

Reward Positivity (RewP) as a Predictor of Incentive-Driven Performance

Aashi P. Patel, Alivia V. Corral, Colin B. Bowyer, Chris B. Martin & Danielle N. Jones

Introduction

- The Reward Positivity (RewP) is an event-related potential (ERP) that is calculated as the difference between brain responses to feedback indicating wins versus feedback indicating losses (Proudfit, 2014).
- The RewP is typically thought to index someone's sensitivity to reward and has been shown to be related to individual differences in reward responsiveness (Bress et al., 2012).
- The RewP is affected by the amount of effort required to obtain the reward (Bowyer, 2021).
- Reward has been shown to positively affect performance on inhibitory control tasks (Burton et al., 2021).
- The current study tests if greater reward sensitivity, as measured by the RewP, will predict the extent to which receiving reward will positively influence an individual's performance during an inhibitory control task. Furthermore, we will see if the RewP to high-effort reward versus low-effort reward is a better predictor of performance.

Methods

Participants:

85 college and community adults
Age: $M = 22.6$ years old; $SD = 4.8$ years
Gender: 51 Women; 30 Men; 2 Non-Binary

Tasks:

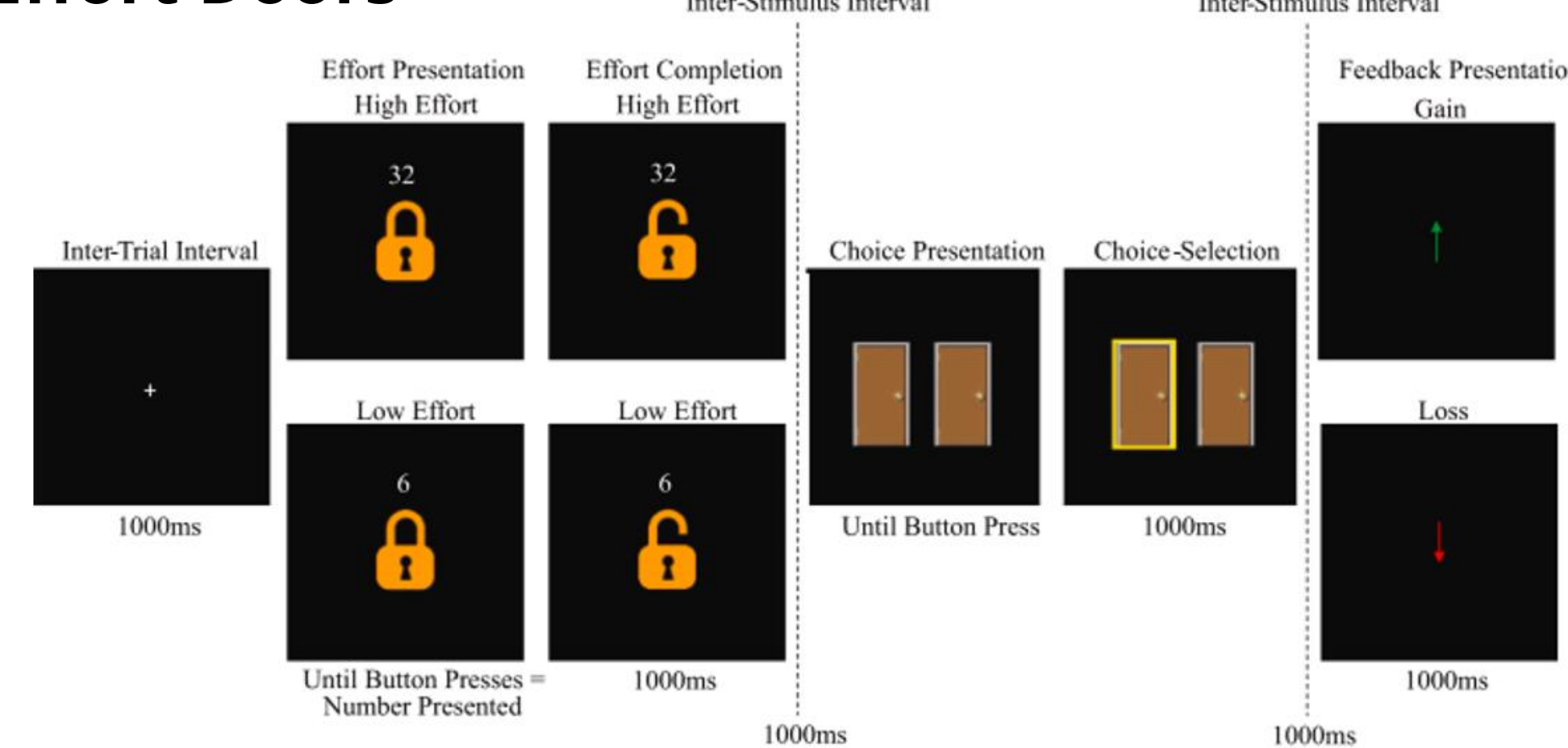
Effort Doors task:

- Participants were instructed to choose a door after completing the task using a high or low amount of effort
- After choosing a door, participants either won 50¢ or lost 25¢
- The brain response to wins and losses were recorded
- RewP:** The difference between these brain responses

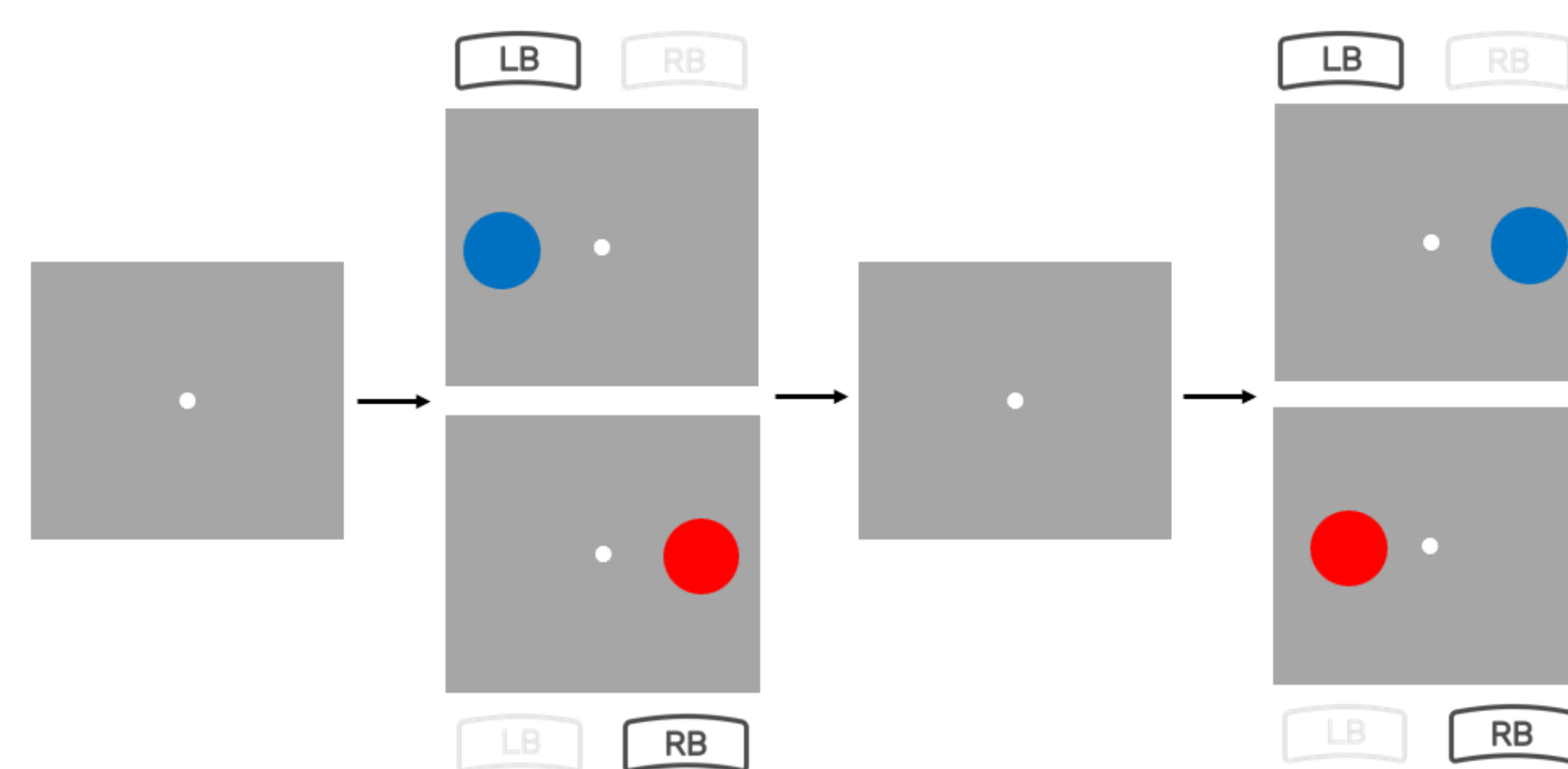
Simon Task:

- Measure of inhibitory control performance
- Reaction time and accuracy were recorded
- An **inhibitory control task** in which participants respond to the color of a circle with a right or left button press. Circles will appear on either side of the screen - participants are instructed to ignore spatial location and just respond based on the color.
- Congruent trials:** correct button press = same side of screen that circle appears on
- Incongruent trials:** correct button press = different side of screen that circle appears on
- Two Block Design**
 - Regular block
 - Reward block: incentivized speed and accuracy; participant performance translated to monetary reward. Points were based on response speed relative to their average speed in the regular block. Participants received feedback about point changes every trial.
- Correct Above Threshold Responses (wins):** gained 1 to 100 points based on speed (faster responses = more points)
- Correct Below Threshold Responses (no change):** 0 points
- Incorrect Responses (loss):** lost 10 to 100 points at random

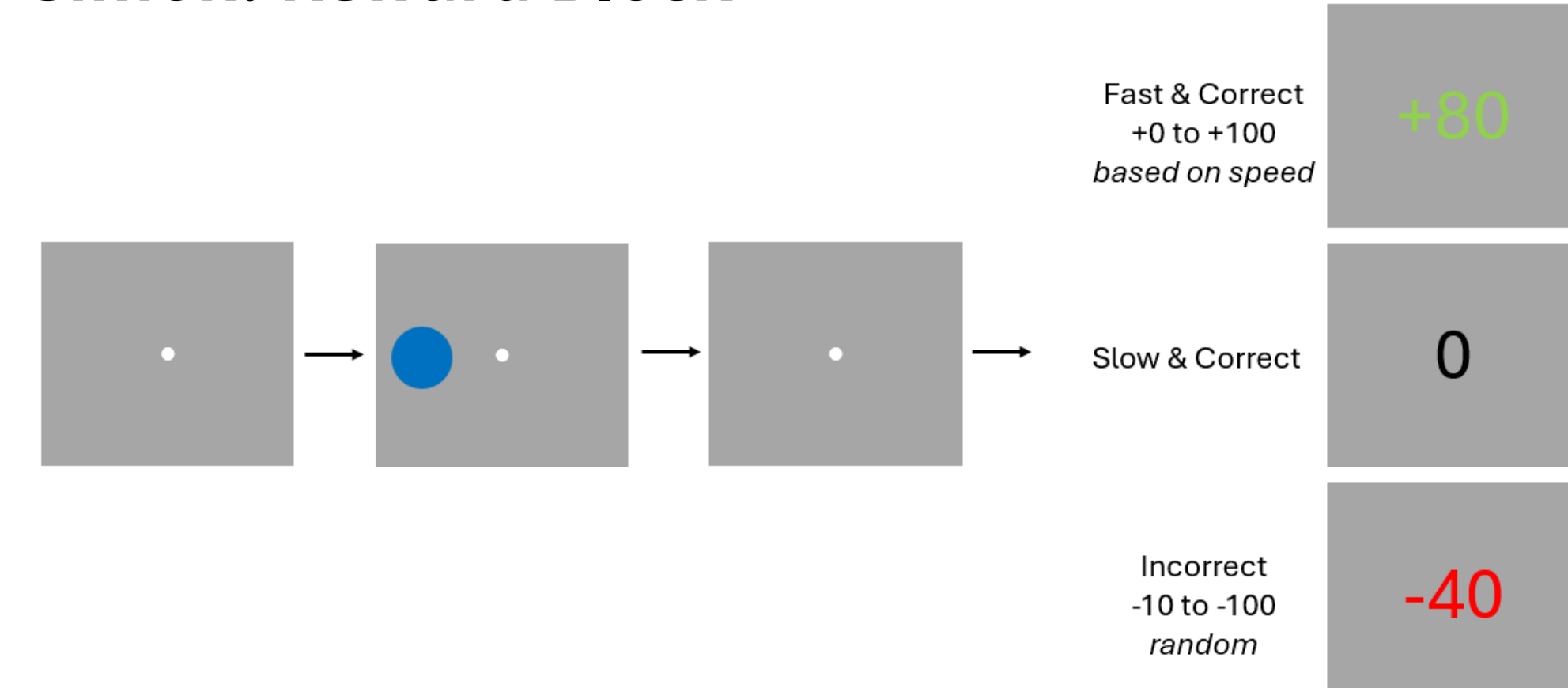
Effort Doors



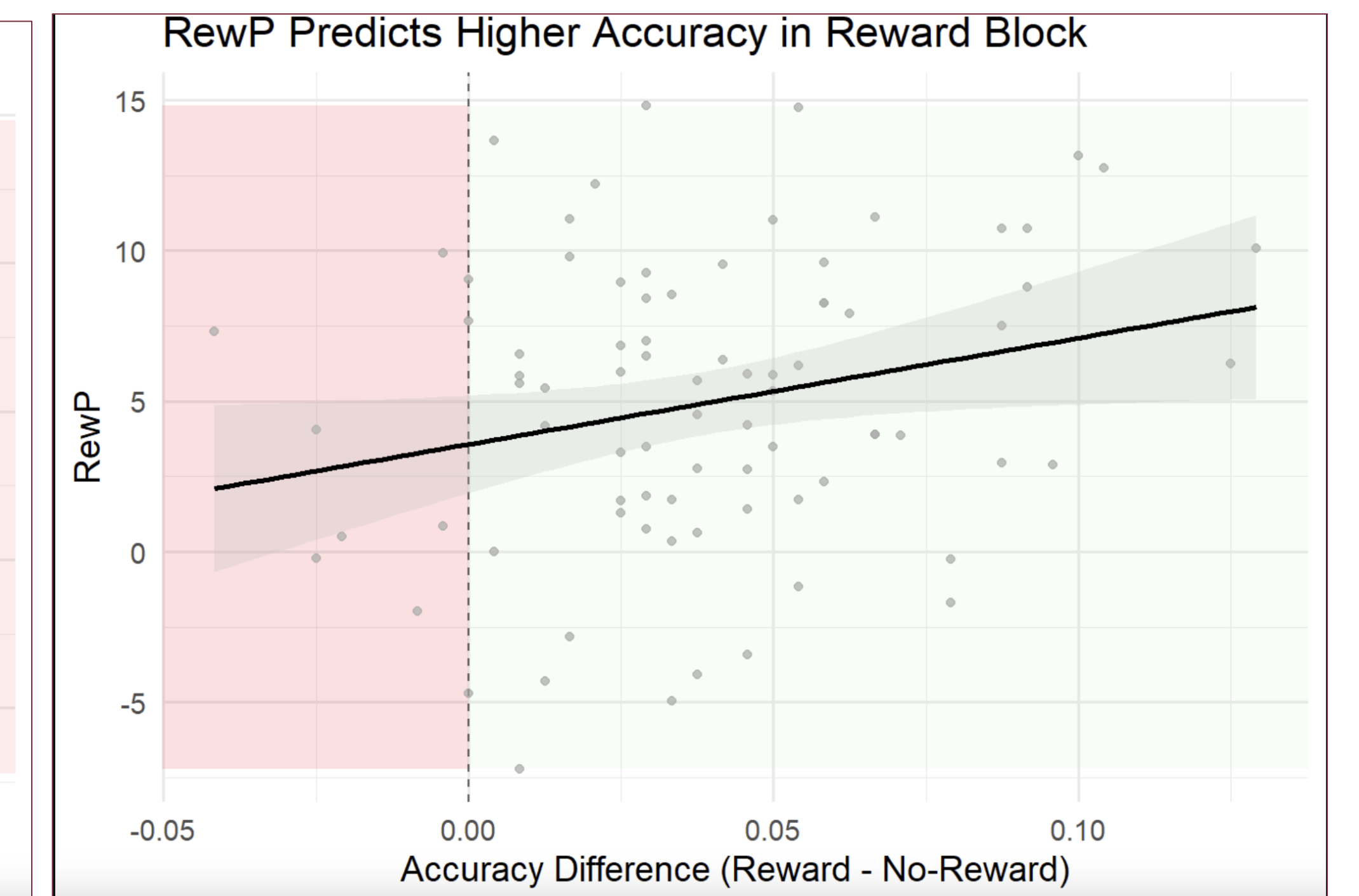
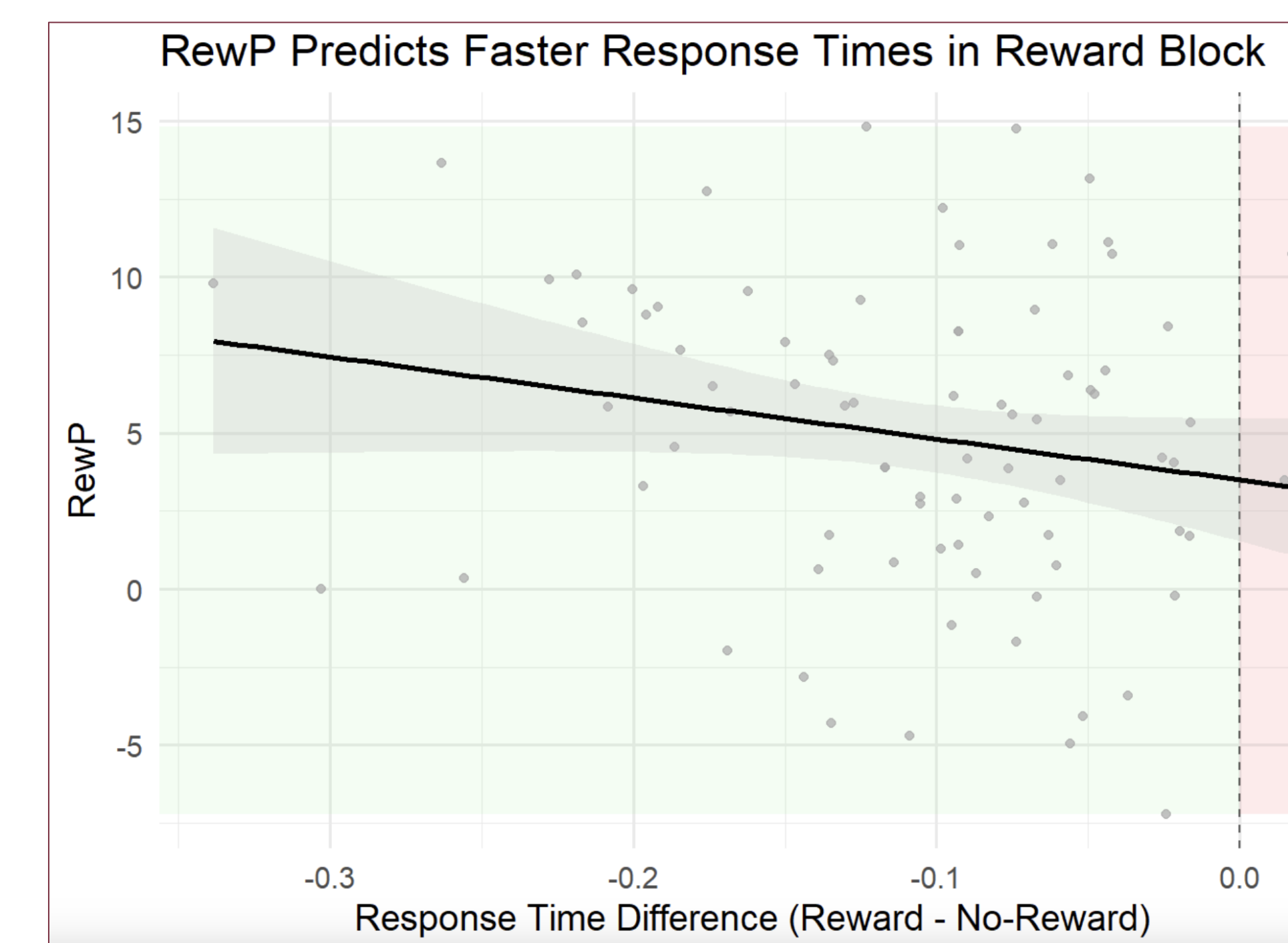
Simon: Regular Block



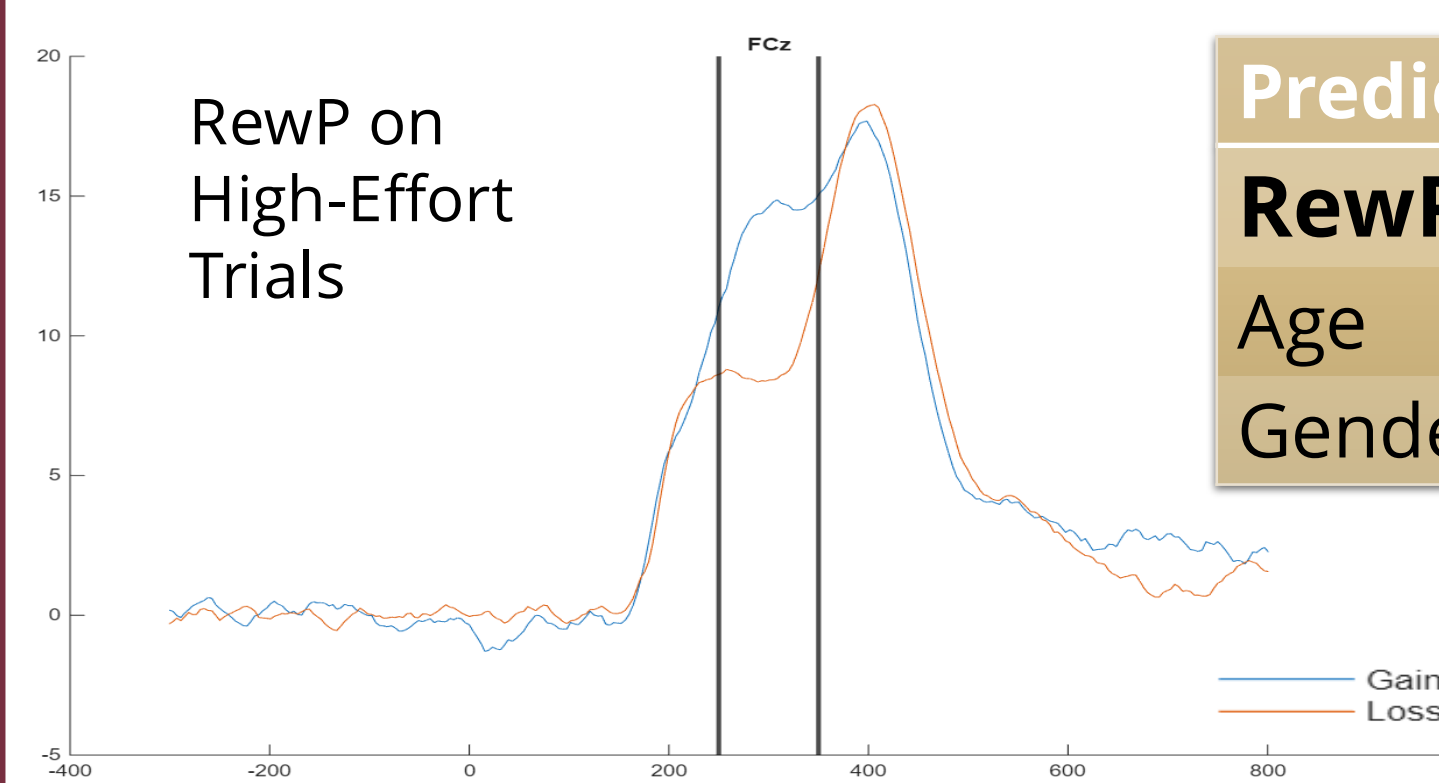
Simon: Reward Block



Results



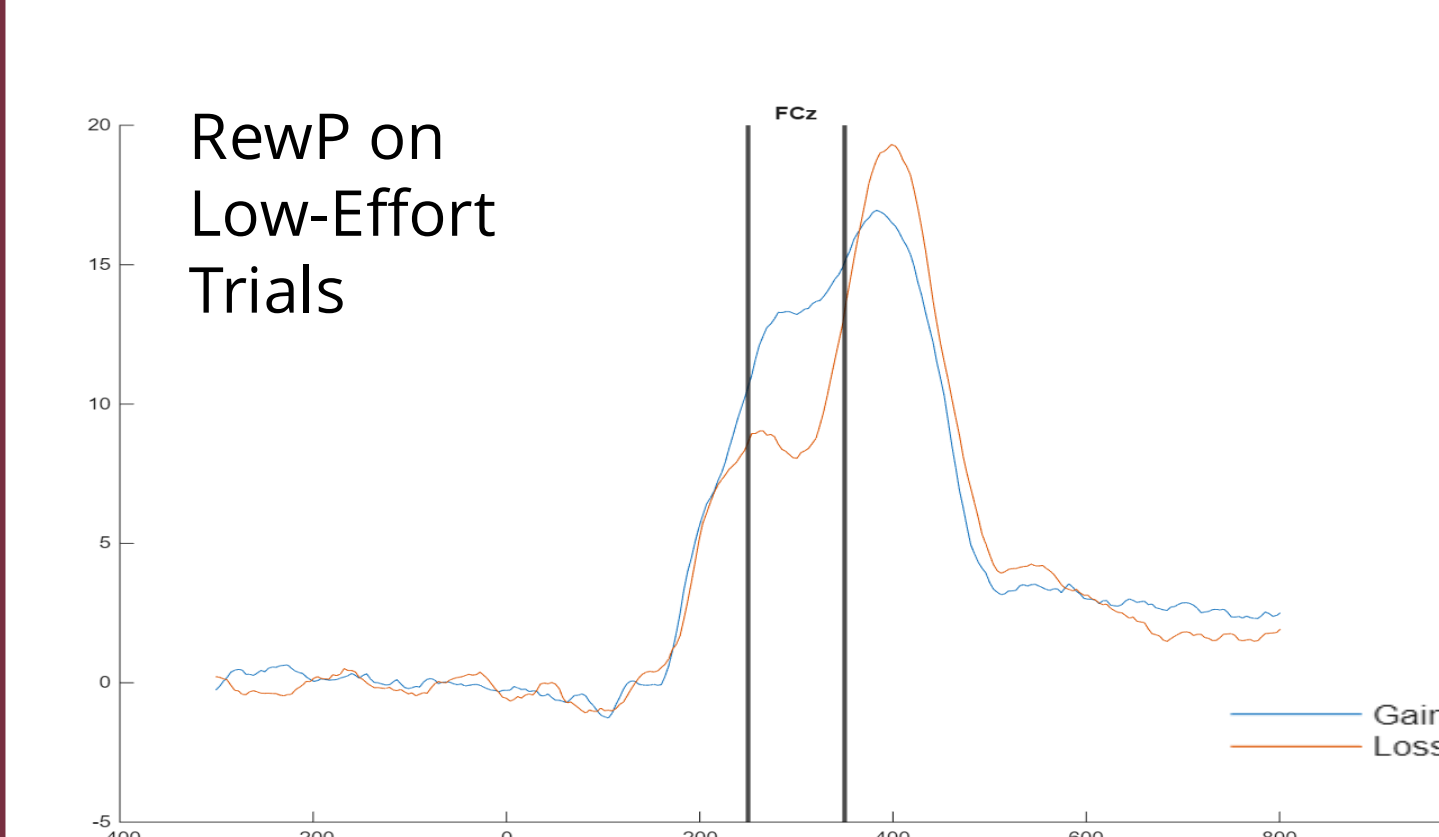
RewP in High-Effort trials significantly predicts better performance in a regression controlling for age and gender



Predicting RT	β	p
RewP (High-Effort)	-.0040	.025*
Age	-.0018	.318
Gender	-.0203	.229

Predicting Accuracy	β	p
RewP (High-Effort)	.0020	.017*
Age	.0001	.535
Gender	.0052	.510
Reaction Time (Reward - No-Reward Difference)	.0920	.093

RewP in Low-Effort trials does not predict better performance



Predicting RT	β	p
RewP (Low-Effort)	-.0014	.309
Age	-.0007	.651
Gender	-.0126	.460

Predicting Accuracy	β	p
RewP (Low-Effort)	-.0001	.773
Age	-.0001	.813
Gender	.0014	.857
Reaction Time (Reward - No-Reward Difference)	.0562	.307

Discussion

- The RewP on high effort trials predicted how much an individual's performance in an inhibitory control task would improve due to reward
 - The RewP on low effort trials does not show this relationship
- Interpretation:** Neural sensitivity to high effort reward predicts how much influence monetary incentive has on behavior
- Limitations:** This study only examined the influence of monetary incentive on behavior in the context of the Simon task
- Future Direction:** Investigating whether this relationship generalizes to other types of performance tasks (E.g. slot machine task)

References

