Heart-rate variability during social and non-social videos in toddlers with varying levels of autistic traits

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Backround

- Previous research in school-aged children and adults suggests that autistic individuals show reduced heart-rate variability (HRV) during social tasks or video viewing, indicating attenuated parasympathetic regulation (Cheng et al., 2020).
- Autonomic differences may reflect diminished engagement with social stimuli which could be detected before the formal diagnosis of autism.

Objectives

- To investigate whether higher ADOS-2 scores in toddlers are associated with smaller differences in HRV towards videos depicting social and non-social content.
- Hypothesis 1: Toddlers with low ADOS-2 scores have higher vagal tone, indicated as higher HRV, during social videos than during non-social videos.
- Hypothesis 2: The difference between non-social conditions will diminish with increasing ADOS scores.

Gaze@Toddler study

- General population sample screened with M-CHAT-R/F at 18 months.
- This sample consisted of N = 86 screen positives (58 boys) and N = 29 screen negatives (15 boys).

Methods

- Autistic traits assessed with ADOS-2 Toddler Module at 18 months.
- Electrocardiogram (ECG) collected during video viewing task at 18 months. Videos (Figure 1) were presented in pseudo-randomized order interspersed among trials of two other tasks.

Figure 1. Example frames of the six video clips (each dur. ~40s) used in the study.

- HRV quantified with RMSSD (Root Mean Square of Successive Differences) and pRR20 (percentage of subsequent RR intervals differing by more than 20 ms) (Salahuddin et al., 2007).
- Mixed models applied with *lme4* package in *R* as RMSSD and pRR20 as the main outcomes, and ADOS-2 score, condition (social vs. non-social videos), and time (time since video onset) as main predictors.

Results

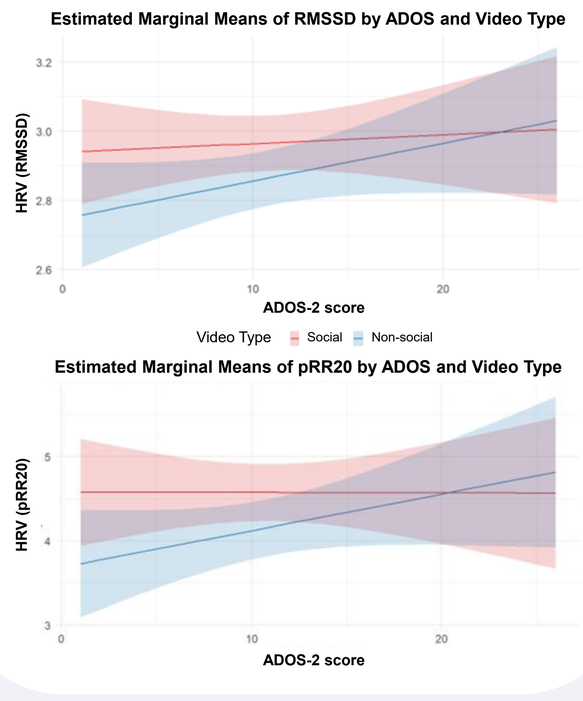
RMSSD:

- Main effect of condition: higher RMSSD during social videos
- Main effect of time: not significant
- Interaction between ADOS-2 scores and condition: difference in RMSSD between social and non-social videos diminished with increasing ADOS-2 scores (Figure 2)

pRR20:

- Main effect of condition: higher pRR20 during social videos
- Main effect of time: decrease of pRR20 across the task
- Interaction between ADOS-2 scores and condition: difference in pRR20 between social and non-social videos decreased with increasing ADOS-2 scores (Figure 2)

Figure 2. Mixed models showing the interaction effect between ADOS-2 scores and video condition on both HRV measures.



Conclusions

Social videos were associated with higher vagal tone indicated by both RMSSD and pRR20

The difference in HRV between social and non-social videos decreased as ADOS-2 scores increased.

Early autonomic response differences between social and non-social stimuli are attenuated in toddlers with elevated autistic traits.

References:
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