Baseline Autonomic State Predictive of Social Responsiveness in Children with Autism Spectrum Disorders

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Introduction

- The Diagnostic and Statistical Manual for Mental Disorders-Fourth Edition outlines significant social impairments in Autism Spectrum Disorders (ASD), including a lack of spontaneous seeking to share enjoyment (DSM-IV; American Psychiatric Association, 2000).

- Polyvagal Theory (Porges, 2007): outlines a Social Engagement System that consists of interconnected cranial nerves that facilitate effective social engagement (i.e., through a soothed physiological state).

- This theory suggests that social dysfunction in ASD should be paired with physiological dysfunction (i.e., over-arousal).

- Prior research finds that children with ASD show an over-aroused, or fight-flight, state at baseline and to unfamiliar individuals (Bal et al., 2010; Vaughan Van Hecke et al., 2009).

Hypotheses:

- We predicted that an over-aroused baseline autonomic state (i.e., high heart rate and low heart rate variability) would be related to lower parent-reported social responsiveness.

- Further, we hypothesized that a lower baseline autonomic state (i.e., low heart rate and high heart rate variability) would be related to higher parent-reported social responsiveness.

Methodology

- Social Responsiveness Scale (SRS; Constantino, 2002): parents rated their child on the severity social impairment in the natural social setting (1 = never true to 4 = almost always true). The SRS measures social awareness, social cognition, social communication, social motivation, and autistic mannerisms. Total and subscale scores were used, with higher scores indicating more impairment.

- The study procedures outlined below are part of a larger study that is not described here.

- Procedure:
  - LifeShirt® attached to participant
  - 3-minute baseline video (watched while sitting)

Results

- Baseline HR significantly predicted total SRS score: $\beta = .46, t(16) = 2.09, p = .025$
- Higher HR was related to increased social dysfunction

- Baseline HRV significantly predicted total SRS score: $\beta = -.45, t(15) = -1.97, p = .034$
- Reduced HRV was related to increased social dysfunction

- One-tailed correlations for SRS subscales
  - Increased baseline HR -> more dysfunction in:
    - Social Motivation, $r(16) = .46, p = .030$
    - Social Cognition, $r(16) = .33, p = .089$
    - Autistic Mannerisms, $r(16) = .35, p = .075$

  - Decreased baseline HRV, more dysfunction in:
    - Social Cognition, $r(15) = -.33, p = .098$
    - Autistic Mannerisms, $r(15) = -.39, p = .062$

Conclusions

- Our hypotheses were supported: higher baseline HR and reduced HRV were related to impaired social responsiveness.

- In particular, social motivation, social cognition, and autistic mannerisms.

- Our results support the tenets of the Polyvagal Theory and its relationship to the Social Engagement System.

- Physiological dysfunction may be reflective of an overactive fight-flight state that can increase the likelihood of social difficulties in a child with ASD.

- Future studies should identify strategies to calm this over-aroused state to potentially improve social responsiveness.

Acknowledgement

Methodology

- LifeShirt®: an ambulatory physiology monitor used to measure heart rate (HR) and heart rate variability (HRV). The LifeShirt® is considered an accurate measure of R-R intervals and R-waves, both necessary in the calculation of HR and HRV (Heilman & Porges, 2007).

- Baseline video: National Geographic Animal Holiday, a nature video for 4-10 year olds. This video contained no people, language, or music.

Participants

- N = 19, 4-7 years old, prior diagnosis of ASD
- Autistic Disorder (n = 9), Asperger’s (n = 9), PDD-NOS (n = 1)

Conflict of Interest: None