

Virtual support: Psychological stress responses and social support in virtual reality

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Introduction

🧠 The Trier social stress test (TSST) is a standardized protocol for eliciting psychophysiological stress in the laboratory. Participants are asked to give an impromptu speech and complete an oral math task while in front of a non-positive audience of confederates.

🧠 The TSST has recently been adapted to virtual reality (VR) and our lab has shown this to be an effective way to study stress in the lab (Byron et., 2023). The extent to which the VR TSST to study variables associated with stress is virtually unexplored.

🧠 A number of in-person studies have found that a supportive audience can affect responses to the TSST. It is not clear if social support from a VR audience would have similar effects.

This study aimed to examine the effects of a supportive immersive pre recorded 3D 360-degree virtual audience of 2 and 200 persons. Audiences were instructed to act supportively or non-supportively throughout the TSST.

H: We predicted that participants would respond differently depending on audience behavior.

Methods

Participants: Participants were undergraduates with an average age of 18.9 (SD=1.0) years. The sample (N=127) was 51% females (n=65) and 49% males (n=62) The ethnic and racial breakdown of the sample was representative of the surrounding population with 83% White/Caucasian, 8% Black/African American, 4% Asian, and 2.7% American Indian/Alaska Native or other. Six percent (n=8) reported being of Hispanic ethnicity.

Procedure: Participants completed a standardized psychophysiological challenge task, the Virtual Trier Social Stress Task (V-TSST).

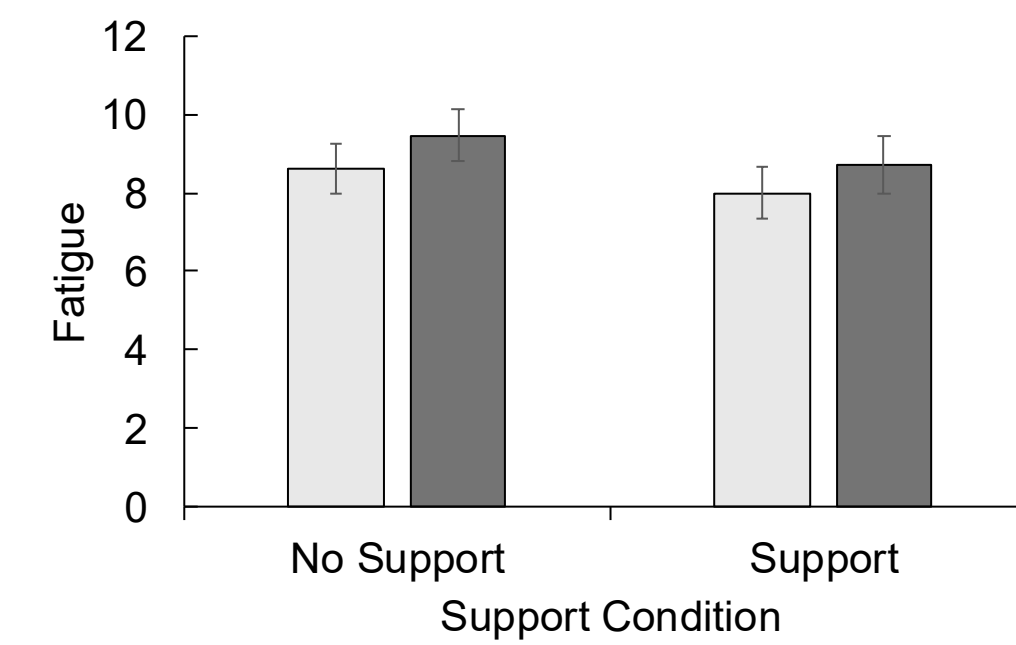
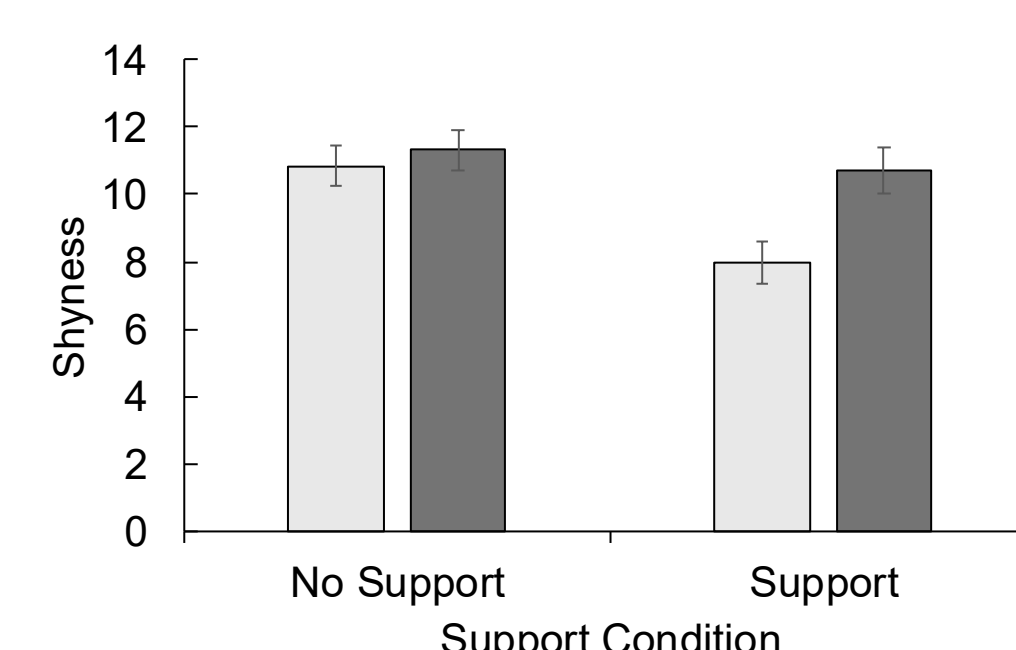
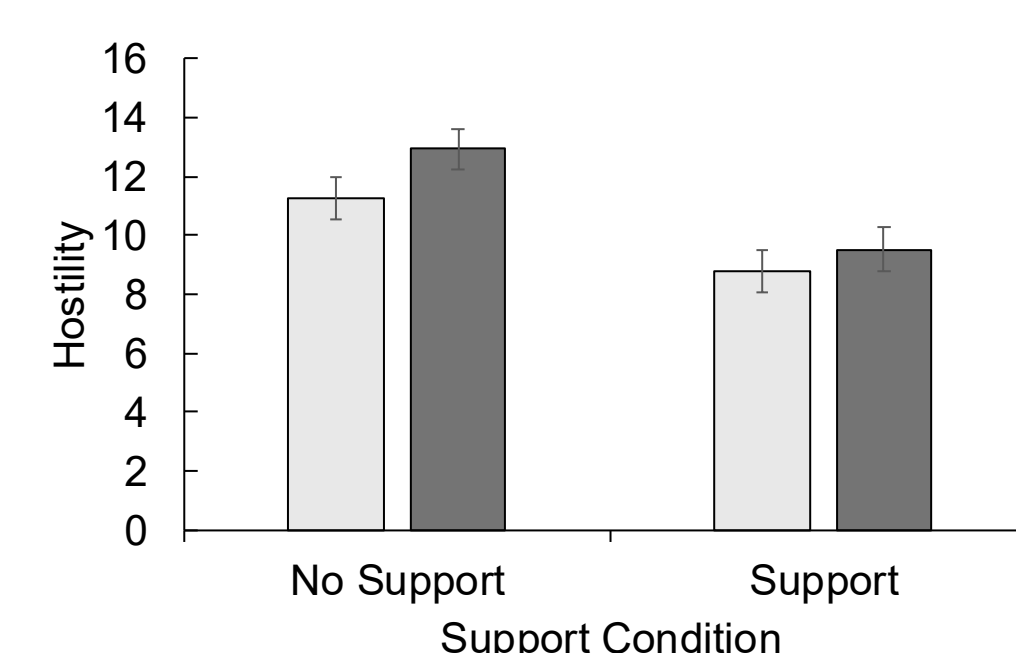
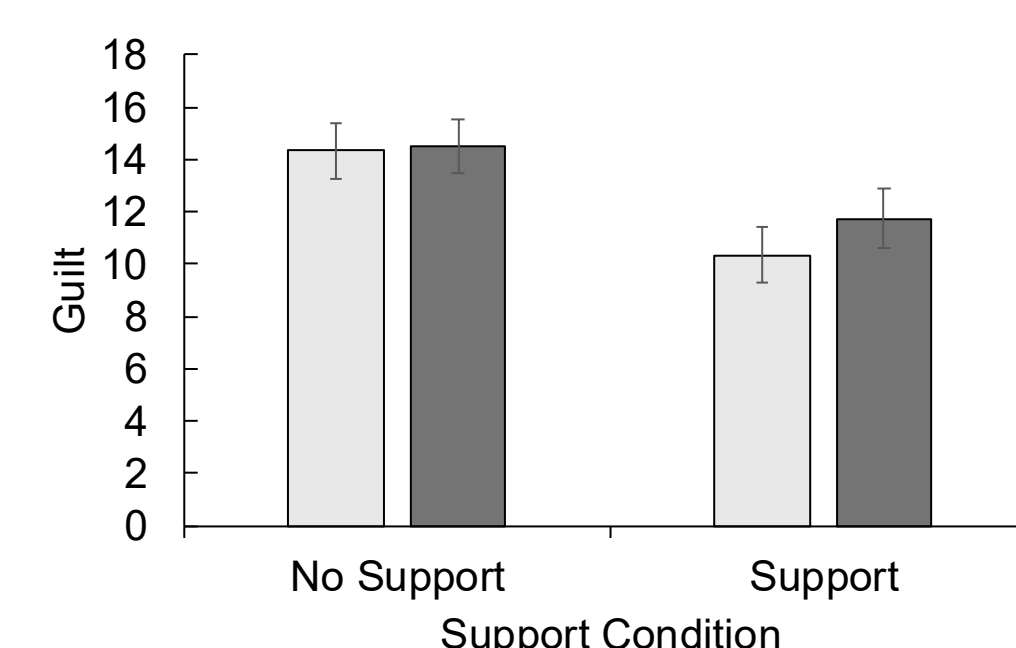
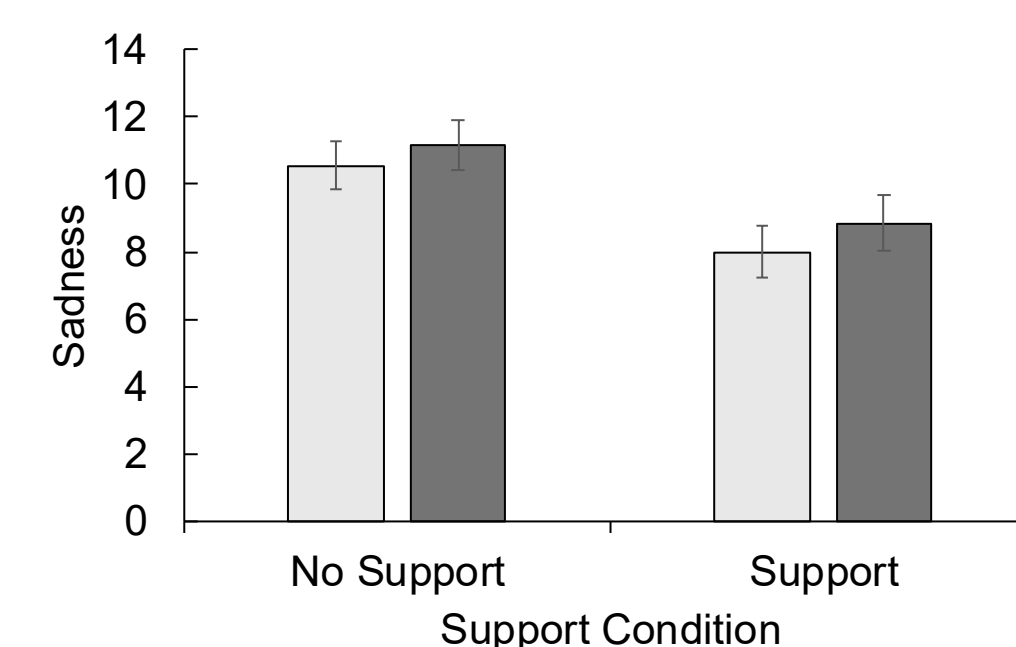
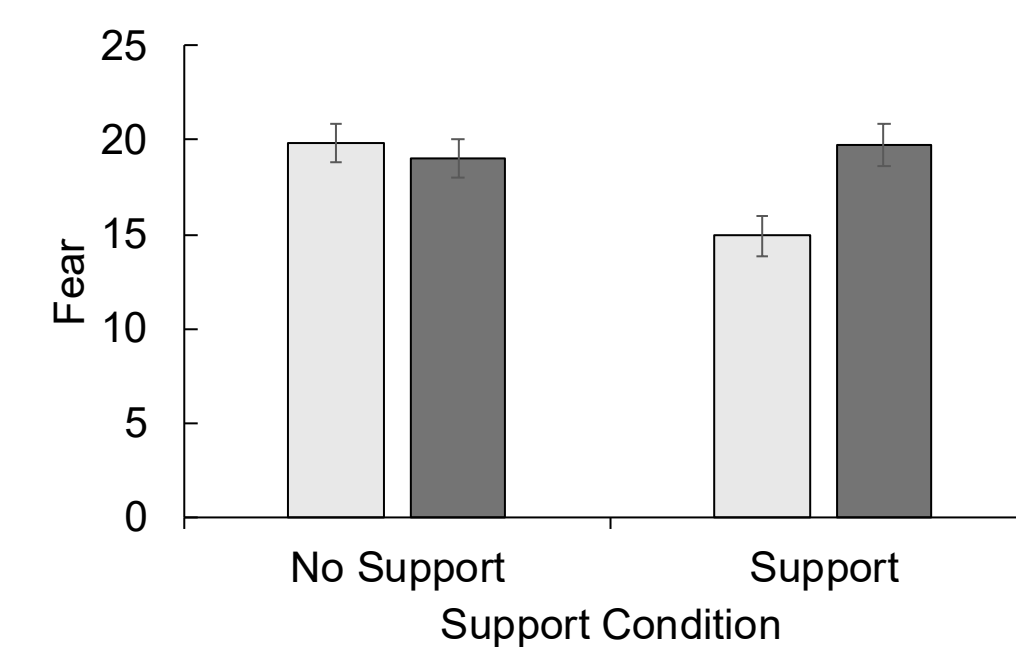
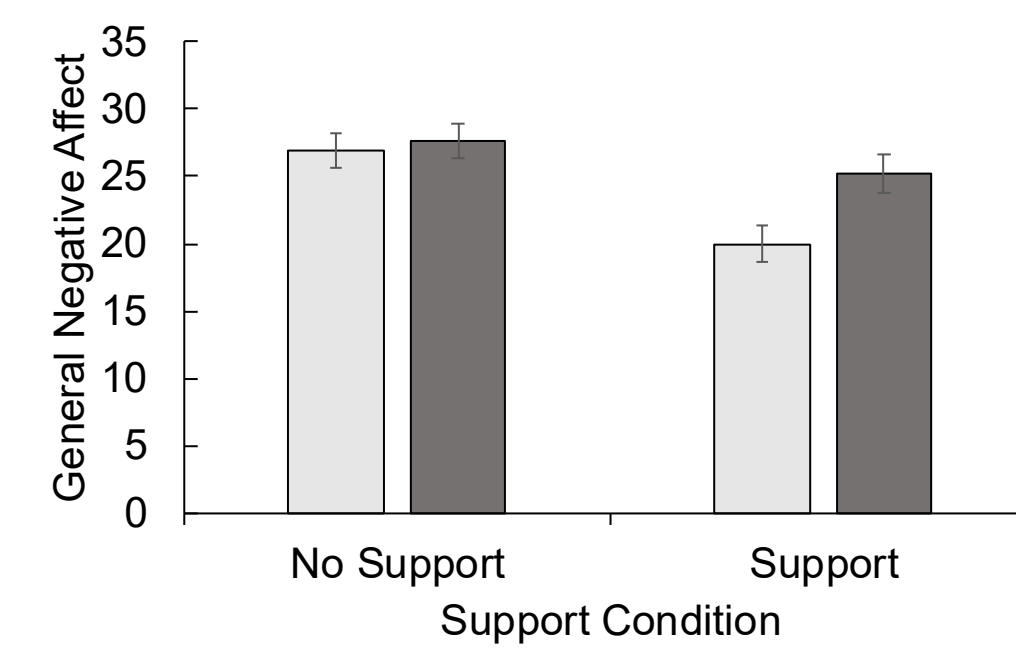
V-TSST: This is a new adaptation of the traditional TSST (Kirschbaum et al., 1993) designed by our lab (Byron et al., 2023). Participants performed 5-minute speech and math tasks while viewing an immersive, 200-person audience recording on an Oculus headset. See Fig 1 for Timeline.

Support Manipulation: In the *non-support condition* the audience was inattentive and unresponsive, with two individuals getting up to leave midway through the tasks. In the *support condition* the audience was attentive and smiling and nodding throughout the task performances.

Measures:

- The Positive Affect and Negative Affect Scale (PANAS; (Watson, Clark, & Tellegen, 1988)) indicated participant **Negative Affect (NA)** and **Positive Affect (PA)** responses to the stress tasks.
- The Stress and Arousal Checklist (SACL; McCormick, Walkey, & Taylor. (1985)) indicated participant self-reported **Stress** and **Arousal** during the tasks.
- Effort** exerted during the tasks was measured with 5 self-report items designed for this study.

Negative Responses



Positive Responses

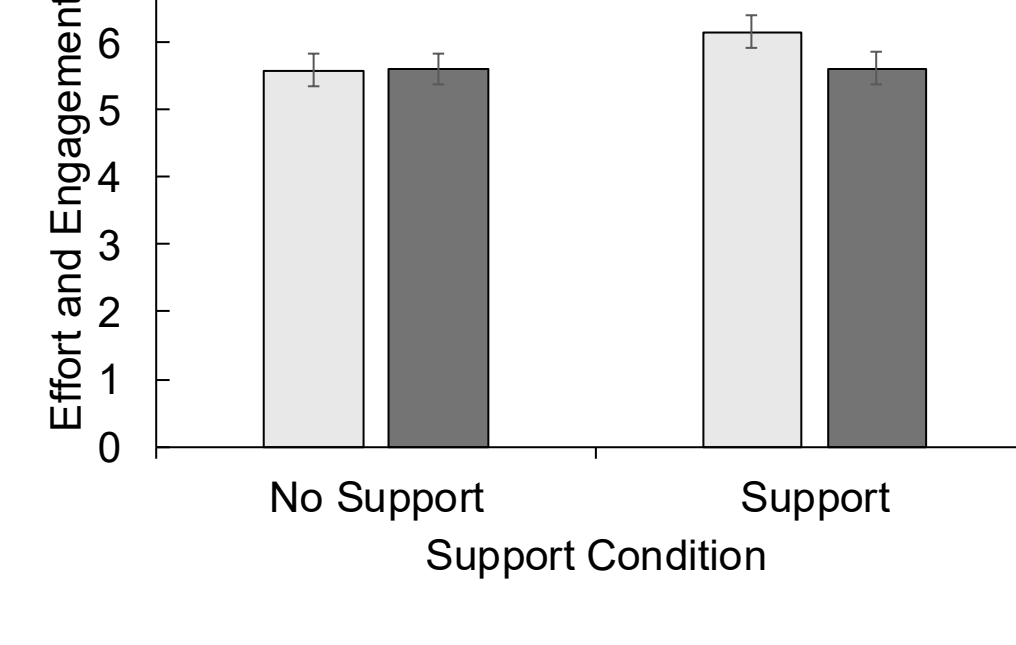
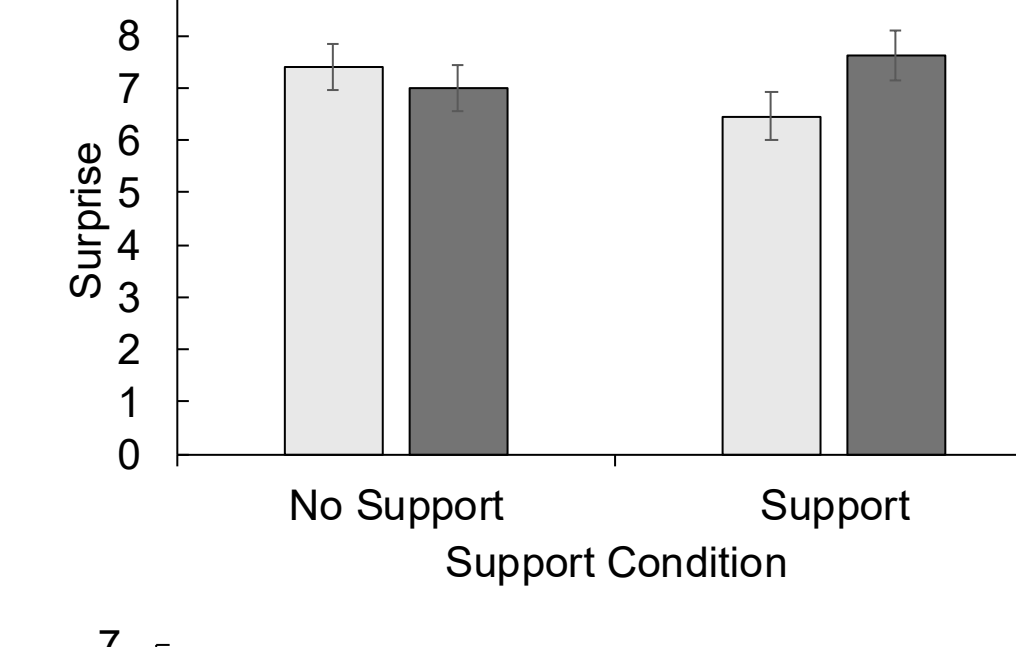
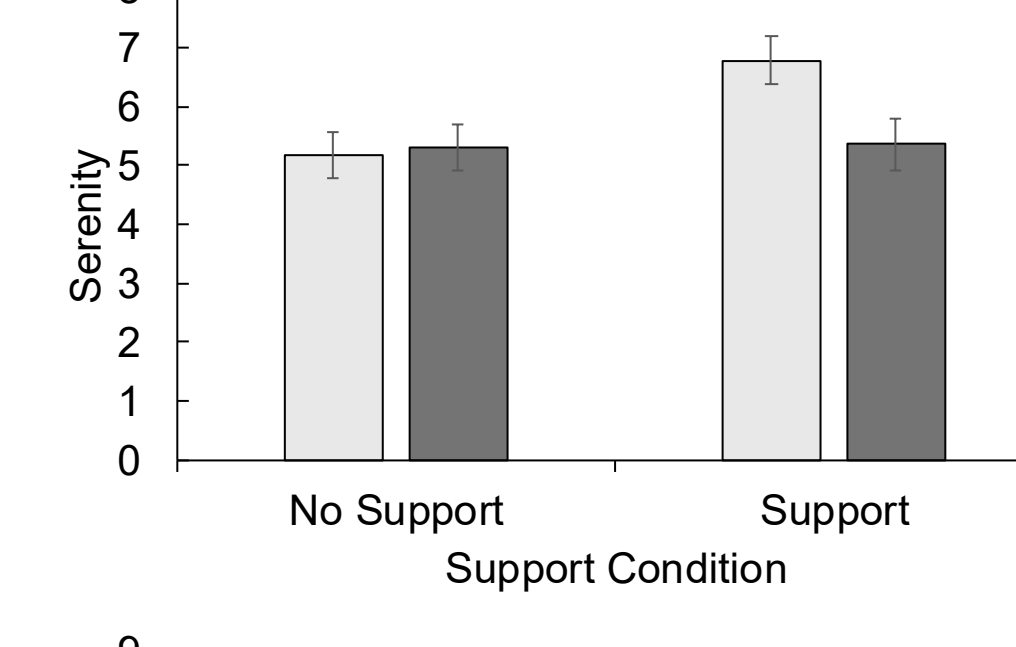
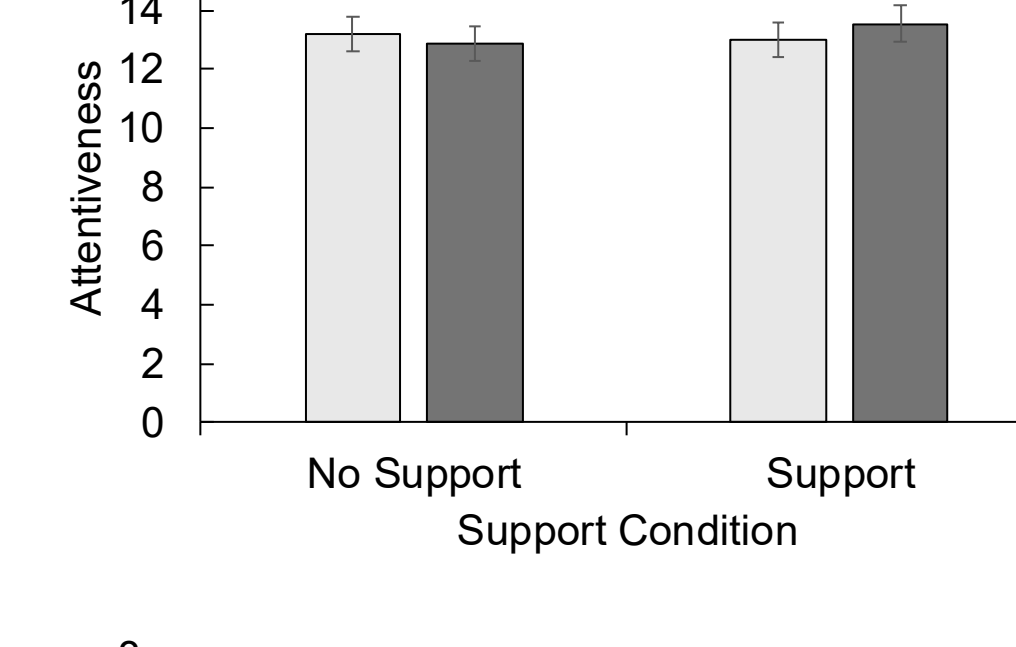
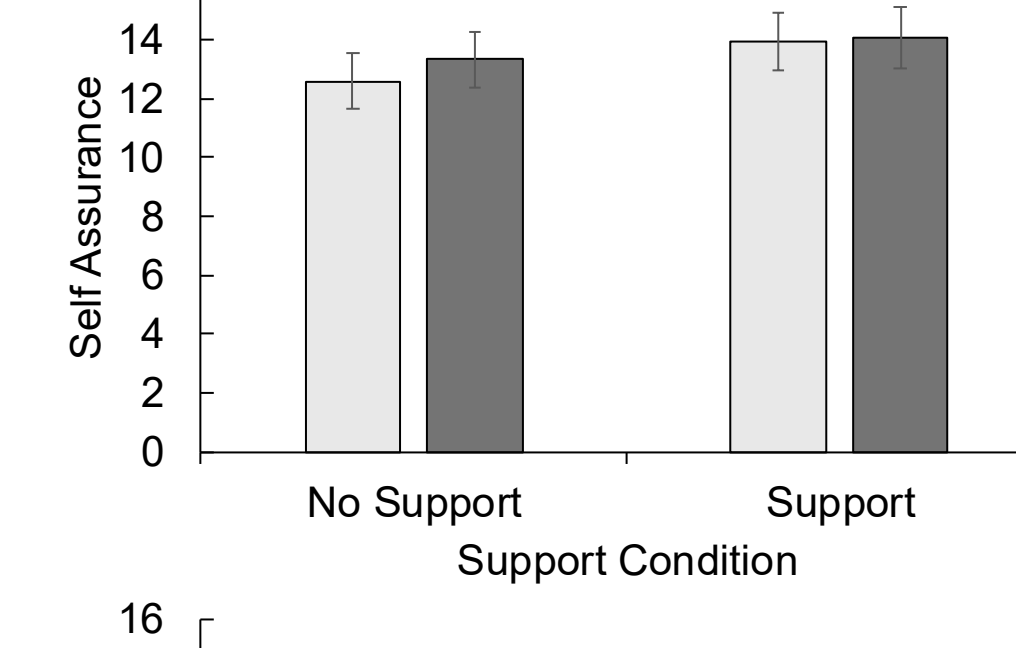
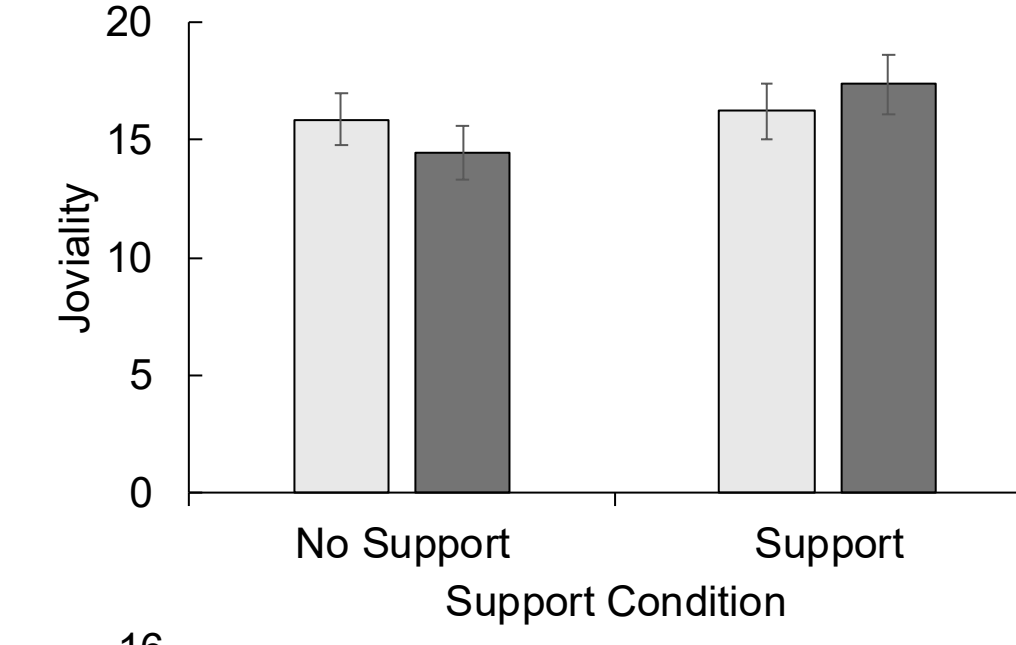
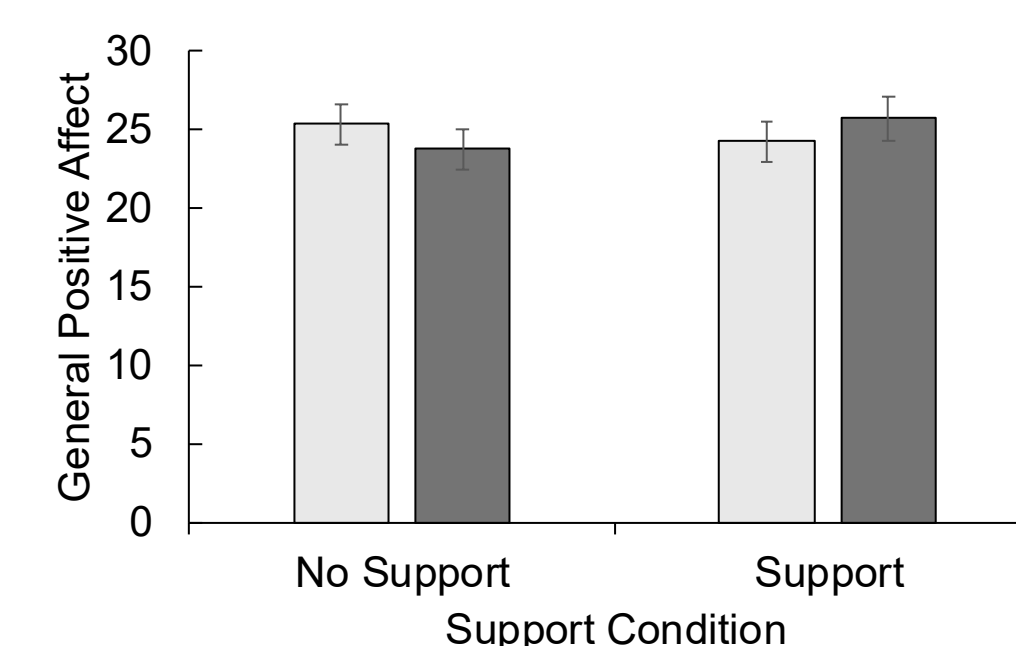


Figure 2. Immersive Virtual Reality Audience Stimulus:



A 3D, 360° pre-recorded 200-person confederate audience (right), viewed using an Oculus head mounted display (left) with accompanying audio.

Results

Analyses:

- 🧠 2x2 ANOVA's were used to compare psychological responses by audience size (2 vs 200 people) and support condition (support vs non-support).
- 🧠 Support condition and psychological responses:
 - Support condition reduced all negative psychological responses; negative affect, fear, sadness, guilt, hostility, shyness, except for fatigue.
 - Parelle analyses were conducted on positive psychological variables. Support condition only influenced self-reported serenity with participants reporting more serenity in the support condition.
- 🧠 Audience size and psychological responses:
 - Audience size influenced negative affect and shyness such that participants reported more negative affect and more shyness in the larger 200-person audience conditions. Audience size had no effect on positive psychological variables.
- 🧠 Support condition and audience size interaction:
 - A significant interaction was found for self-reported fear, such that social support was most effective in the 2-person audience.
 - There was also a marginal interaction of support and audience size condition on self reported serenity $p=.057$

Discussion

Our results suggest that social support from a virtual audience is effective at reducing the negative psychological impact of the TSST. Even though the audience was pre-recorded and presented virtually the positive behavior of a supportive audience reduced negative affect significantly.

Interestingly, support did not affect positive affect with a single exception. Serenity was increased by the supportive audience. This lack of effect on positive emotions is consistent with past research showing a similar pattern.

There was also an indication that greater negative affect was elicited by the large 200-person audience and one result (fear) suggesting that support from a 2-person audience is more effective than from a 200-person audience.

Thus, virtual reality can be used to study social support and perhaps develop interventions utilizing its effects.

