



Objective and Subjective Stress on Risky Decision-Making

Mitchell Dandignac & Joseph Johnson
Miami University



Abstract

- The current research had a couple objectives. **First**, this study examined the relationship between cortisol, heart rate, subjective perceptions of stress and heart rate, and interoception. **Second**, this study examined the relationship of these objective and subjective measures of stress on risky decision-making.
- The hypotheses of the current research are as follows:**
 - Heart rate will peak immediately following the stress task (Time 2) while cortisol levels will peak 20 minutes after beginning the stress task (Time 3).
 - There will be convergent validity between cortisol levels and physiological heart rate.
 - Interoception of stress will positively relate to interception of heart rate.
 - Participants with higher stress will have higher rates of risky decision-making.
 - Magnitude change in cortisol will more strongly relate to risky decision-making than raw cortisol levels.
- The current research found mixed results for the hypotheses.** The stress task was effective in eliciting stress among participants and cortisol peaked at the predicted time. Heart rate measures showed little relationship to stress measures. Some gender differences in risky decision-making were found but further investigation is required.

Background

Cortisol and Stress

- Research shows that cortisol levels increase after stressful tasks, such as socially evaluated performance (Dickerson & Kemeny, 2004).

Heart Rate and Stress

- Multiple studies have shown a relationship between stress and heart rate.
- Heart rate increases when people are stressed (Terasawa et al., 2014) and Heart rate variability (HVR) indicated levels of stress in participants when participating in risky decision making tasks. (Dulleck et al., 2014).
- Individuals with high heart rate variability has been shown to have high cortisol reactivity (Reyes et al., 2015).

Interoception and Stress

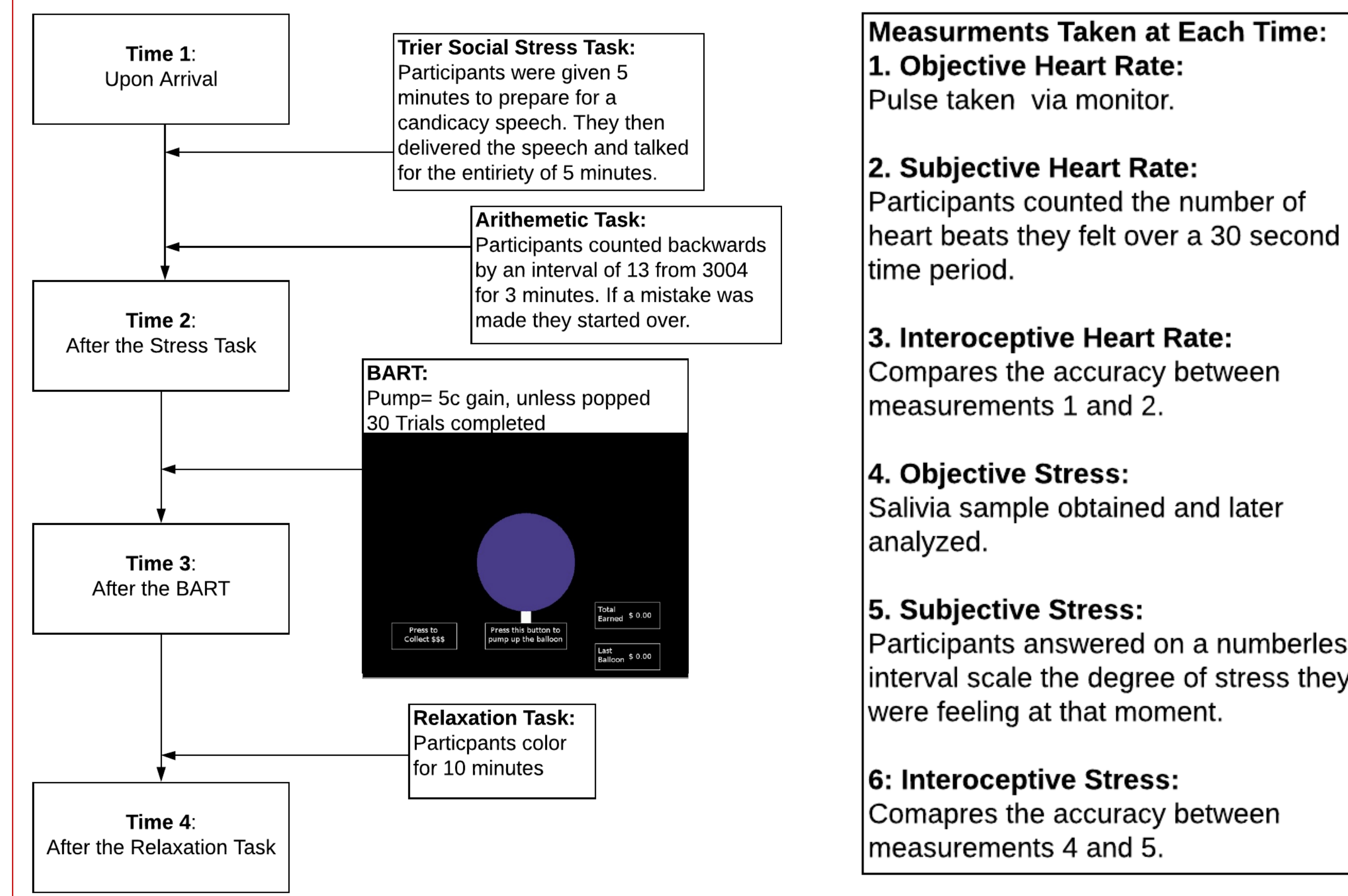
- This study also looked at interoception, which refer to one's awareness of their own physiological states. Specifically, this study examined interoception of heart rate and stress.
- Interoceptive awareness helps people regulate emotions and stress (Füstös et al., 2013). Participants with good interoception are more sensitive to emotions and stress (Terasawa et al., 2014). This suggests those with good interoceptive abilities would perform better on decision-making tasks following a stressful task.

Risky Decision-Making

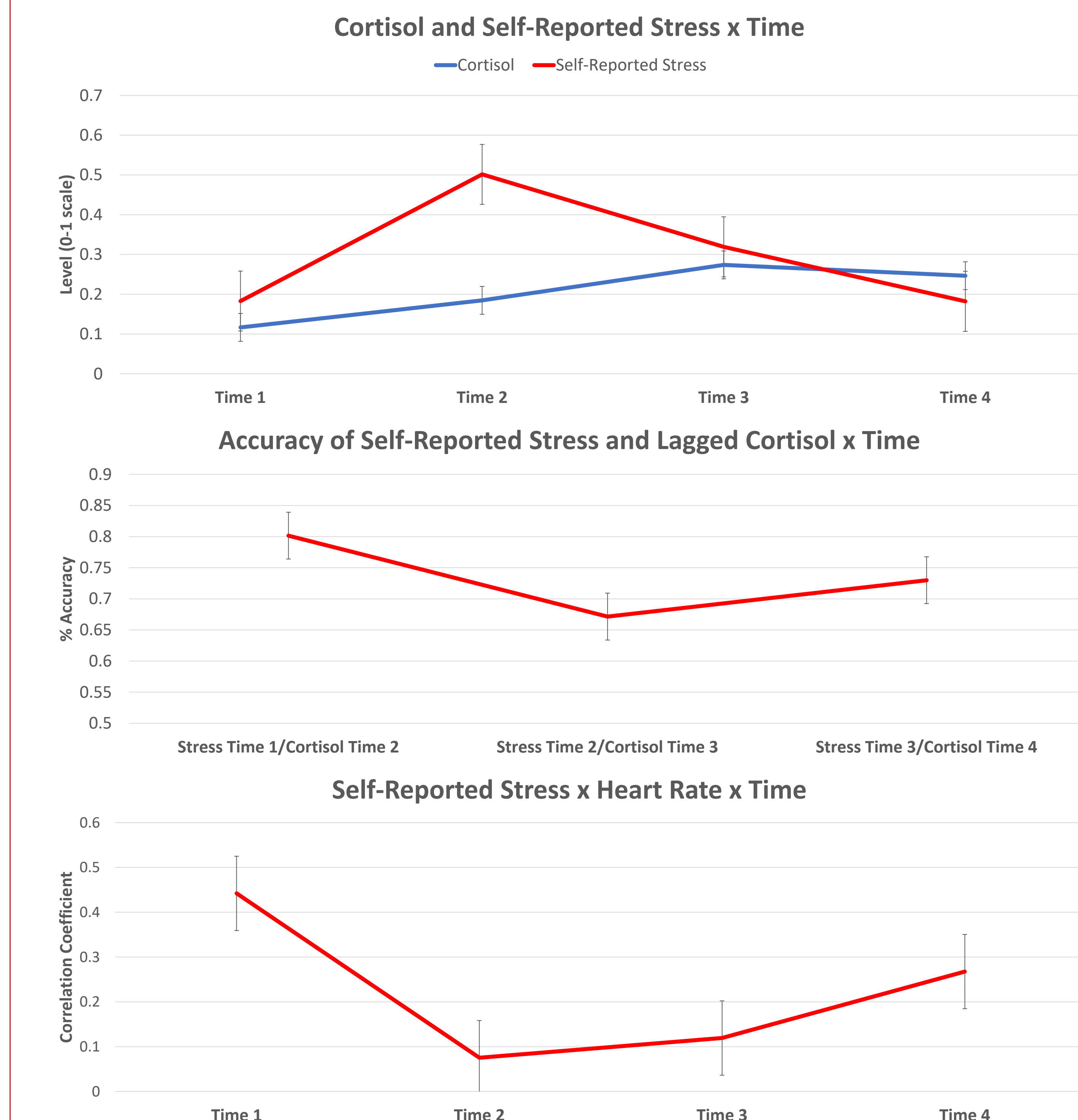
- There has been little research which examines the relationship among stressful states, interoception of heart rate and stress, and risky decision-making.
- Interoceptive ability predicts loss aversion, but not risk attitudes or choices (Sokol-Hessner et al., 2015).
- Low interoceptive ability is associated with riskier behavior on risky decision-making tasks (Herbert & Pollatos, 2012).
- The cold pressor stress task doubled cortisol levels for both men and women, with women showing higher levels of subjective stress. Stress induced gender differences such that males had more profitable behavior on a risky decision-making task than the females did, although overall levels of risk taking were low. (Lighthall et al., 2012).

Method

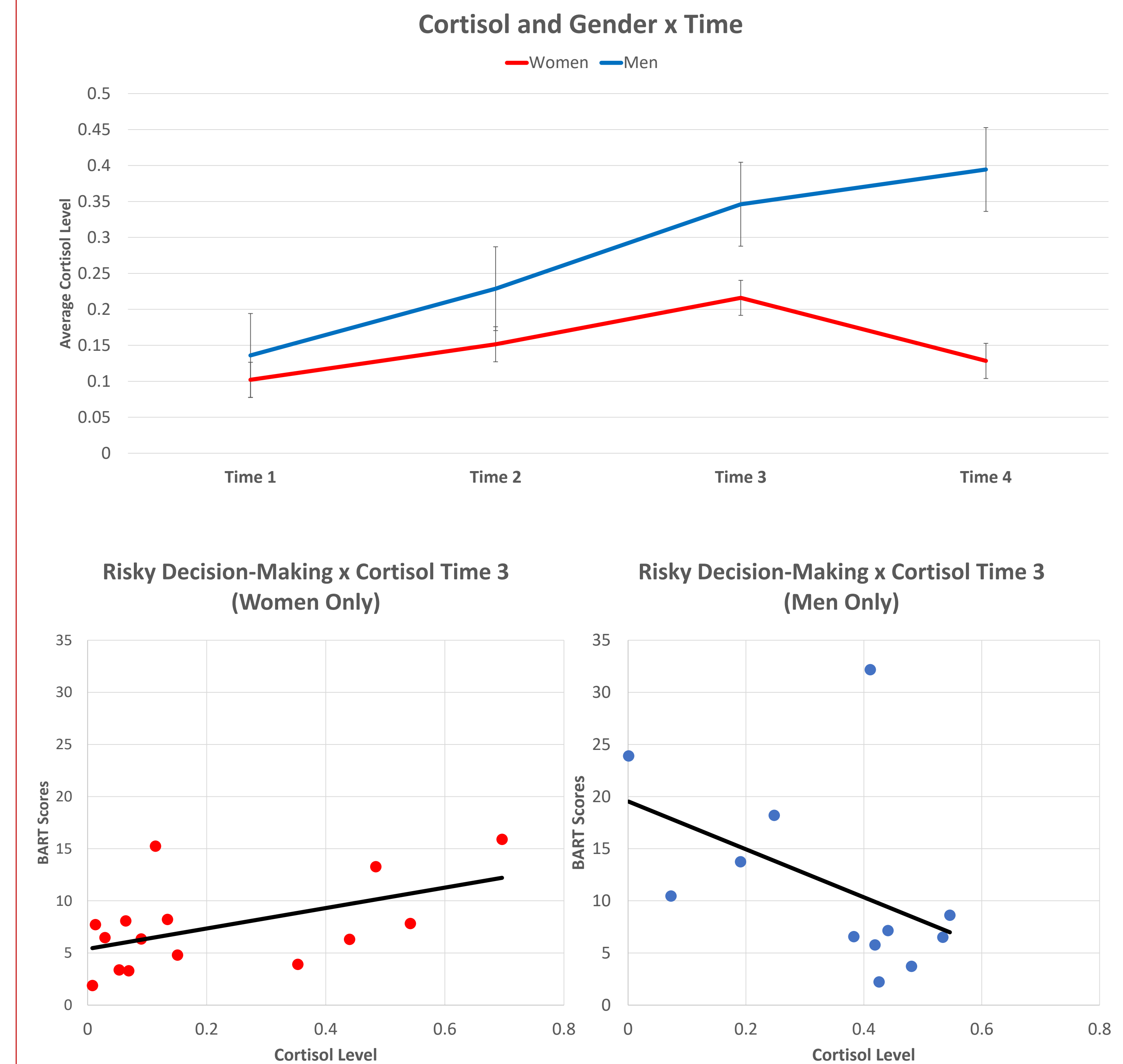
- Sample: 29 undergraduate students (Men = 41%, Women = 59%)
- Participants performed the Trier Social Stress Task, Balloon Analogue Risk Task (BART), and subjective and objective measures of stress were collected at 4 different intervals.



Results



Results (continued)



Discussion

- The current study investigated the relationships between stress levels and risky decision-making, stress levels and heart rate, and interoception of stress and interoception of heart rate. Significant results were found for two different relationships.
- First, **higher cortisol levels at time 3 related to more risky decision-making among women but not men.** Previous research has found sex differences in stress responses (Bale & Epperson, 2015).
- Second, **a significant relationship found was between subjective reported stress and heart rate.** Positive correlations were detected during baseline (time 1) and post-experiment (time 4). This increased congruency between subjective stress and objective heart rate in times of lower stress suggests that heart rate measures are more accurate at detecting a relaxed state than an aroused state.
- Self-reported stress levels increased significantly at time 2 and cortisol levels peaked at time 3. **These findings confirms the effectiveness of the stress tasks.**
- There was an **insufficient sample size to make firm conclusions about sex differences in BART scores** correlated with increased cortisol levels. Future research should use a larger sample of men and women to increase the power of this interaction. **Future research should also counterbalance the gender of the experimenters.**