



Heart Rate Variability During False EKG Feedback in A Mixed-Antisaccade Task



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Introduction

Cognitive models of social anxiety assert that maladaptive cognitions lead to distressing thoughts and behaviors that are associated with the disorder (Clark & Wells, 1995; Rapee & Heimberg, 1997). Recent research has turned to the study of attention in social anxiety to explain this phenomenon (Judah, Grant, Lechner, & Mills, in press).

Respiratory sinus arrhythmia (RSA) is a measure of parasympathetic nervous system activation, and has been associated with emotion regulation and cognitive activity (Porges, 2001) as well as attention (e.g., Richards, 1994). Specifically, RSA is a marker of cognitive underload (i.e. boredom) (Pattyn et al., 2008; Muth et al., 2012).

Magnitude of RSA has also been found to be negatively correlated with level of anxiety (Watkins et al., 1998). However, findings regarding RSA in social anxiety generally do not find this difference (e.g., Hofmann et al., 2006).

The current study examined RSA during a mixed-antisaccade task completed by high socially anxious individuals (HSA) and low socially anxious individuals (LSA). This task is widely used to assess executive control over attention. However, it is unclear whether errors during this task are primarily due to cognitive load (i.e., task difficulty) or to difficulty sustaining attention throughout the task (i.e., boredom). The goal is to examine this using heart rate variability as an objective measure of cognitive load.

Hypotheses:

- 1) HSAs will show lower RSA compared to LSAs for all phases.
- 2) RSA for both groups will be higher during the task phases.

Methods

Participants

Participants in this study included 9 male and 17 female undergraduate students at a large mid-western university. The mean age of participants in this study was 19.19. The racial distribution was 69% White, 11% Latino, 8% African American, 8% Native American, 4% Asian.

Methods

After providing informed consent, participants completed an online version of the Social Interaction Anxiety Scale (Mattick & Clarke, 1989). The scoring of this measure was used to divide the participants into HSA and LSA sub groups for data analysis. Upon completing the questionnaires a research assistant attached three electrodes to monitor and record ECG data. Participants then completed a mixed-antisaccade task (see Figure 1). Upon completion of the task participants were debriefed and dismissed. Compensation came in the form of course credit.

Materials

Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1989). This is a twenty item questionnaire that is used to measure the level of social anxiety that an individual experiences when interacting with other people. This is a well supported measure of social anxiety. It is scored on a five point scale with higher scores indicating higher levels of social anxiety

Results

RSA was calculated from raw ECG data using CMet (Allen et al., 2007). A 2×3 mixed ANOVA was used to examine the effects of Group (LSA & HSA) and Phase (Baseline, Task Phase 1, Task Phase 2). There was a main effect of Phase, $F(2,48)=5.26, p=.009$ (see figure 2). Pairwise comparisons revealed that Baseline RSA ($M = 6.5, SD = 1.24$) was significantly lower compared to Task Phase 1 ($M = 6.85, SD = 1.21$). There was no significant main effect of Group or interaction between Task Phase and Group.

Discussion

The results supported cognitive underload (Pattyn et al., 2008) during the mixed-antisaccade task compared to baseline. This is seen in the significant increase in RSA of both groups, indicating increased parasympathetic activation. These findings may suggest that the task measures the maintenance of attentional focusing rather than executive working memory capacity. The mixed-antisaccade task is widely used, and these findings contribute to the interpretability of studies using this task.

The results of this study are generally consistent with previous literature which does not support differences in RSA among socially anxious individuals (Hofmann et al., 2006), although this is inconsistent with findings regarding trait anxiety (Watkins et al., 1998). Although the HSA group appeared to have consistently lower RSA, this was not a statistically significant difference. This may suggest that more research is needed to support a relationship between lower parasympathetic activation and social anxiety.

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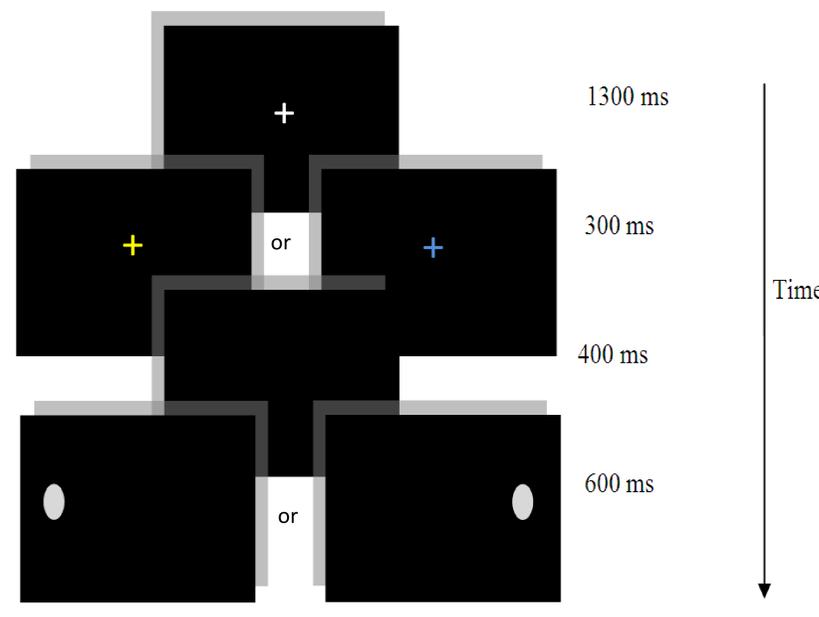


Figure 1. Screen view of mixed-antisaccade task with time scale throughout an individual stimulus event.



Figure 2. Mean RSA score at baseline, Task Phase 1 and 2 of LSA and HSA individuals.