Understanding Individual Differences in Response to Social Stress

Alexandra Shoff, Samantha DiChiara, Justin Kopec, Erika Siegel, Jolie Wormwood, Lauren Sears, Karen Quigley, and Lisa Feldman Barrett

Abstract

In this study, we looked at individual differences in affective reactivity and interoceptive sensitivity using a variety of behavioral and physiological measures. We recorded participants' cardiovascular activity and output, respiration, electrodermal activity, facial electromyography, and blood pressure while they completed a self-report to measure their cardiac activity and output, as well as a mental math task that assessed their ability to accurately assess their body state. Participants completed 100 trials, during which they needed to decide if a series of 10 beeps occurred in sync or out of sync with their heartbeat. In the heartbeat detection task, participants were asked to rate their overall stress level and habituation time was measured.

Task 1: Heartbeat Detection

• 100 trials consisting of 10 beeps each triggered by their own heartbeat.
• Assessed whether beeping occurred during or between heartbeats.

Task 2: Acoustic Startle

• Participants listened to brief bursts of white noise, while the orienting reflex was recorded and habituation time was measured.

Task 3: Picture and Sound Rating Task

• Placed IEMG sensors on the Zygomaticus and Corrugator muscles.
• 4 tasks where participants rated valence and arousal after viewing images and sounds.

Task 4: Social Stress Task

• Participants completed a social stress task of mental math with evaluation while we recorded cardiac variables (Figure 1): heart rate (HR), interbeat interval (IBI), respiration rate (RR) and respiratory sinus arrhythmia (RSA), as well as the parasympathetic activity that calculates heart rate variability (as a function of respiration) and cardiovascular variables: systolic and diastolic blood pressure (SBP and DBP, respectively).

Method

Participants (n=107) completed four tasks while we recorded their cardiac activity and output, respiration, electrodermal activity, facial electromyography, and blood pressure.

Participants completed several surveys, including measures of emotional control, emotional reactivity, and body vigilance. We hypothesized that participants who reported experiencing more stress and less ability to cope in the task would have higher blood pressure, a faster heart rate, and perform more poorly on the math task. We also predicted stronger correlations between self-report and physiological activity during the stress task for participants with higher interoceptive sensitivity.

Discussion

As the task got more difficult, participants' self-reported coping decreased, while patients' self-reported stress increased.

Our physiology results support our hypothesis that:

a) Sympathetic activity increased during the social stress task: significant increases in blood pressure and heart rate, significant decreases in interbeat interval and respiration rate.

b) Parasympathetic activity decreased during the social stress task: significant decreases in RSA.

Our results partially support our hypothesis that self-reported stress and coping was related to their physiology: self-reported stress was only related to blood pressure. There were no other relationships between the self-report measures and physiology.

This study provides important insights into how individuals respond to threatening situations.

Further Directions

Data collection and analysis are ongoing.

Future analyses will explore the relationship between the findings in this task and the data collected during the Heartbeat Detection Task. Picture and sound rating task, and questionnaires.

References


Figure 1: Physiology Hook ups

Results

Correlations:

<table>
<thead>
<tr>
<th>Heart Rate: Change from Baseline</th>
<th>Respiratory Sinus Arrhythmia:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress and Diastolic BP</td>
<td>Diastolic Blood Pressure: Change from Baseline</td>
</tr>
<tr>
<td></td>
<td>Systolic Blood Pressure: Change from Baseline</td>
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<tr>
<td></td>
<td>Interbeat Interval: Change from Baseline</td>
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