

Examining Relations Between Cardiac Autonomic Activity and Autism Traits in Adults

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BACKGROUND

- The autonomic nervous system (ANS) is responsible for regulating basic bodily functions, such as respiration and perspiration.
- Cardiac ANS, including heart rate (HR) and respiratory sinus arrhythmia (RSA, defined as the variation in timing between heart beats during respiration), have been found to relate to emotion processing in neurotypical adults (Bradley et al., 2008; Quintana et al., 2012)
- Individuals with ASD show differences in cardiac ANS responses.
 - Children with ASD show elevated HR and lower RSA at baseline (e.g., Bal et al., 2010), and RSA is positively correlated with social functioning (e.g., Van Hecke et al., 2009)
- Some recent work has also looked at associations between ASD traits in the broader population and physiological responses (e.g., pupillometry; DiCriscio & Troiani, 2017).

The current study aims to extend past work to examine cardiac ANS activity as it relates to ASD traits in the general population.

METHOD

Participants

- The final sample included 78 college students between 18 and 46 years old ($M = 20.34$ years, $SD = 4.59$). Data was collected in the Cognitive Development Lab at the College of Staten Island.

Procedure

- Three electrodes were placed on the participant in lead II configuration (Berntson et al., 2007), and cardiac activity was recorded using a Biopac MP150WSW system.
- Participants viewed 60 emotionally-valenced images (20 neutral, 20 negative, and 20 positive) for six seconds each (images taken from the International Affective Picture System; Lang et al., 2005).
- After the picture-viewing task, participants completed the Social Responsiveness Scale, Second Edition (SRS-2; Constantino & Gruber, 2012) to measure ASD traits.



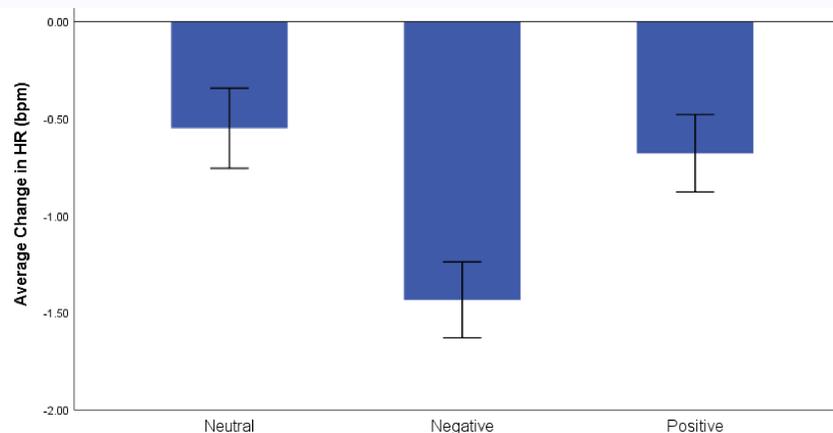
Data Analysis

- Change in HR to Images:** Based on Bradley et al. (2008), change in HR was calculated as HR during image minus HR during 2 seconds prior to image (baseline); this was averaged for each valence category.
- RSA During Valence:** For the first five 60-second segments of the valence task, heart rate variability was extracted in the respiration frequency of 0.12 - 0.40 Hz, and the segments were averaged.
- SRS-2:** Total score and scores for Social Communication and Interaction (SCI) and Restricted and Repetitive Behaviors (RRB) were used.

RESULTS

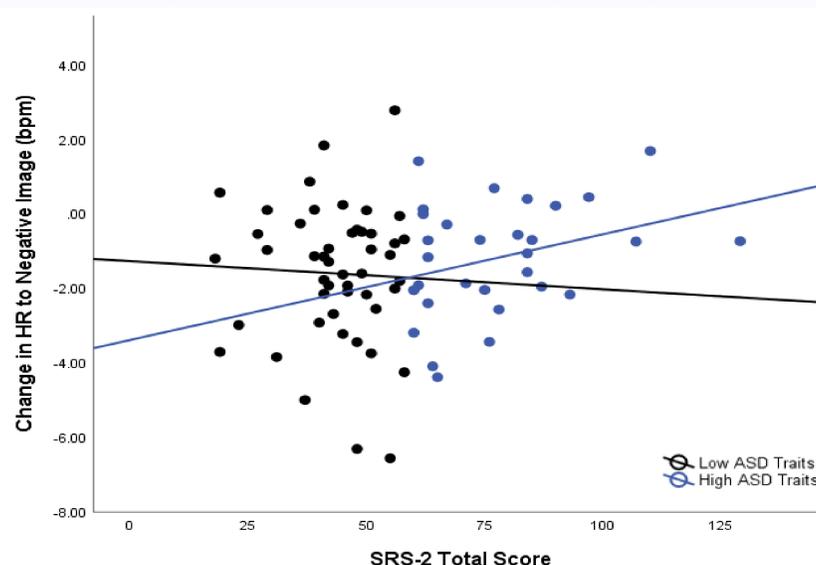
Effects of Valence on Change in Heart Rate

- Significant effect of image valence on change in HR found, $F(2,154) = 8.124$, $p < .001$, with greater HR deceleration to negative images as compared to positive and neutral ($ps < .01$).



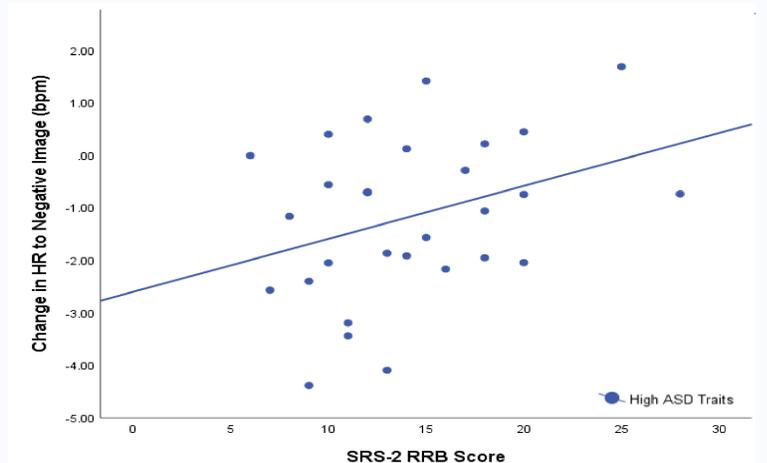
Correlations Between Cardiac ANS Activity and ASD Traits

- Correlations looked at change in HR to negative images and RSA in relation to SRS-2 scores, partialling out age (see Antelmi et al., 2004).
- The first analysis examined all subjects, and the second analysis divided participants based on SRS-2 cutoff scores (Low ASD Traits: T -score ≤ 59 , $n = 48$; High ASD Traits: T -score > 59 , $n = 30$).
- Full Sample**
 - No significant correlations were found between HR to negative images and SRS-2 scores or between RSA and SRS-2 scores ($ps > .15$).
- Groups with Low and High ASD Traits**
 - For the Low ASD Traits group, correlations between cardiac activity (HR to negative images and RSA) and ASD traits were non-significant ($ps > .2$).
 - For the High ASD traits group, a marginal positive correlation showed that greater HR deceleration to negative images was related to a trend towards decreased autism traits based on SRS-2 total score ($r(28) = .32$, $p = .085$, see below). No relation was found with RSA ($p = .139$).



RESULTS, continued

- In the High ASD Traits group, a trend towards greater HR deceleration to negative images relating to lower RRB scores was found ($r(28) = .344$, $p = .063$, see below). This trend was not seen for SCI scores ($p = .147$).



DISCUSSION

- Consistent with prior work by Bradley et al. (2008), we found greatest HR deceleration to negative images, which is posited to reflect parasympathetic responding.
- No relations between RSA and ASD traits were found in the current non-clinical sample. More work is needed to understand why different aspects of ANS functioning might relate to characteristics seen in individuals with ASD specifically, rather than varying with ASD traits in the broader population.
- In participants high on ASD traits, a trend was found for greater cardiac deceleration to negative images relating to less ASD traits, especially RRB. This suggests a link between greater parasympathetic activity and fewer RRB characteristics (see also Van Hecke et al., 2009).
- Future work will extend this work to examine relations between cardiac ANS during emotionally-salient images as it might relate to alexithymia (difficulty identifying and describing emotions) and emotion recognition abilities in the broader population.

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