

The Impact of Virtual Social Support During Stress on Negative Affect and Cortisol

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SIGNIFICANCE

How does virtual social support influence psychophysiological stress responses during social evaluation?

Trier Social Stress Test (TSST)

- The TSST is a standardized laboratory paradigm used to elicit psychophysiological responses to stress in a laboratory setting.

Virtual Trier Social Stress Test (VTSST)

- Our lab has developed a virtual reality-based version of the TSST utilizing an immersive (3D) pre-recorded audience stimulus.

Social Support & Audience Size

- Larger audiences enhanced cortisol and impacted Negative Affect when performing in front of a non-supportive audience (Byron et al., 2023).

METHODS

Participants

Participants (N = 144) were undergraduate students recruited from NDSU. After excluding participants due to eligibility criteria or missing Finometer or survey data, the final sample included 113 participants. This sample had a mean age of 18.8 years (SD = 0.97) and were 50% female (n = 56). Additionally, the sample was racially and ethnically representative of the surrounding population with 82.3% White/Caucasian and 6.2% reporting Hispanic ethnicity.

Virtual Trier Social Stress Test (VTSST)

The VTSST is a TSST (Kirschbaum et al., 1993) based protocol developed by our lab that virtually displays an immersive (3D) pre-recorded audience to participants. This has been shown to be effective in studying stress (Byron et al., 2023).

Procedure

Participants completed the VTSST protocol where they performed a 5-minute public speaking and oral arithmetic task in front of a randomly assigned audience condition. See Figure 3 for details.

Audience Size Manipulation (2 vs. 200)

The size of the audience presented was either 2 (in-line with the TSST protocol) or 200 confederates.

Support Manipulation (Support vs. Non-Support)

Virtual audiences for the recording were instructed to respond to a speaker in either a supportive (e.g., smiling, nodding, paying attention) or non-supportive fashion (e.g., looking away, appearing bored, or slight head shakes).

Measures

- The Positive Affect and Negative Affect Scale (PANAS)
- Salivary Cortisol via **Salivette** (Dental Chew) Collection (see Figure 3)

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TABLES & FIGURES

Figure 1: Immersive Virtual Reality Audience Stimulus

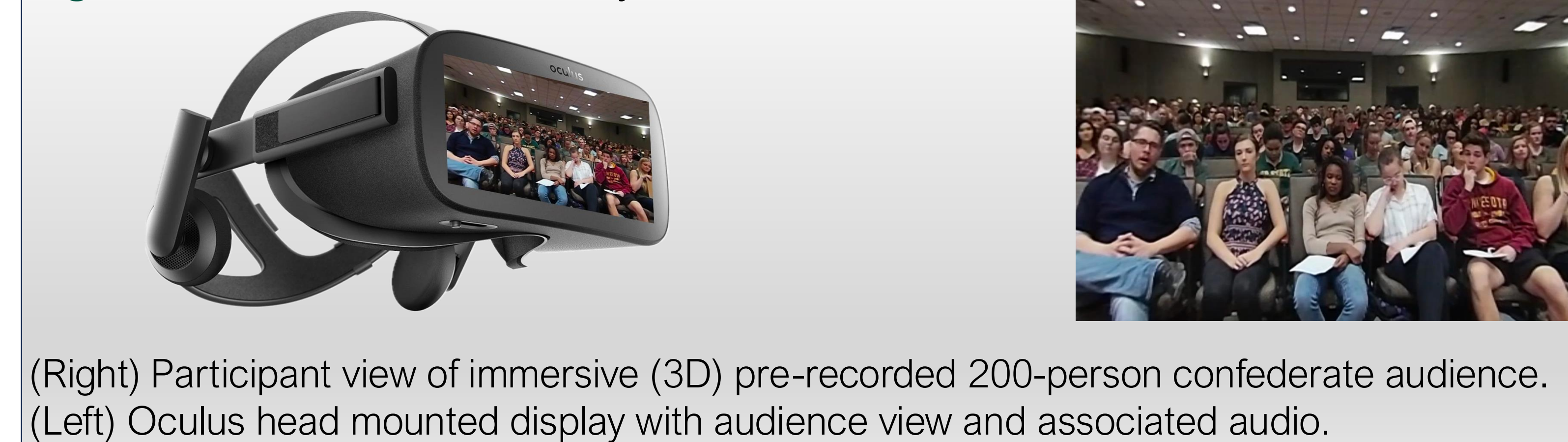
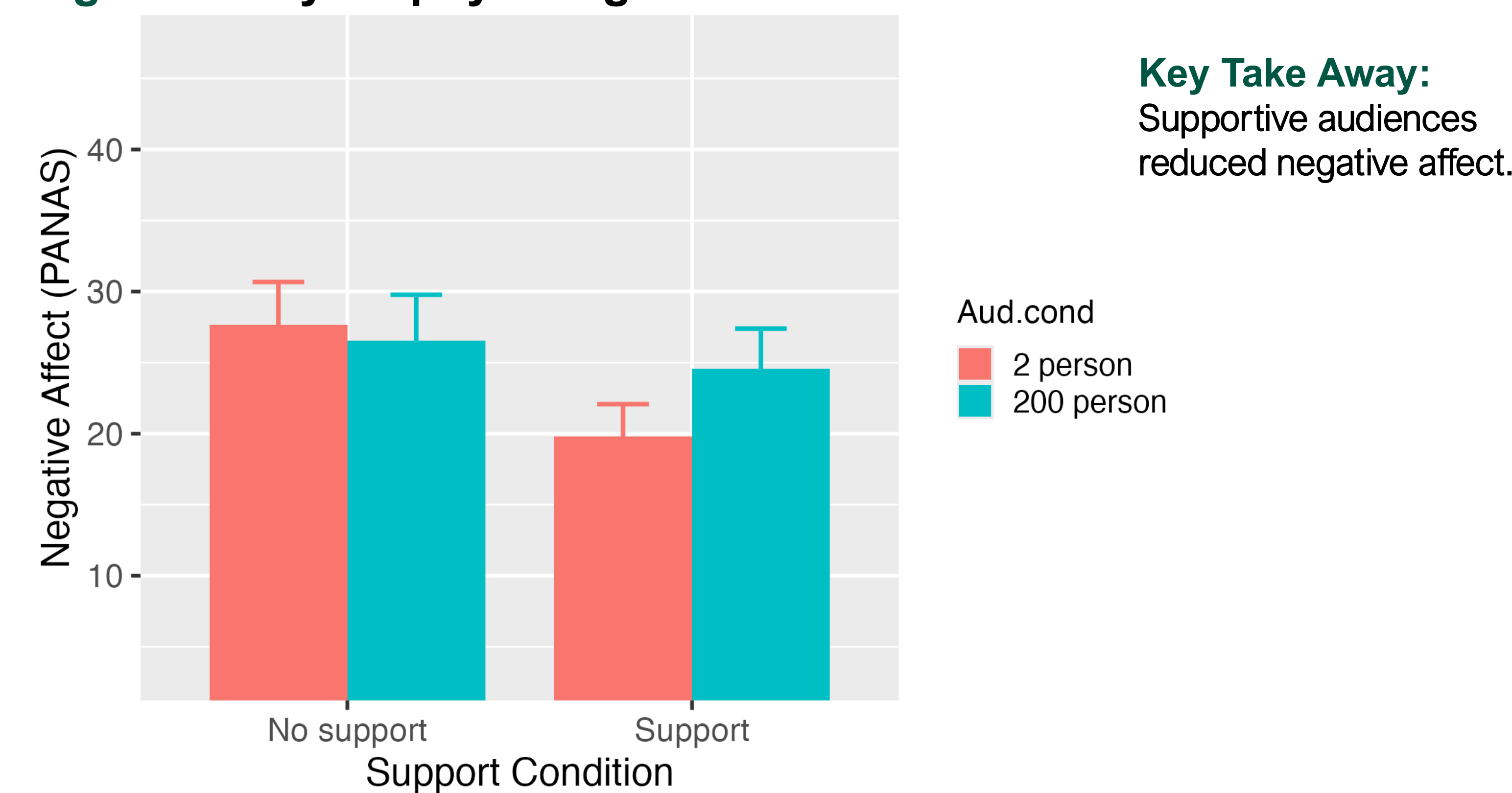


Figure 2: Psychophysiological Results



Key Take Away: Supportive audiences did not affect cortisol levels; Larger audiences may cause higher cortisol.

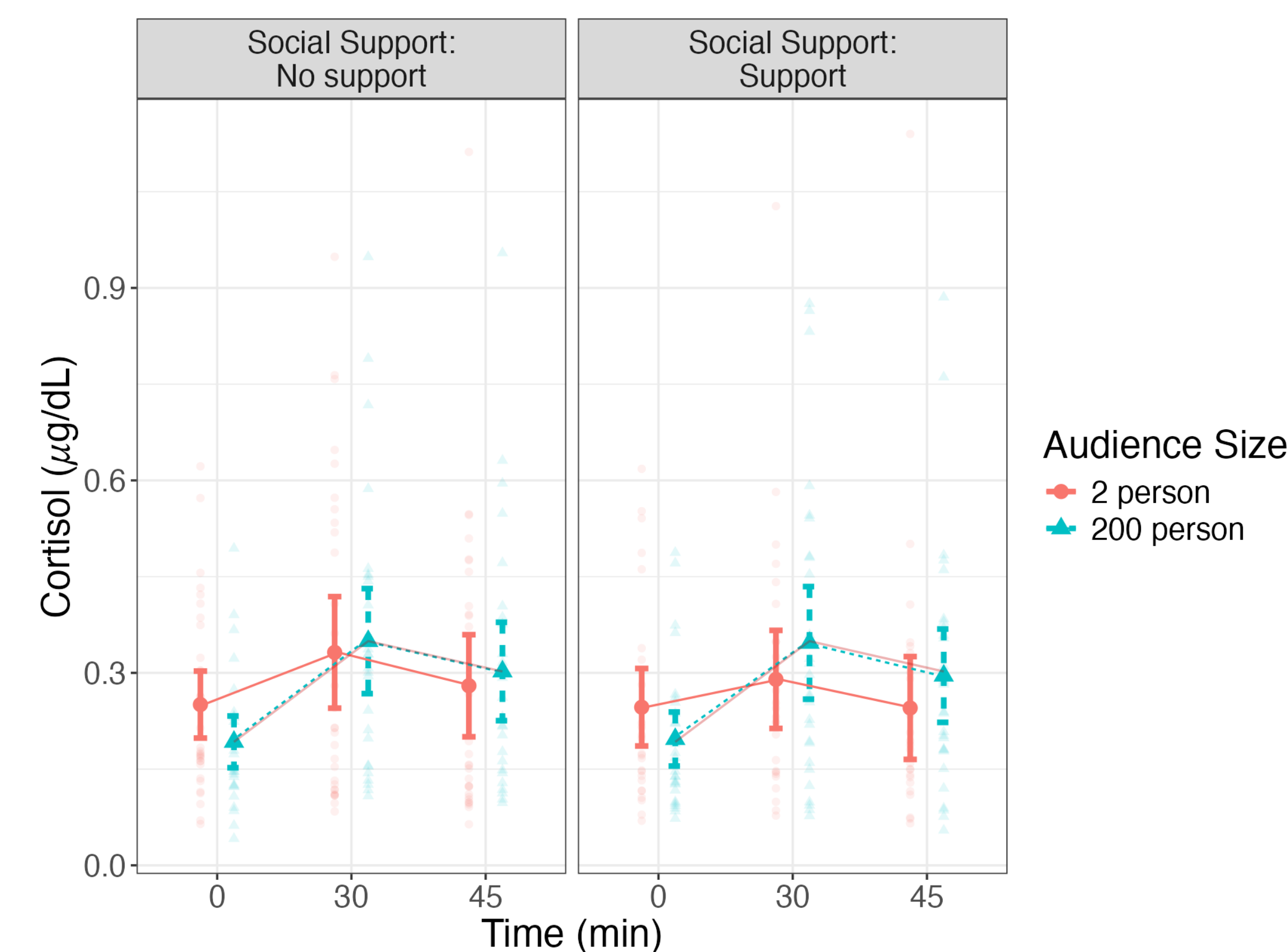


Figure 3: Virtual TSST Timeline

RESULTS

Analyses

- 113 analysis eligible participants
- ANOVA (PANAS) or ANCOVA – Baseline Adjusted (Cortisol) procedures were used to assess simultaneous main effects of Audience Size and Support conditions
- Cortisol data was transformed via $\log(\text{cortisol})$ for analyses (Miller & Plessow, 2013)

Primary Findings

Social Support (Supportive)

- Reduced Negative Affect – $F(1,109)=10.53, p < 0.05, \eta_p^2 = 0.084$
- No observed effect on Cortisol – $F(1,108)=0.230, p=0.63, \eta_p^2 = 0.001$

Audience Condition (200 Person Audience)

- Trending Increase in Cortisol – $F(1,108)=3.42, p = 0.07, \eta_p^2 = 0.03$
 - Observed 25% increase in Cortisol at first recovery for a 200-person audience

Marginal significance ($F(1,109)=3.73, p=0.056$) observed of the interaction between Audience Size and Social Support for Negative Affect (See Figure 2).

DISCUSSION

Social Support decreases negative affect, but perhaps less so with a larger audience

- Consistent with prior findings, a supportive audience decreased negative affect. A marginally significant interaction was observed between support and audience size. Indicating that for larger audience the impact of positive support may be diluted and the impact of negative support is enhanced.

Cortisol not observed to be impacted by Social Support, Larger Audience may be Factor

- Previous findings indicated that cortisol levels were increased by a larger audience within a non-support condition (Byron et al. 2023). These results were partially replicated. The positive support condition did not elicit significant differences in cortisol levels at recovery 1 from the non-supportive condition.

What does this mean?

- Virtual reality lets us bring the stress of public speaking into the lab, and what we found is that who's watching matters: supportive audiences ease the emotional toll of stress, but as the crowd grows, that buffer fades, and your body responds to the size of the audience more than its warmth.

FUTURE DIRECTIONS

Our lab is studying why social support works differently for different people during stress. We're also looking at the processes through which social support affects both how people feel and how their bodies respond during stress.

REFERENCES

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- Miller, R., & Plessow, F. (2013). Transformation techniques for cross-sectional and longitudinal endocrine data: Application to salivary cortisol concentrations. Psychoneuroendocrinology, 38(6), 941-946.