

# Anticipated Psychosocial Stress Informs Sustained Attention Performance: A Behavioral and Physiological Perspective

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# Background

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Sustained attention is essential in student life as it assists in the retention and comprehension of information (Lam & Beale, 1991)

Transactional models of stress suggest individual differences in coping with stress (Lazarus & Folkman, 1987; Matthews & Campbell, 2009)

Previous studies on stress anticipation have suggested deficits in visual search (Cain et al., 2011), decision making (Preston et al., 2007; Starcke et al., 2008), and memory (Hyun et al., 2019; Lupien et al., 1997)

The ability to maintain attention may be impacted by stressors unrelated to the task

- Unrelated stress could impact performance

# Study Aims

## Does Anticipated Stress Impact Performance?

- Does anticipated psychosocial stress induce a stress response?
- Does anticipated stress influence sustained attention?

## Does Personality Play a Role?

- Does trait anxiety, self-esteem, extraversion, or neuroticism have a relationship with sustained attention performance?

## Do Changes in Mood, Motivation, and Thinking Occur?

- Do measures of mood, motivation level, thinking style, and thinking content change from pre- to post-stressor/attentional task
  - Is this different between groups?

# Who Were the Subjects?

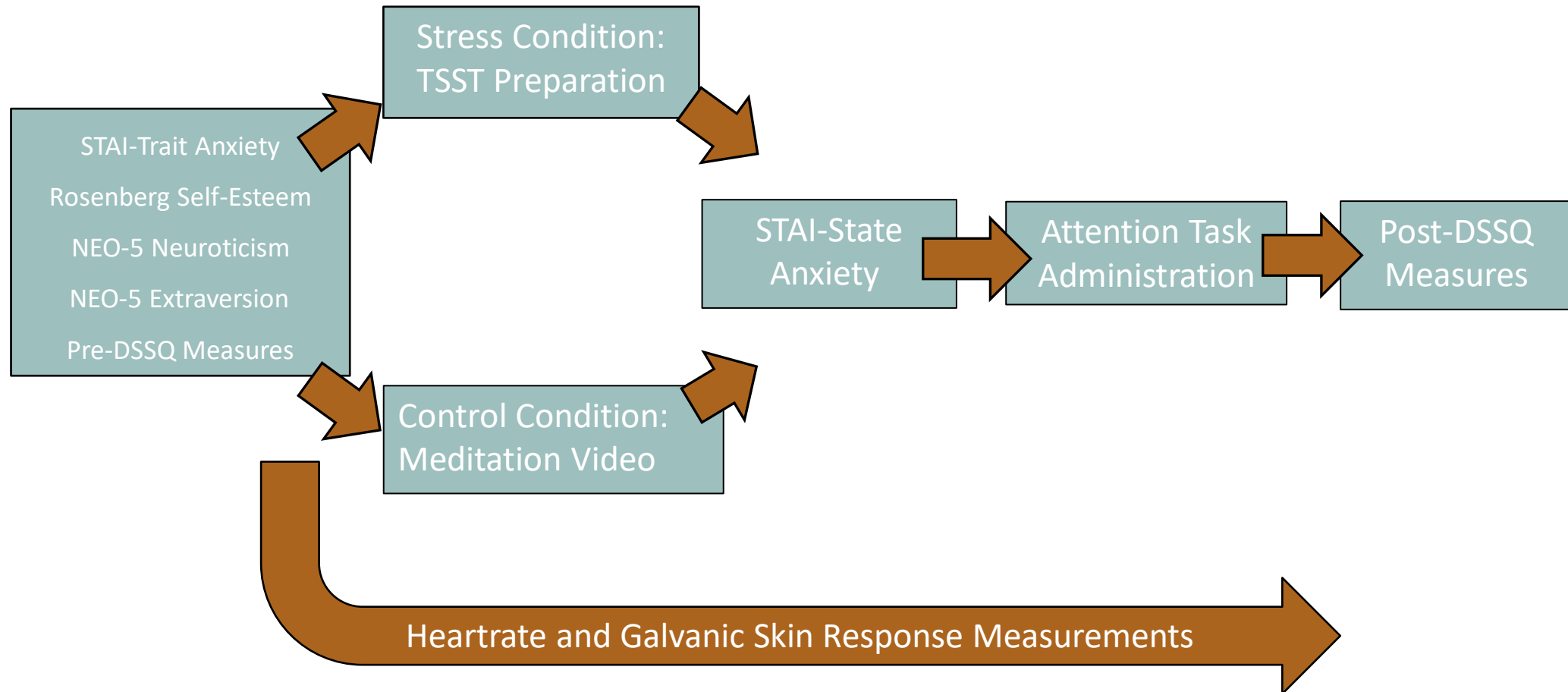
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	Age (Years)	Sex (M:F)
Stress (N=16)	21.1 ± 2.7	5:11
Control (N=15)	21.9 ± 3.5	1:2
Total (N=31)	21.5 ± 3.1	10:21

- **31 undergraduate students**
  - 21 females, 10 males
- **Aged between 18 and 35**
  - M=21.5 years, SD=3.1
- **No formal diagnosis of the following in the last 12 months:**
  - Major Depressive Disorder
  - Social Anxiety Disorder
  - Generalized Anxiety Disorder
  - Post-Traumatic Stress Disorder
- **No diagnosis of the following in the lifetime:**
  - Attention-Deficit Hyperactivity Disorder

# Study Procedures

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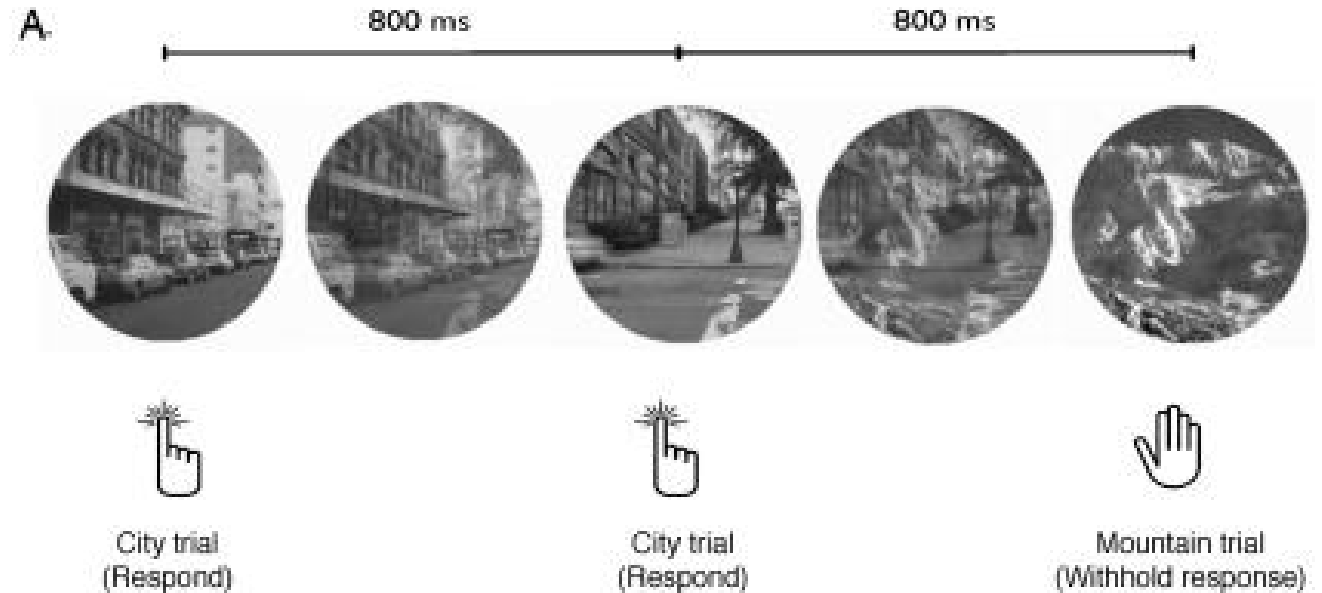
# Gradual Onset Continuous Performance Task

## Sustained Attention Variables:

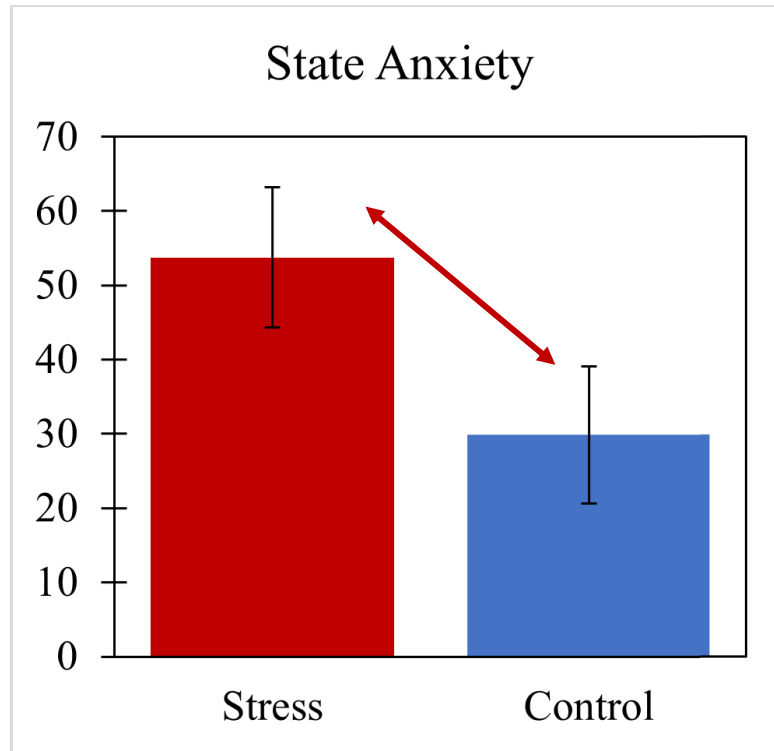
- Reaction Time (RT)
- Reaction Time Variability (CV)
- D-Prime (d')
- Commission Errors (CE)
- Omission Errors (OE)

## Procedure:

- 12 minutes
- Recorded data through 3-minute quartiles



(Esterman et al., 2013)

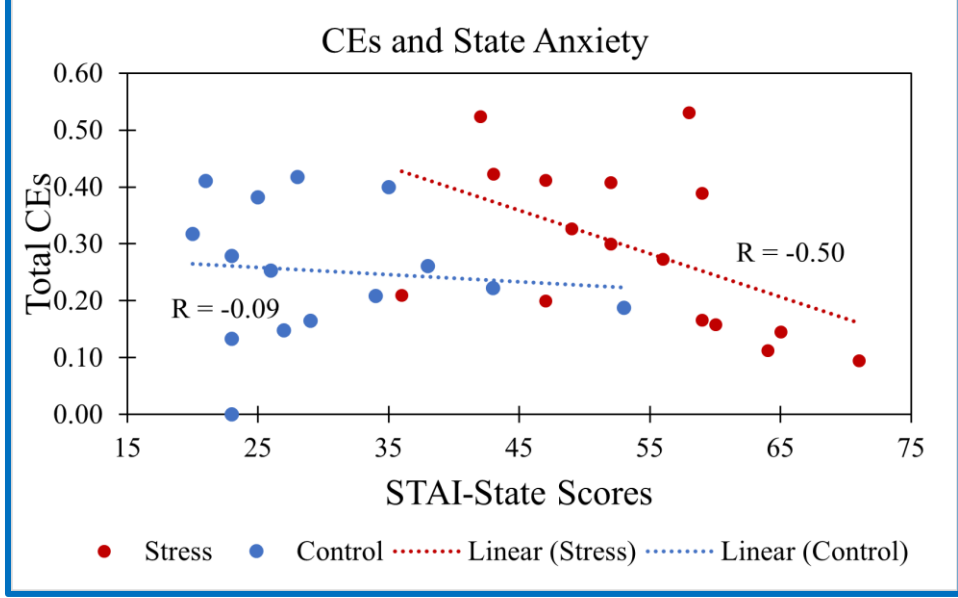
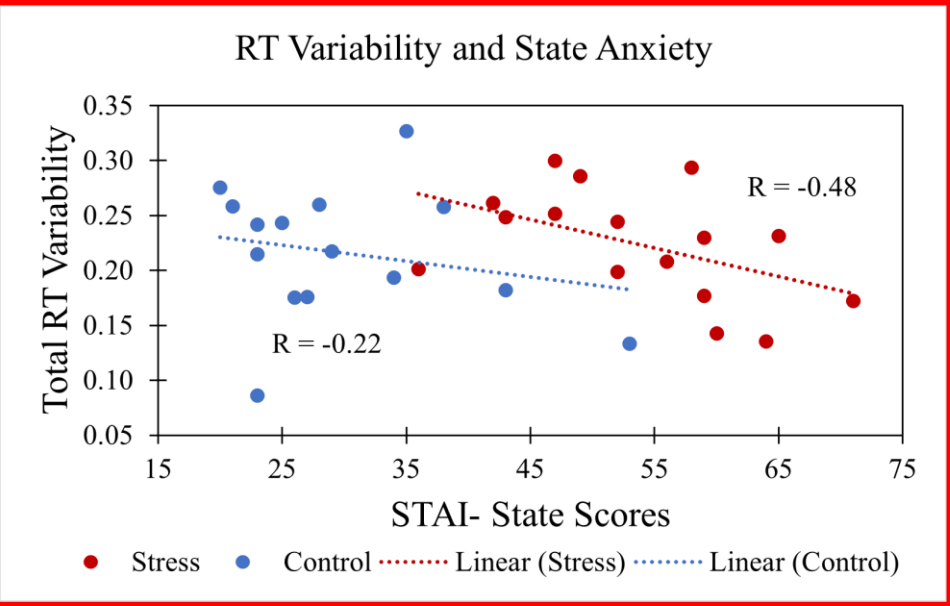


	STRESS	CONTROL	STATISTIC
State Anxiety	53.75(9.53)	29.87(9.2)	$t(29) = 7.128, p < 0.001$
Anticipation GSR PSD- VLF (0-0.045 Hz)	0.097(0.16)	0.031(0.07)	$U = 53, p = 0.023$
Anticipation GSR PSD- LF/HF (0.045-0.25 Hz)	0.059(0.16)	0.017(0.05)	$U = 47, p = 0.011$
Anticipation GSR PSD -VHF (0.25-0.5 Hz)	0.003(0.008)	0.001(0.003)	$U = 53, p = 0.023$

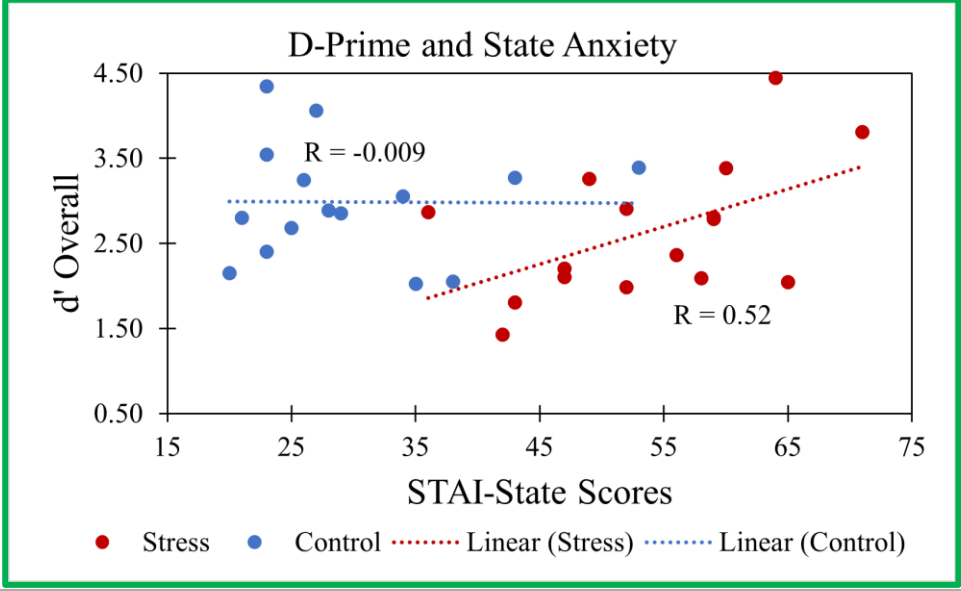
No statistical significance between groups found for measures of HR

Evidence of Stress Induction

# Higher Perceived Anxiety, Better Performance



Negative correlation between RT variability and state anxiety in the stress group,  $r = -0.483$ ,  $p = 0.053$

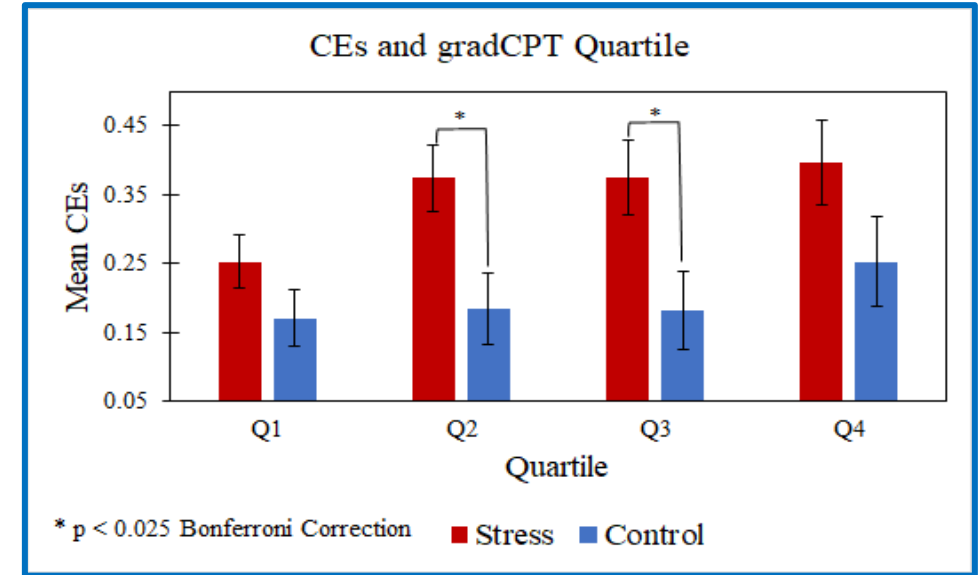
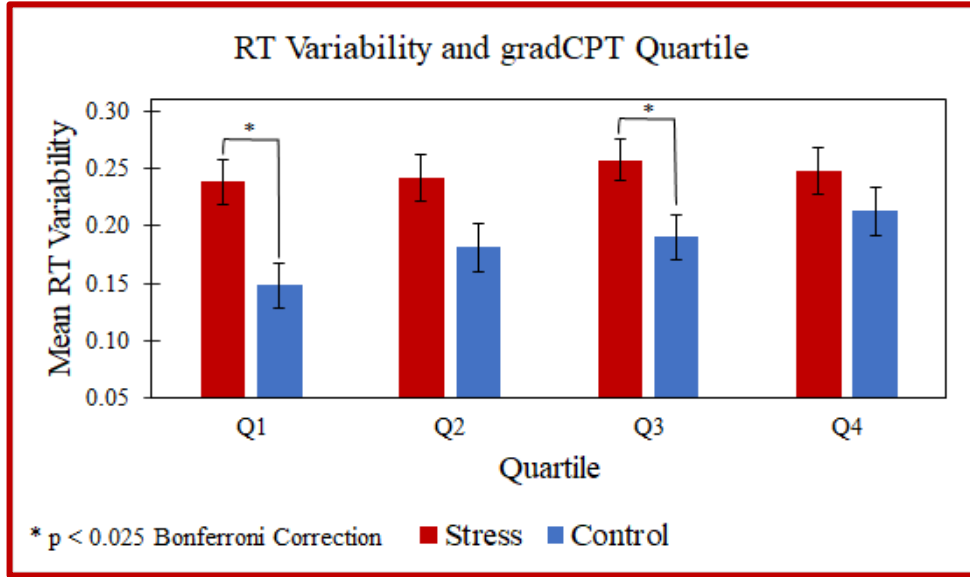


Negative correlation between CEs and state anxiety in the stress group,  $r = -0.5$ ,  $p = 0.048$

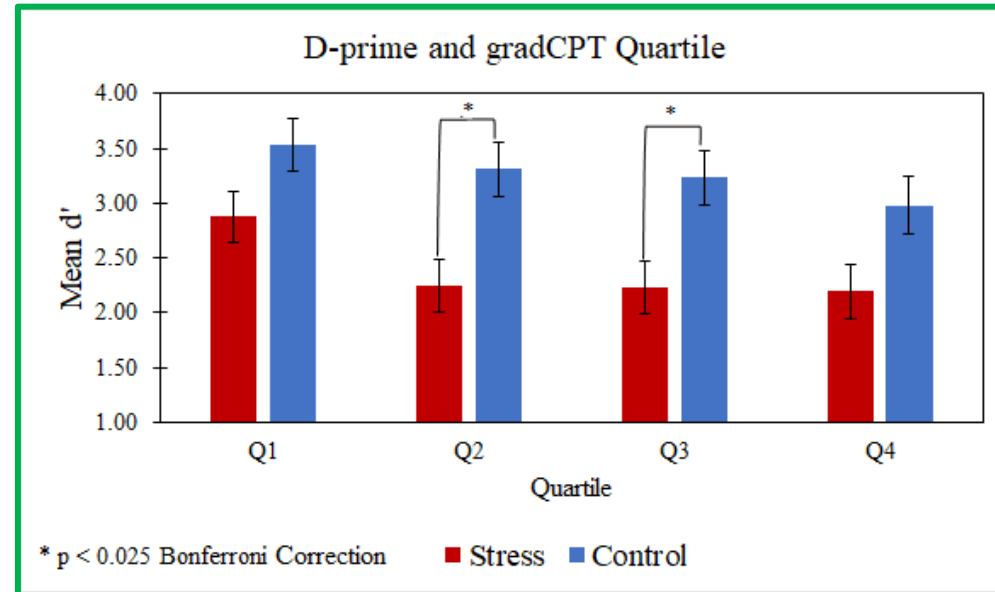
Positive correlation between d-prime and state anxiety in the stress group,  $r = 0.521$ ,  $p = 0.038$



# Independent of Perceived Anxiety, Stressed Individuals Perform Worse



- Interaction effect (group \* quartile),  $F(1,28) = 3.495$ ,  $p = 0.072$
- Main effect of group assignment,  $F(1,28) = 4.067$ ,  $p = 0.053$



Main effect of group assignment,  $F(1,28) = 3.926$ ,  $p = 0.057$

Main effect of group assignment  $F(1,28) = 5.540$ ,  $p = 0.026$

\*State anxiety set as a covariate

# Conclusion and Continuation

## Conclusions

- Differing levels of state anxiety exist among the stress condition
  - Individuals with lower state anxiety under stress appear to have better ability to distinguish a signal from noise
    - Those who perceive themselves to be more stressed may allocate attentional resources more effectively
- Stress may be a motivator for some individuals

## Future Research Endeavors

- Thought probes throughout the task
- Larger sample size

# Questions?

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## A Special Thank You To:

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- The SNHU Institutional Review Board
  - For approving and supporting this research endeavor

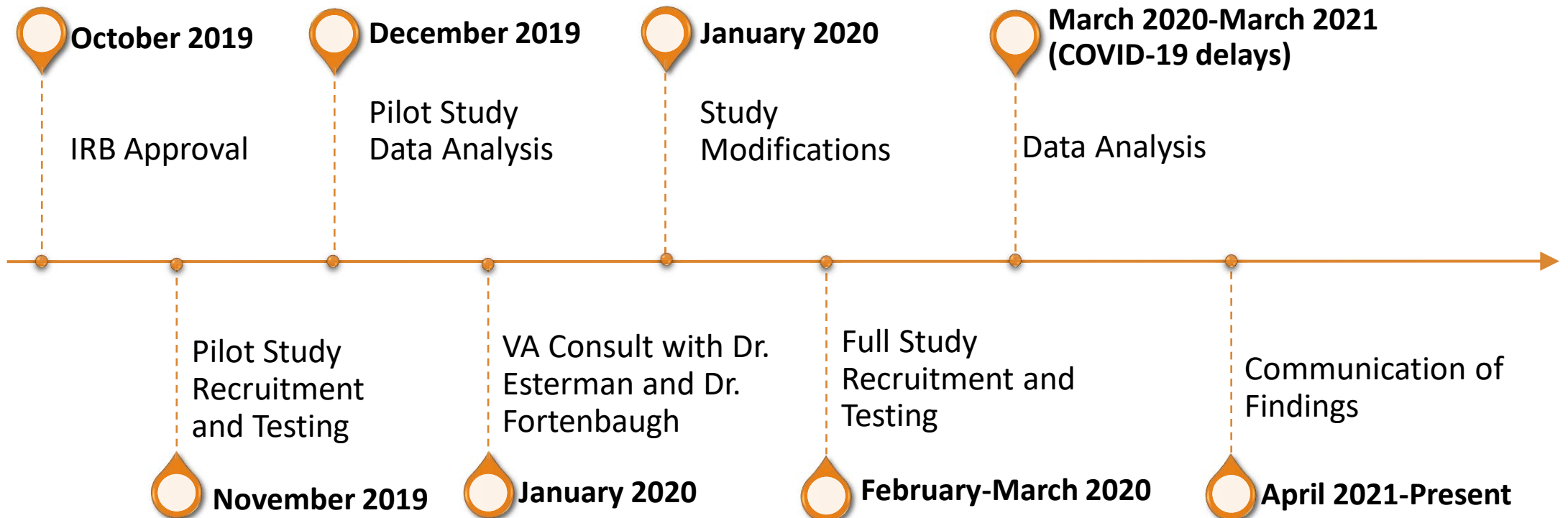


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# Study Timeline

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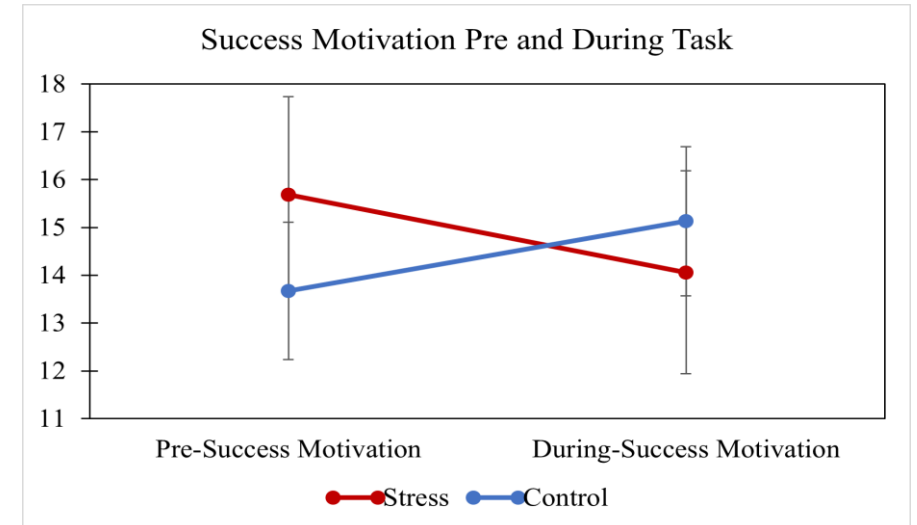
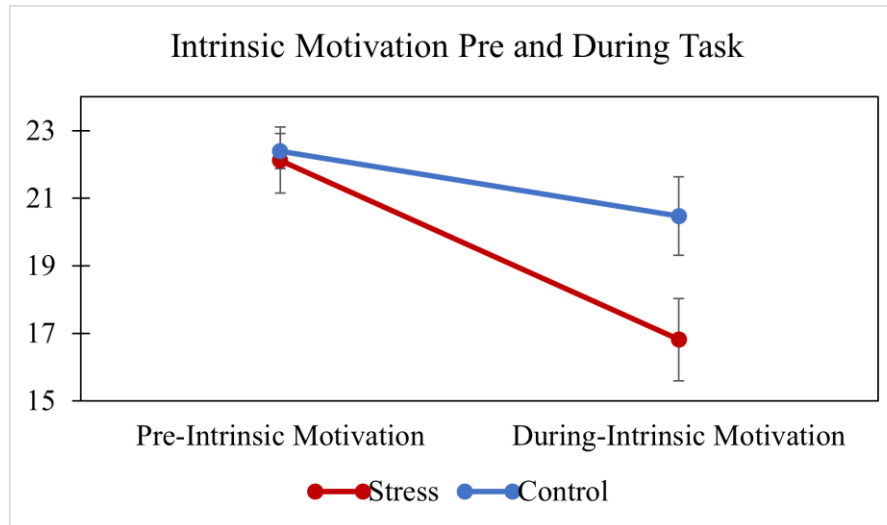
# What About the DSSQ Data?

Pre-and post- measures of interest:

- Energetic arousal
- Tense arousal
- Success motivation ←
- Intrinsic motivation ←
- Self-focused attention
- Concentration
- Control/confidence
- Task related thoughts
- Task irrelevant thoughts

Variables reaching significance, or nearing significance:

	Stress	Control	Statistic
Pre-Post Success Motivation Difference	-1.625(5.2)	1.467(2.33)	$t(21.05) = -2.159, p = .043$
Pre-Post Intrinsic Motivation Difference	-5.313(5.02)	-1.933(4.4)	$t(29) = -1.988, p = .056$
During Intrinsic Motivation	16.81(4.85)	20.47(4.5)	$t(29) = -2.171, p = .038$



# What is Power Spectral Density Analysis?

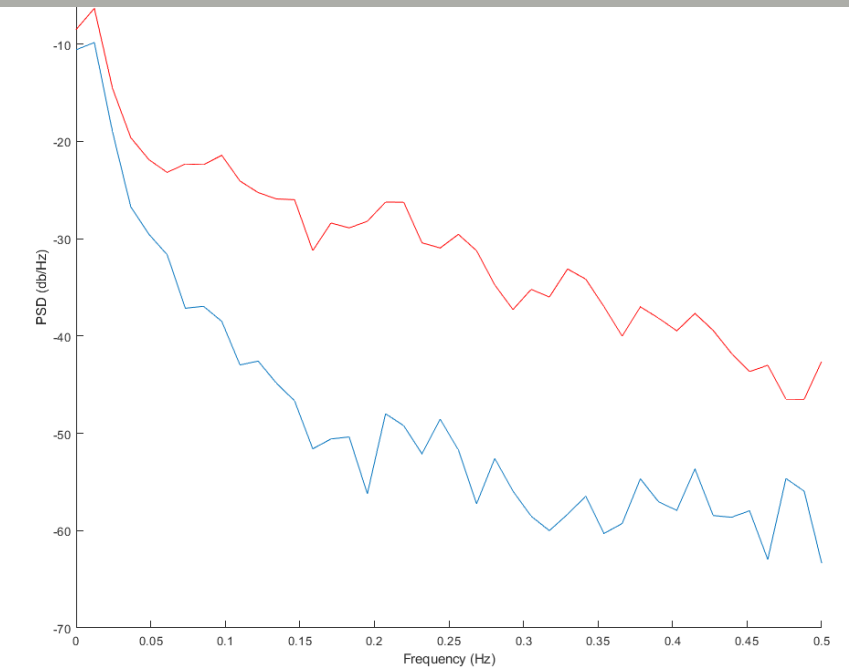
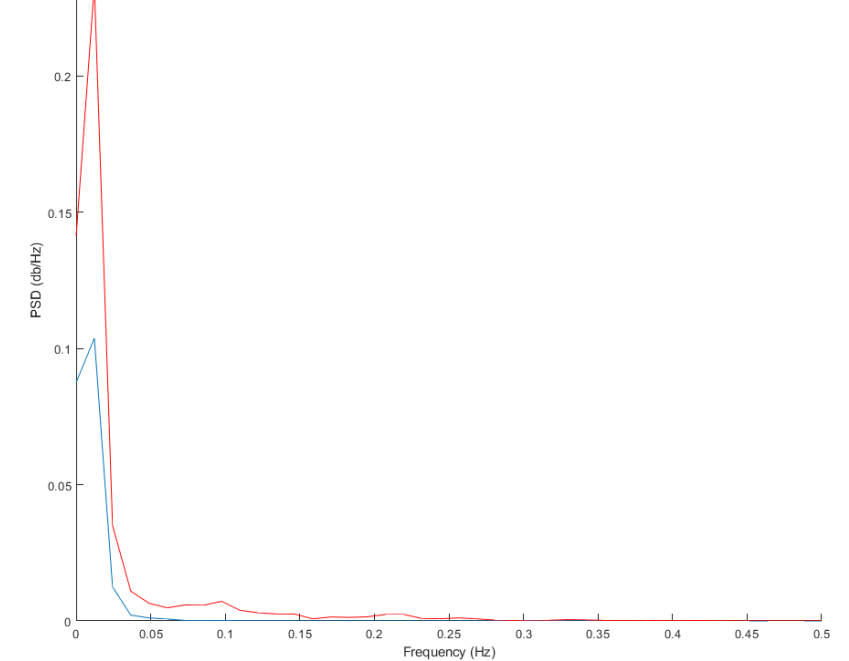
Power of signal in regard to frequency

Certain frequency bands are said to be associated with sympathetic arousal related to GSR (Posada-Quintero et al., 2016)

- VLF – 0-0.045
- LF/HF - 0.045-0.25
- VHF – 0.25-0.5

Methods used:

- Detrending data to correct for linear drift
- Trimming data to ensure same amount of data points
- PSD analysis
  - Sum of energy in frequency bands
  - Percent of energy in frequency bands



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