Executive Function and Decision Making in Emotional Face Processing Tasks

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INTRODUCTION

This study examines differences between two commonly used **emotional face processing tasks using red vs black letters** to evaluate how color, task-irrelevant emotional faces, state-trait anxiety scores, and perceptual load affect executive function and decision making.

- results from emotional face processing tasks have implications for psychopathologies (such as anxiety's modulation of decision making) & future research directions

AIMS

Aim 1: Understanding whether colored fonts enhance the salience of the task-relevant information, thereby making identification of the targets easier, resulting in faster response time and accuracy.

Aim 2: Evaluating whether the interference from the task-irrelevant emotional faces is reduced under> the colored foreground condition.

Aim 3: Examining whether participants reporting higher anxiety symptoms will show greater emotional interference.

MATERIALS AND METHODS

Participants
- n = 10
- Between the ages of 18 - 25
- No history of color blindness or dyslexia

1. Screening Survey to identify participants within the age and exclusionary criteria

2. One 60 minute in-person visit including:

   a. State and Trait Anxiety Questionnaire
   b. Emotional Face Processing Task #1 with red or black letters
   c. Emotional Face Processing Task #2 with red or black letters
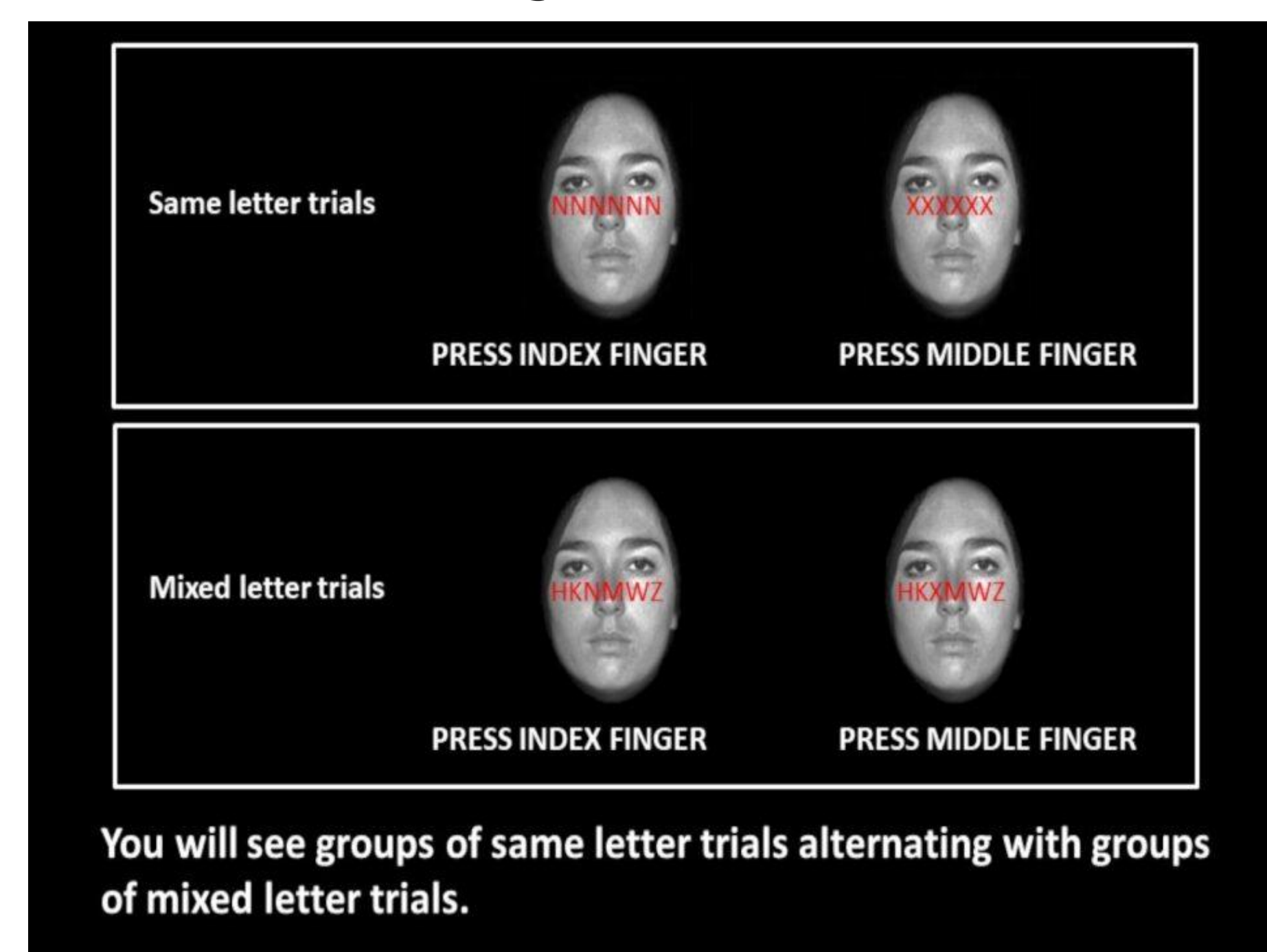
Emotional face processing task with red letters instruction slide

DISCUSSION

- Red color of foreground letters increases salience of information

- Red letters also appear to relate to less interference from the emotional background, allowing for faster decision making

- Analysis of modulation by trait anxiety level was limited (only 20% of participants had lower than age-group median level of anxiety (t < 36))

Differences in attending to emotional face condition (fear vs angry vs neutral) might relate to what area of the brain is being stimulated

- fMRI studies done with black letters have shown increased activity in the amadalya in response to fearful versus neutral face conditions

- fMRI studies done with red letters have also shown increased activity in the insula in response to angry versus neutral face conditions
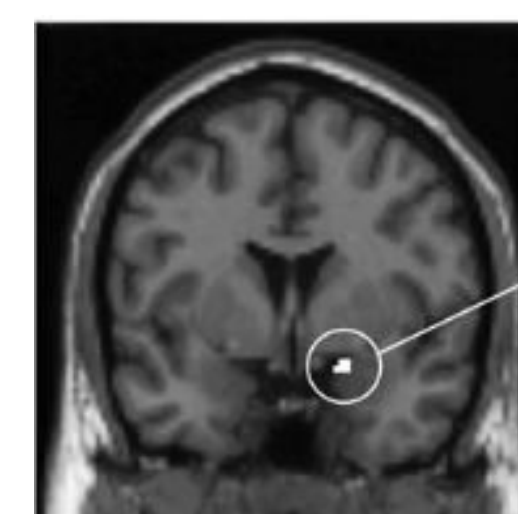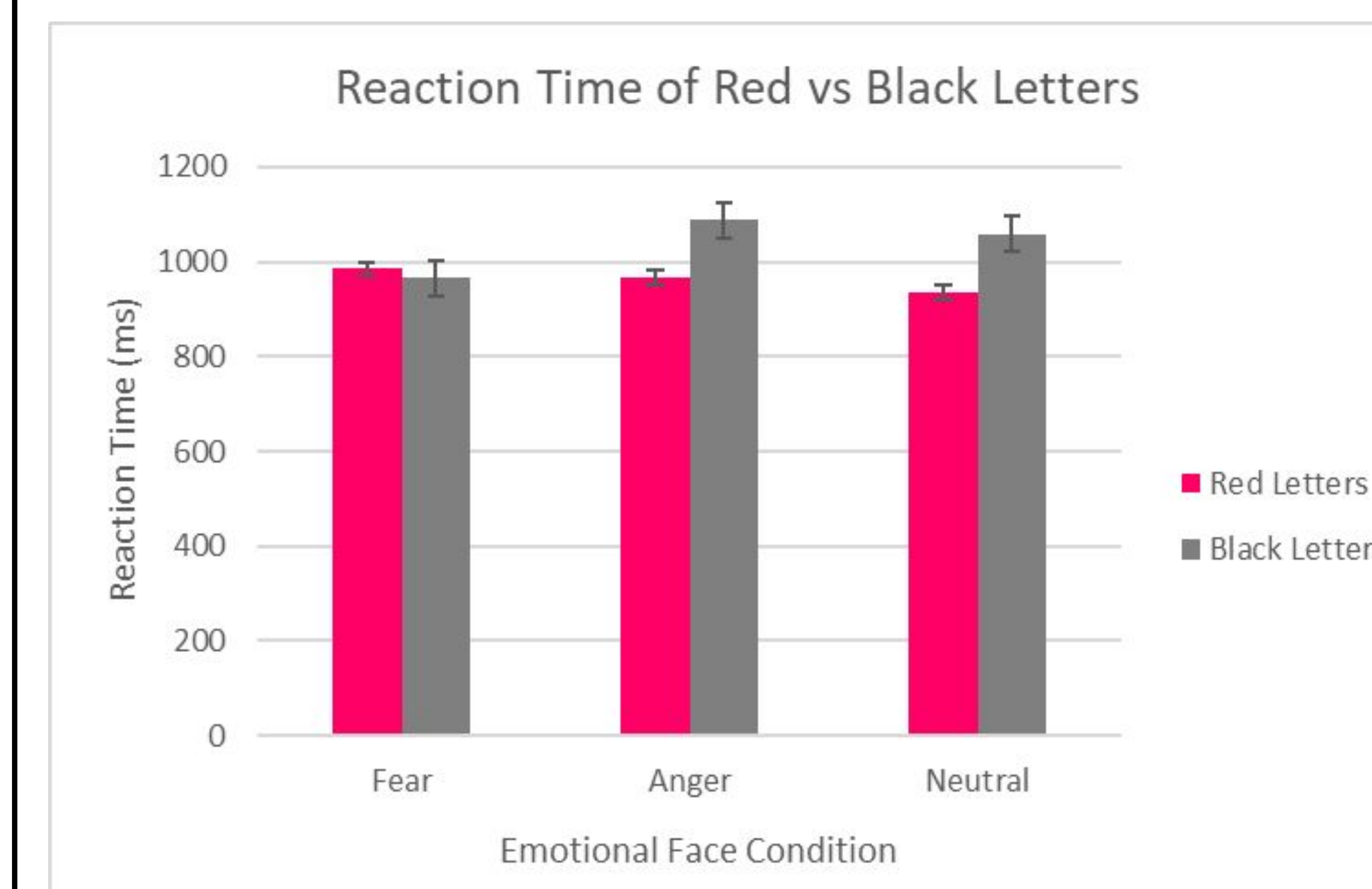

*Figure 2 Amadiba cluster activation. From Bishop, S. J., Jenkins, R., & Lawrence, A. D., "Neural processing of fearful faces: effects of anxiety are gated by perceptual capacity limitations," Cerebral Cortex.

*Figure 4 Insula cluster activation. Klumpp, H., Fitzgerald, D.A., Piejko, K., Roberts, J., Kennedy A. E., & Phan, K. L. (2016) "Prefrontal control and predictors of cognitive behavioral therapy response in social anxiety disorder"

RESULTS

Reaction Time of Red vs Black Letters

Average Reaction Time vs Correct Hits for Red and Black Letters

- Participants had faster reaction times and higher correct hits (%) with red letters
  - letter color: reaction time (p <0.001) and hits (p = 0.946)
- Participants had faster reaction times and higher correct hits (%) for the angry and fear conditions with red letters
  - emotional face condition: reaction time (p = 0.392) and hits (p = 0.608)

- Higher levels of trait anxiety (t > 36) also appear to relate to longer average reaction times (p = .106) and lower percentage of correct hits (p = 0.002) than lower levels of trait anxiety
  - interactions between trait anxiety, emotional face condition, and letter color were not significant (p > 0.05)

REFERENCES

Bishop, S. J., Jenkins, R., & Lawrence, A. D. (2007). Neural processing of fearful faces: effects of anxiety are gated by perceptual capacity limitations. Cerebral cortex, 17(7), 1595-1603.
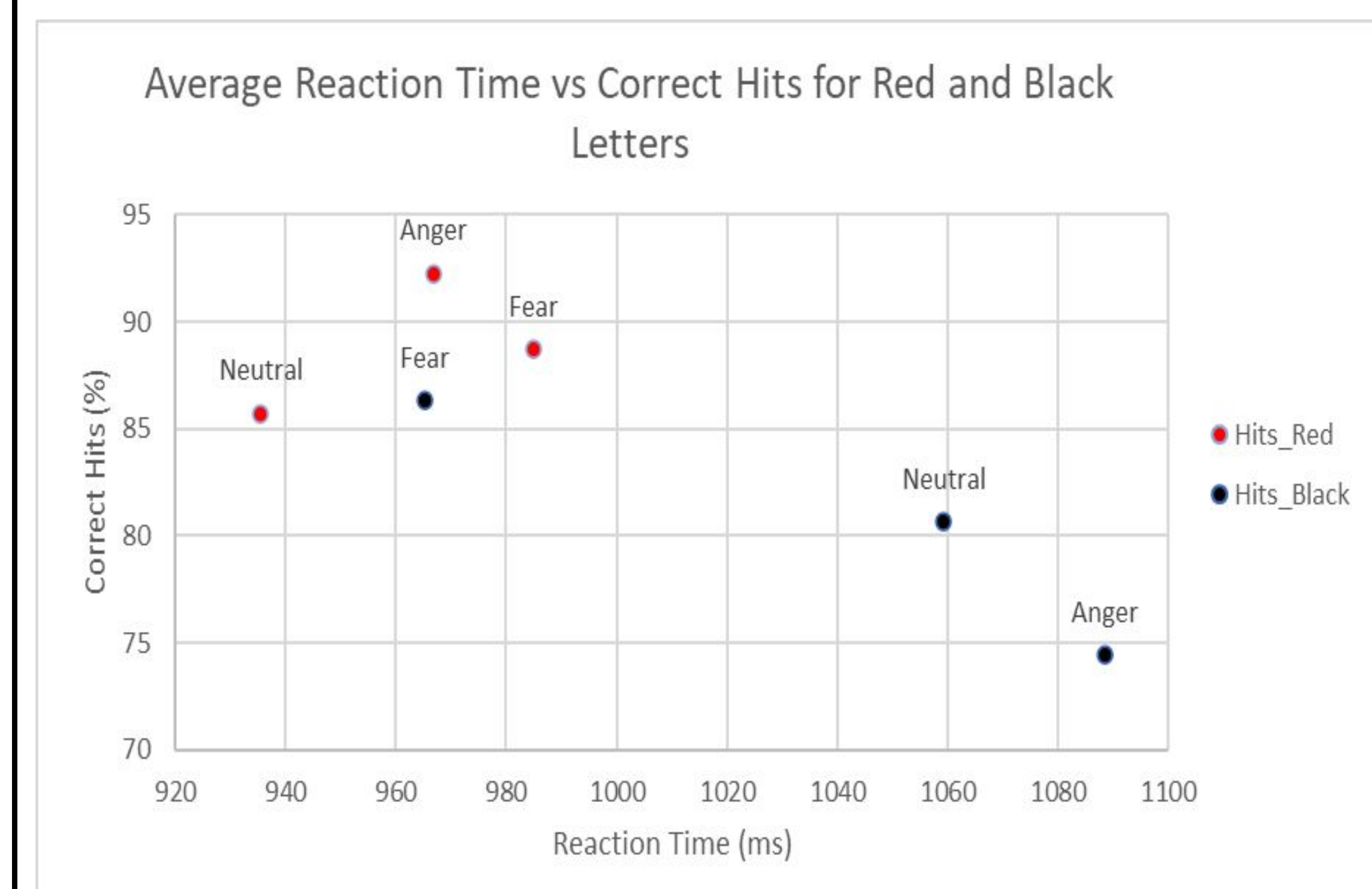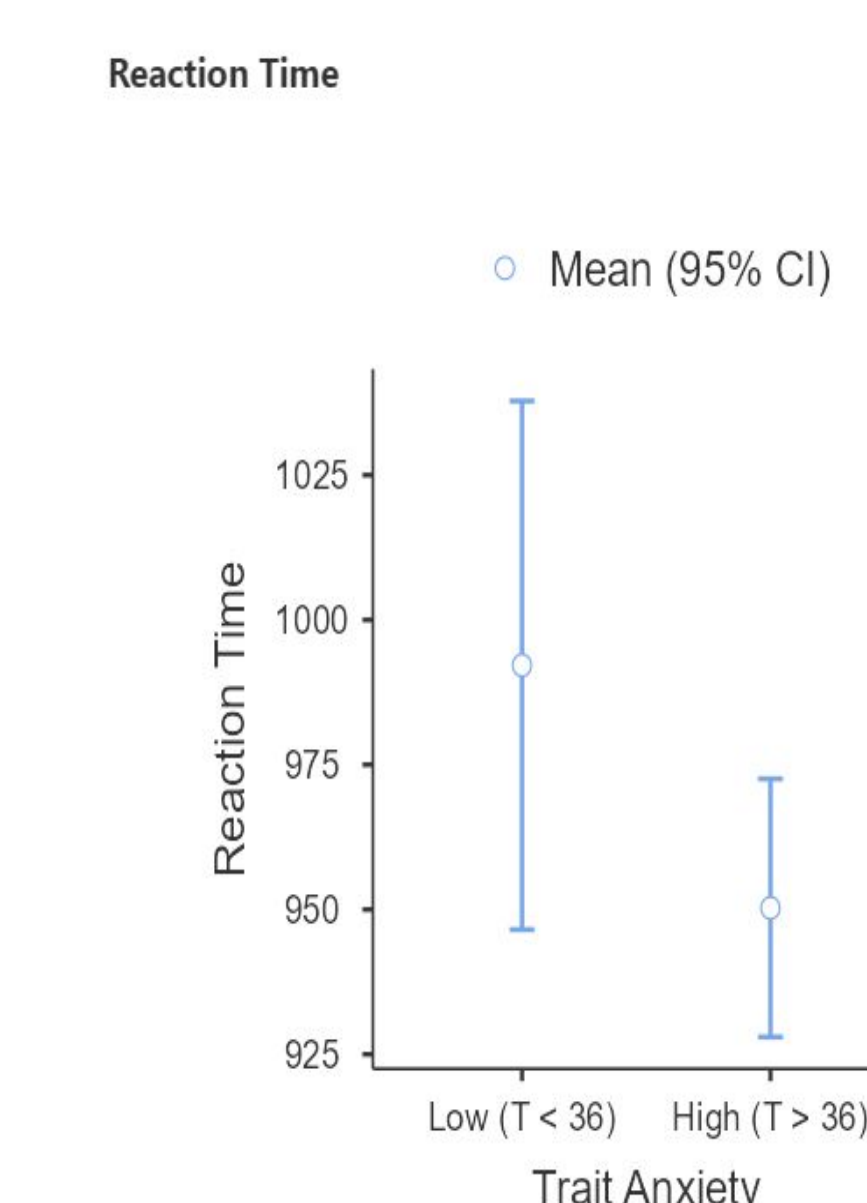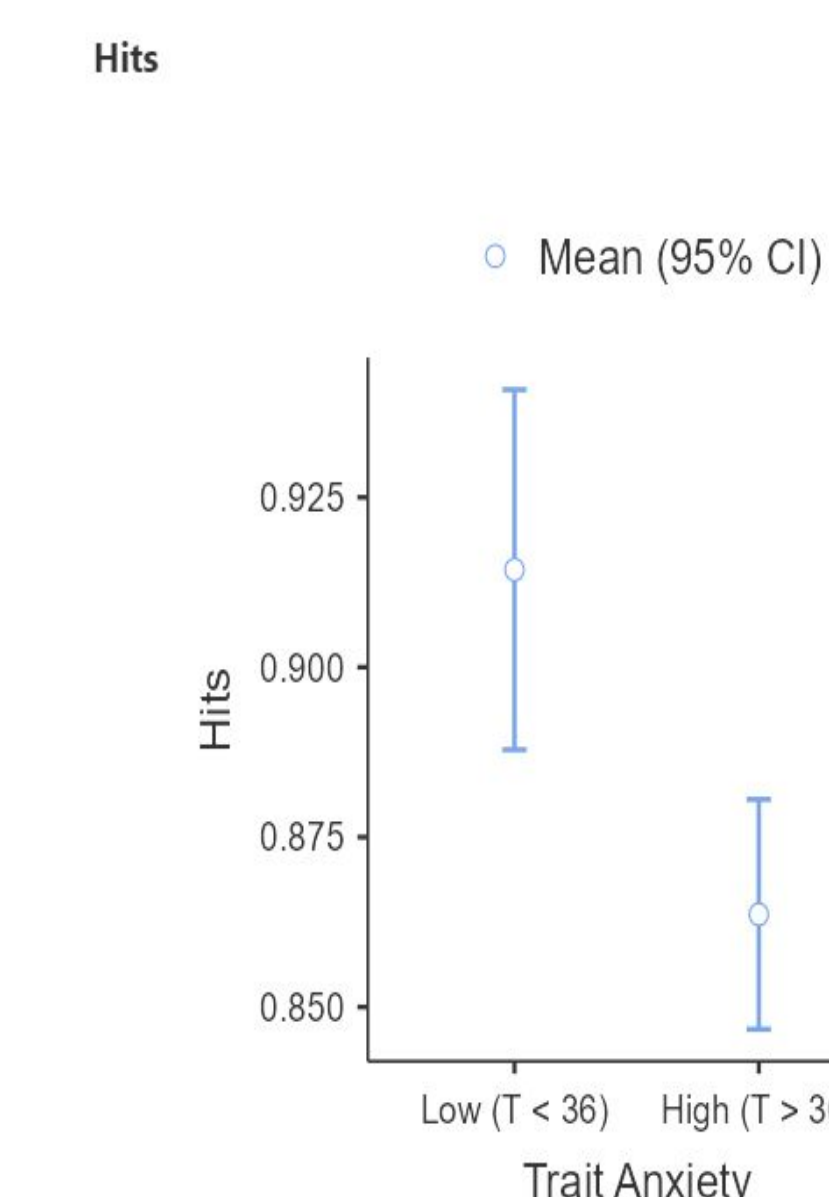
Klumpp, H., Fitzgerald, D. A., Piejko, K., Roberts, J., Kennedy, A. E., & Phan, K. L. (2016). Prefrontal control and predictors of cognitive behavioral therapy response in social anxiety disorder. Social cognitive and affective neuroscience, 11(4), 630-640.

Feurer, C., Jimmy, J., Bhaumik, R., Duffecy, J., Medrano, G. R., Ajilore, O., ... & Klumpp, H. (2022). Anterior cingulate cortex activation during attentional control as a transdiagnostic marker of psychotherapy response: a randomized clinical trial. Neuropsychopharmacology, 47(7), 1350-1357.