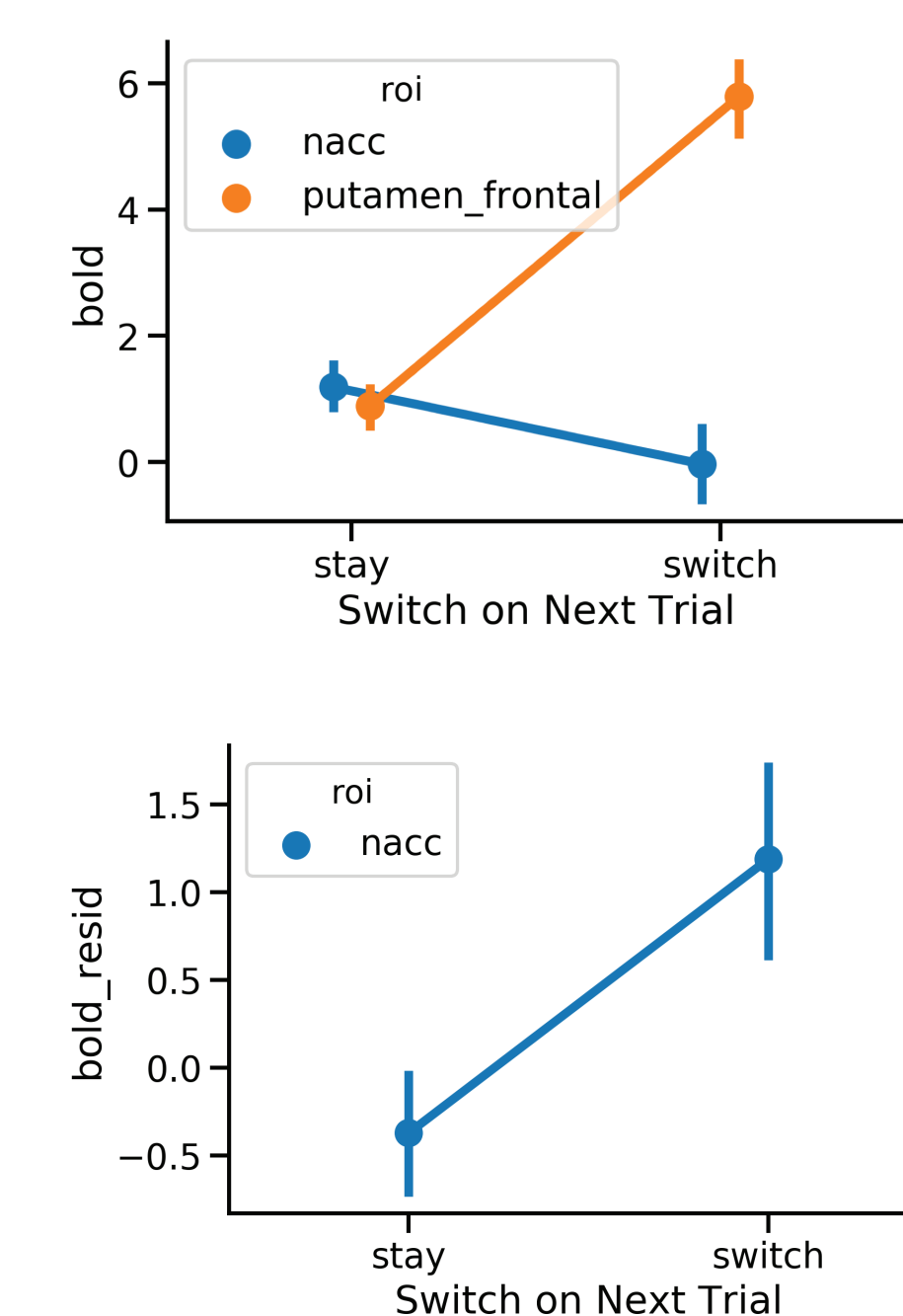
Ventral striatum response reflects reward and updating



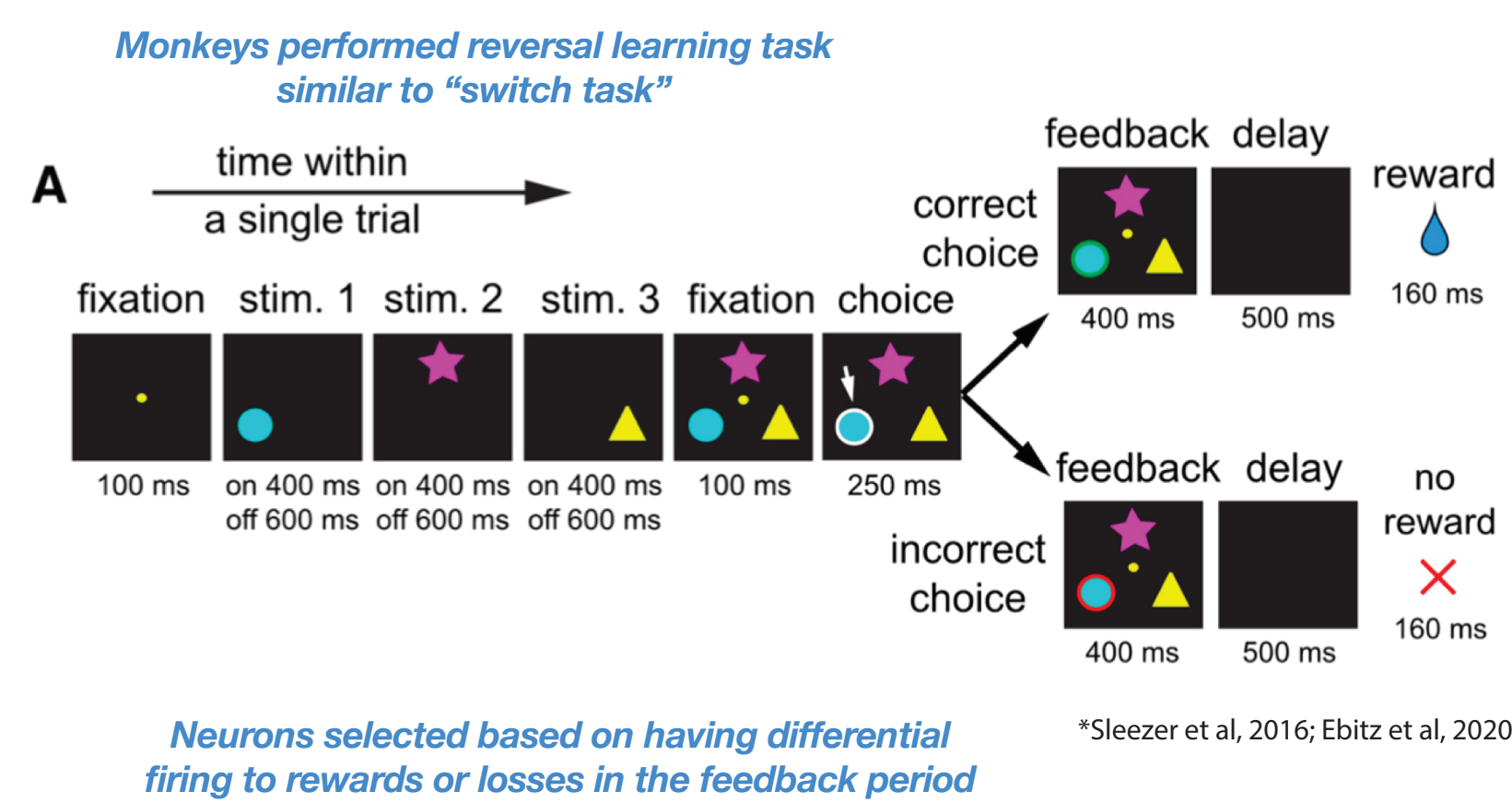
Dorsal striatum response reflects only updating



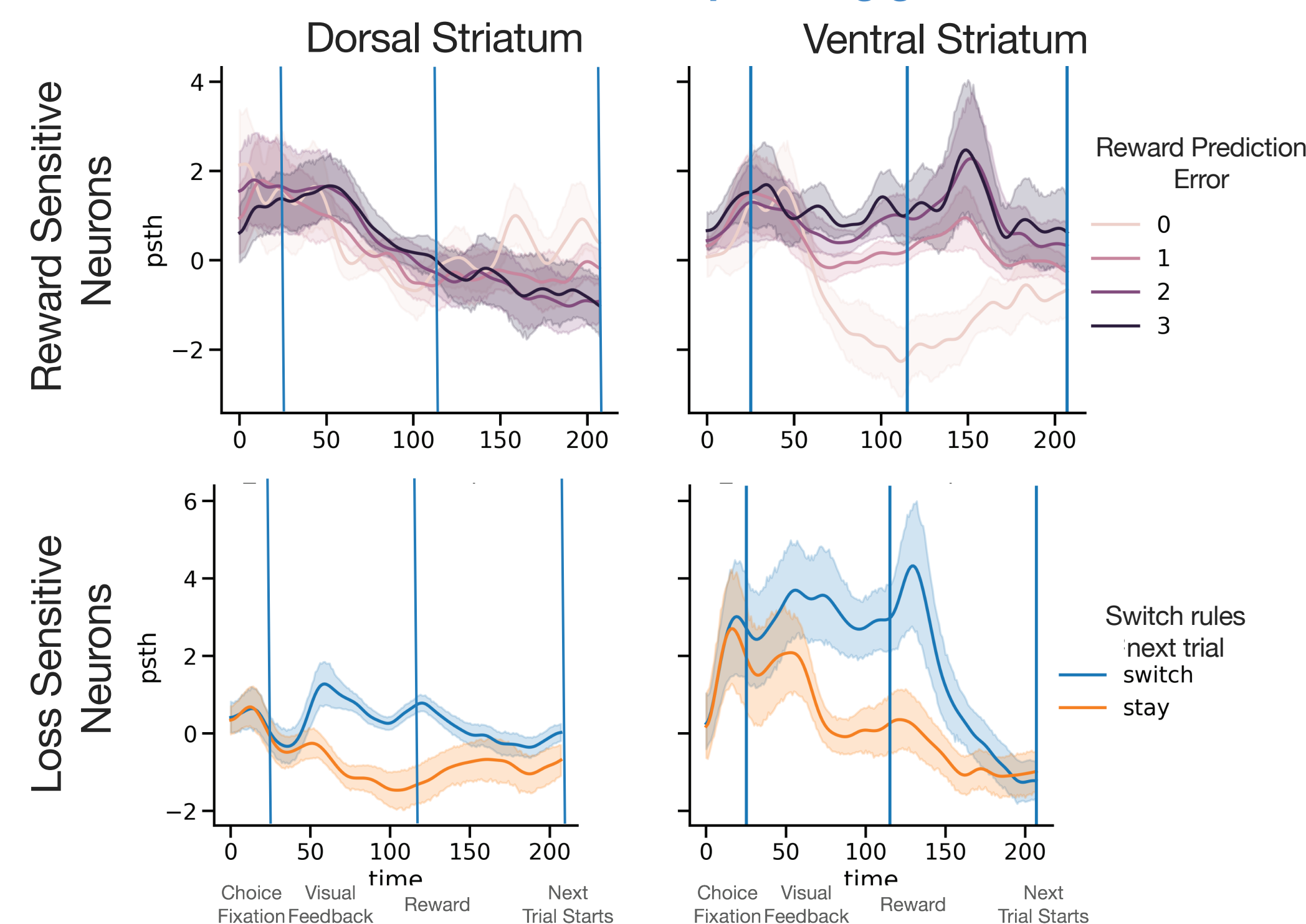
Updating responses predict goal switches



## Neurophysiology Results



Ventral striatal reward neurons code RPE, but ventral striatal loss neurons code for upcoming goal switches



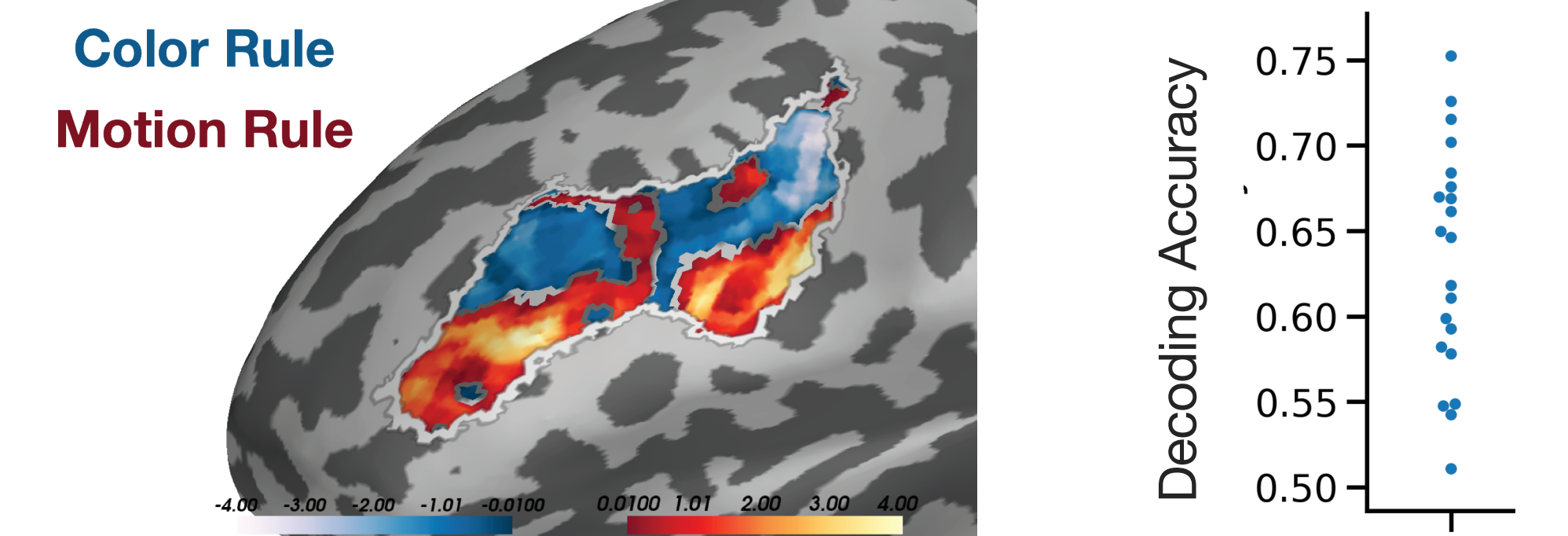
## Conclusions

- 1) Both human fMRI and NHP neurophysiology show that the ventral striatum has an affective reward component and a goal updating component, reflecting different neural subpopulations
- 2) Both human fMRI and NHP neurophysiology show that dorsal striatum responses reflect goal updating
- 3) Accumbens responses may not reflect affect per se, but rather how affect is used to adjust goal-directed behavior

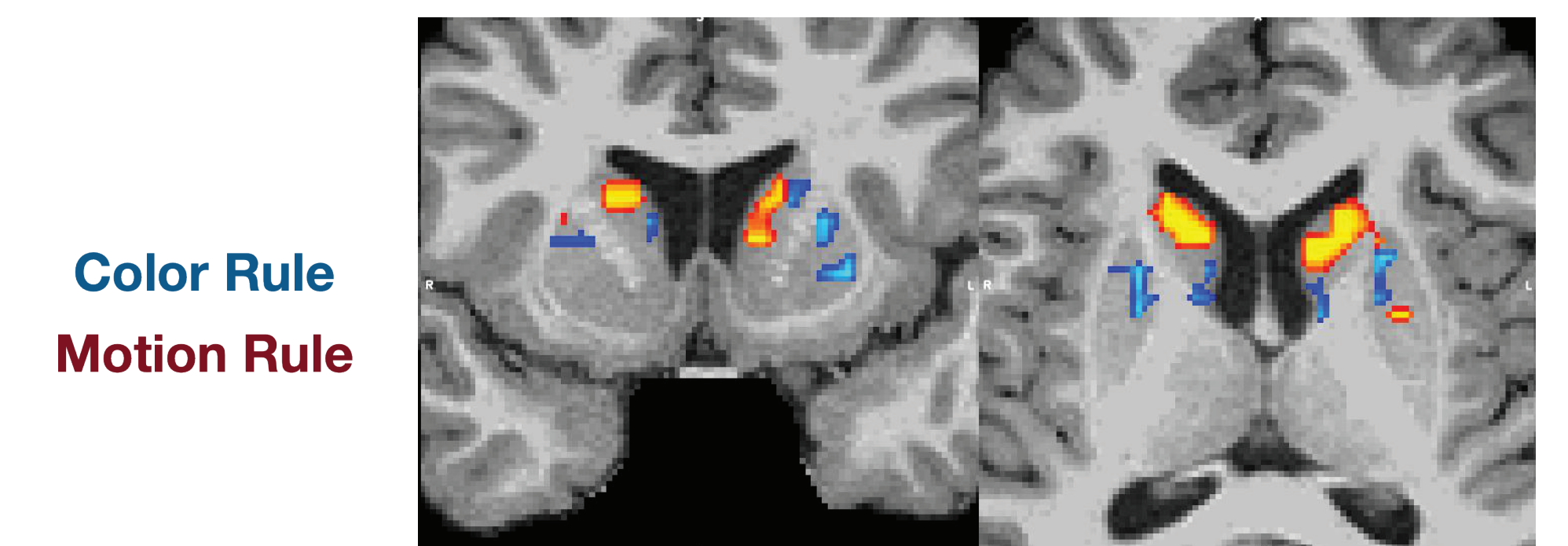
## Future Directions

Question: Do striatal updating responses drive changes in prefrontal goal representations?

Prefrontal goal representations at choice



Striatal feedback responses are spatially selective to goal



## Acknowledgements

- 1) The D'Esposito Lab
- 2) NIMH R01 MH063901