

Repetitive Behaviors and Parent-Child Biobehavioral Synchrony in Families of Children with Autism Spectrum Disorder

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INTRODUCTION

The theory of biobehavioral synchrony proposes that the marked predictive power of early parent-child reciprocity to important child outcomes likely lies in the manner with which this behavioral synchrony is aligned with relevant biological processes in each interactive partner (Feldman, 2012). These processes can include coordinated autonomic nervous system arousal, as indexed by electrodermal activity (EDA). Children with autism spectrum disorders (ASD) exhibit significant social, affective, and behavioral challenges, including restricted and repetitive behaviors (RRBs), which may disrupt parent-child interaction and the formation of synchrony. Indeed, preliminary analyses from the present sample validated the notion of biobehavioral synchrony in ASD by demonstrating high concordance between coordinated EDA and established observational measurement of behavioral synchrony (Baker et al., 2014). Furthermore, we found that children scoring higher on the restricted and repetitive behavior subscale of the Autism Diagnostic Observation Schedule (ADOS-2) demonstrated poorer EDA synchrony with their parents during unstructured play. Possible interpretations include: 1) that this relation is mediated by RRBs in the moment, such that RRB intrusions disrupt synchrony measurements in-time, 2) that the observed disruptions in synchrony are not simply an artifact of in-time RRBs, but rather result from a pattern of challenged interaction over time, or 3) that the causal direction is reversed such that higher biobehavioral parent-child synchrony is actually ameliorating RRB tendencies in children with ASD. For the present study, we updated the preliminary analyses with an expanded sample and developed an observational system for coding RRBs during play in order to determine the role that in-the-moment RRBs may or may not play in the link between parent-child EDA synchrony and restricted and repetitive behavior tendencies in the children with ASD.

RESEARCH AIMS

- To replicate findings from Baker et al. (2014) regarding the validity and importance of biobehavioral synchrony in children with ASD and their primary caregivers**
 - Biological synchrony (EDA) during a free play will correlate positively with observed behavioral synchrony
 - Biological and behavioral synchrony will relate to fewer child tendencies towards restrictive and repetitive behaviors (RRBs)
- To develop an observational system for coding RRBs during the free play in order to assess the potential for these in-the-moment behaviors to elucidate the association between synchrony and broader RRB tendencies.**

METHOD

Participants

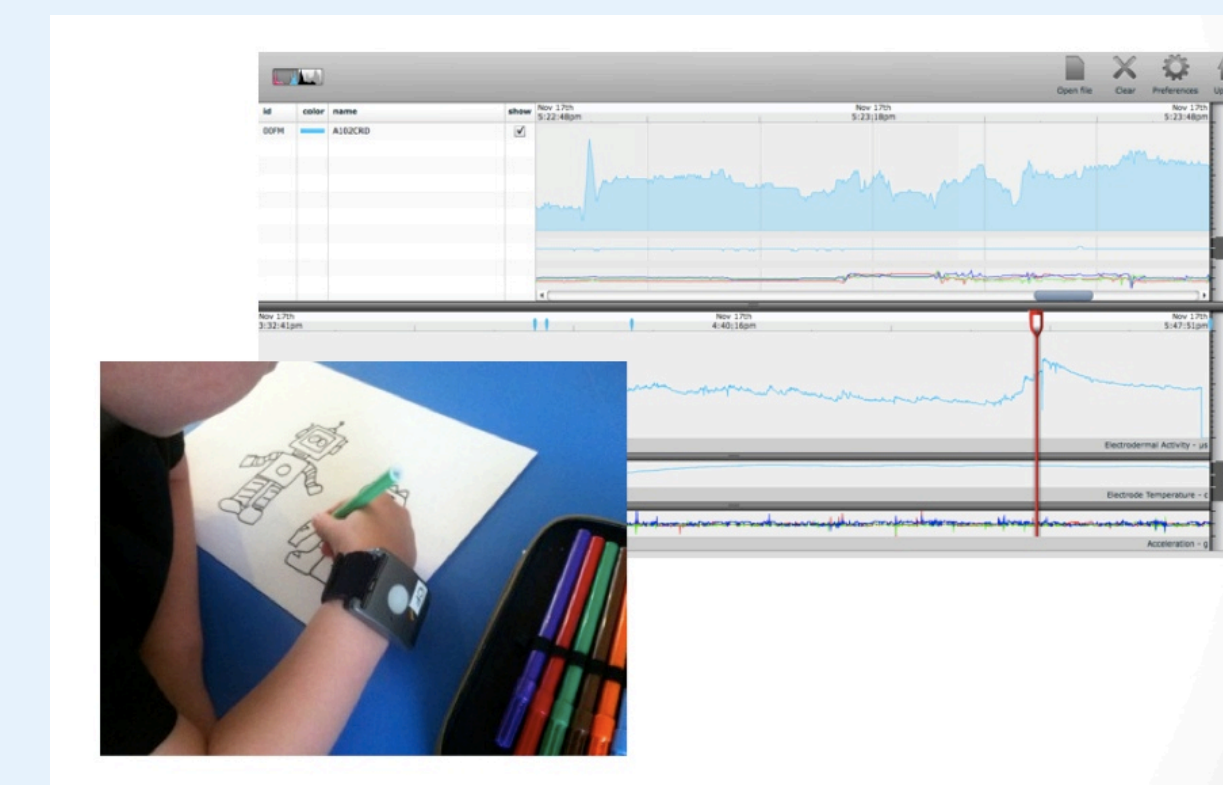
- 20 children aged 4 to 11 years (16 male; $M_{Age} = 6.36$; $M_{IQ} = 82.89$; $SD_{IQ} = 26.82$) and independently diagnosed with ASD participated with their primary caregivers (one father).
- Average annual household income was \$50,000 – \$70,000, 44% of the children were Caucasian, non-Hispanic, and 80% of mothers were married.

Procedures

- Laboratory visit that included a 5-minute parent-child free play and direct child assessment.
- Wireless, unobtrusive wrist sensors were worn by both children and their caregivers.

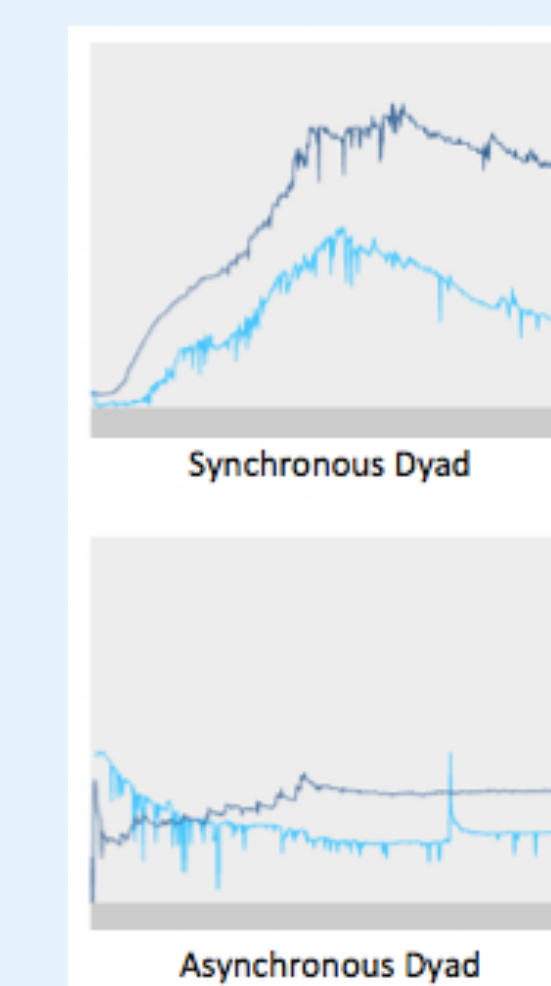
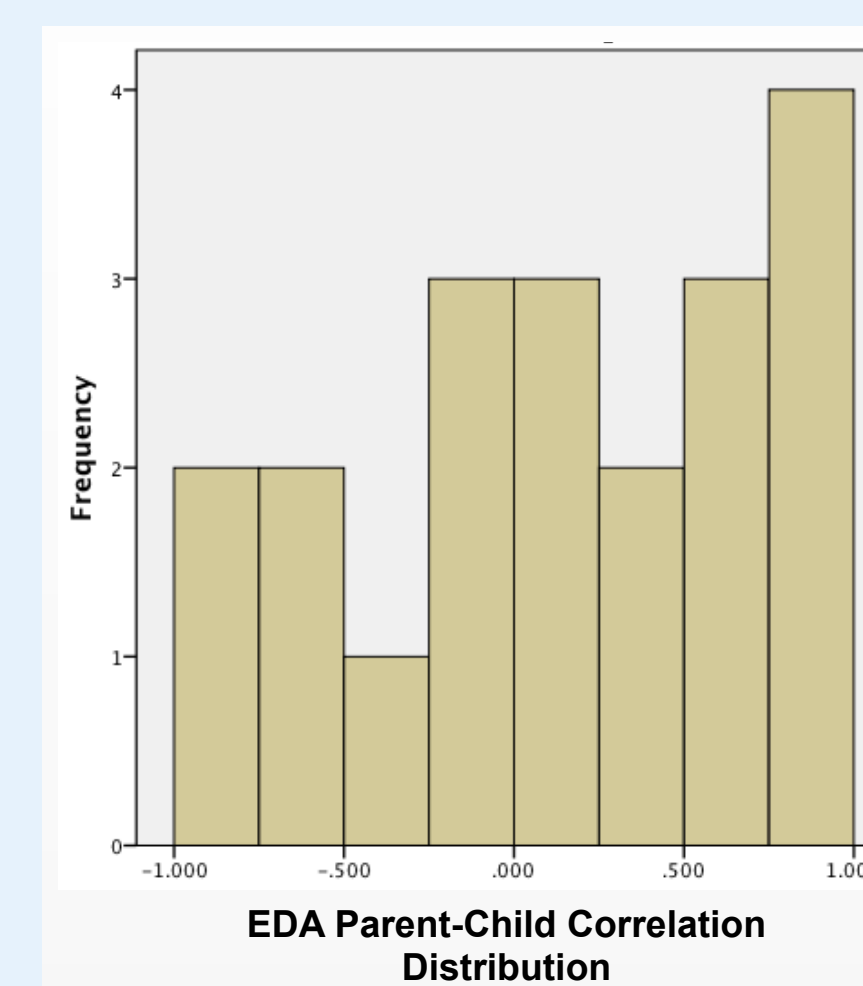
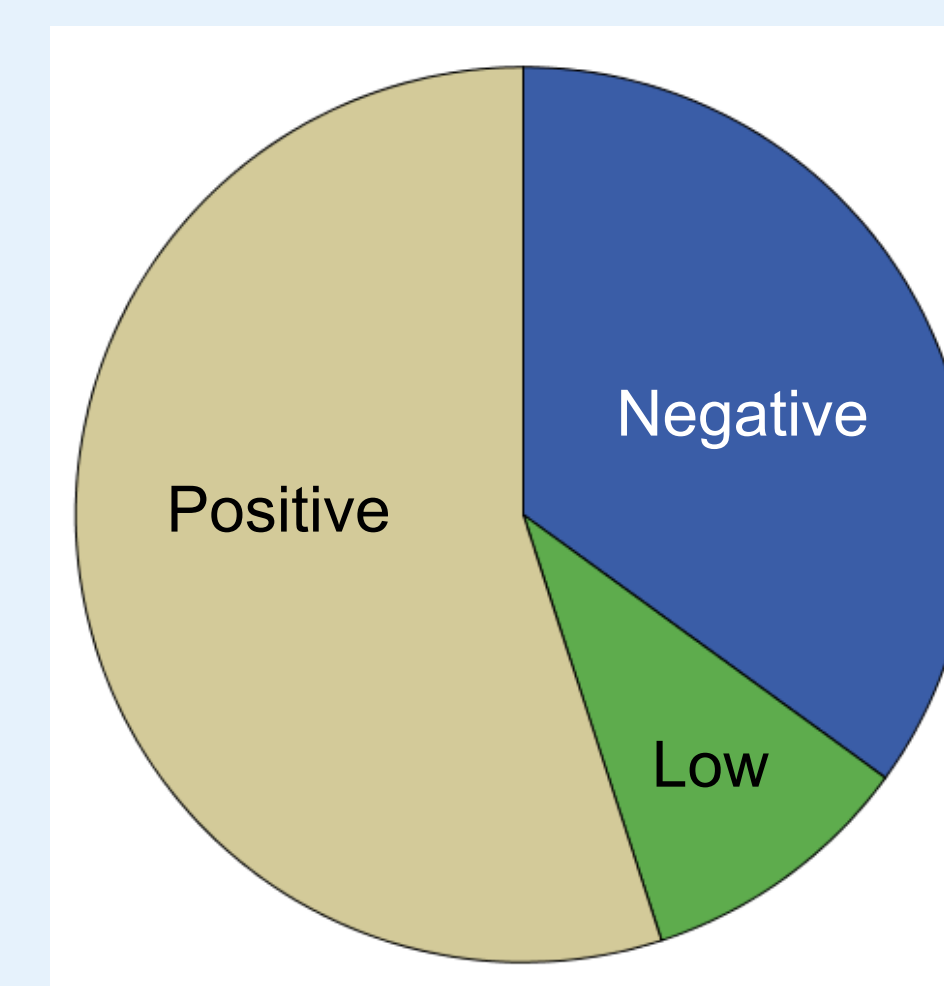
Measures

- Biological Synchrony** was indexed by the correlation between parent and child concurrent scores of electrodermal activity during the free play, recorded using wireless *Affectiva Q-Sensors* (Poh, Loddenkemper et al., 2010; Poh, Swenson, & Picard, 2010). Both parents and children wore sensors on a wrist and/or ankle. The sensors logged EDA scores in microsiemens each 8hz, which were aligned with task start and stop times for the Free Play task. Sensor movement and temperature, and children's age, sex, and race were unrelated to EDA, thus were not controlled.
- Behavioral Synchrony** was measured by with the Affective Mutuality observational scales developed by the NICHD Early Child Care Research Network (e.g., 1999), $ICC = .96$.
- Restrictive and Repetitive Behavior Tendencies** were assessed directly through the appropriate subscale of the Autism Diagnostic Observation Schedule-2 (ADOS-2; Lord et al., 2012), as performed by a licensed clinical psychologist trained in the system. Higher scores indicated more symptomatology.
- In-the-Moment Restrictive and Repetitive Behaviors** were measured during the free-play task using an observational system adapted for the present study from the *Repetitive Behavior Scale-Revised* questionnaire (Bodfish et al., 2000). The frequency of relevant behaviors were recorded and the total scores were used in analysis.
- Child IQ** was indexed with the Abbreviated IQ Battery of the Stanford-Binet 5 (Roid, 2003) as performed by a licensed child clinical psychologist. Child IQ was related to ADOS RRB scores, $r = -.47$, $p < .05$, but was unrelated to either form of synchrony.



RESULTS

- Heterogeneity in biological synchrony** was observed, with only approximately half of dyads exhibiting positive correlations.



- Evidence of biobehavioral synchrony** was suggested by a high correlation between biological and behavioral synchrony, $r = .50$, $p < .05$.
- Psychometric Support for the Observational RRB Scale.** Our newly developed scale evidenced strong inter-rater reliability, $ICC = .94$, and high convergent validity with the relevant scale from the ADOS-2, $r = .58$, $p < .01$.

Synchrony and Restrictive & Repetitive Behaviors

- Biological synchrony was significantly, negatively related to ADOS RRB tendencies, indicating that children with lower RRB tendencies exhibited more EDA synchrony with their parents.

	Bio. Synch.	Behav. Sync.	ADOS RRBs
Biological Synchrony	--		
Behavioral Synchrony	.50*	--	
ADOS RRB Tendencies	-.46*	-.28	--
In-Time RRBs	-.21	-.39+	.58**

The role of in-time RRBs

- A partial correlation suggested that in-the-moment RRBs did NOT account for the association between ADOS RRB tendencies and biological synchrony during the free play, $pr = .58$, $p < .05$.

CONCLUSIONS

- Evidence supports the notion of biobehavioral synchrony**, with a strong positive link between parent-child behavioral and biological synchrony.
- Biological synchrony demonstrated a clear link to restrictive and repetitive behavior (RRB) tendencies in children with ASD.**
 - In-the-moment child RRBs (as coded with a reliable and valid system) did NOT account for the association between RRB tendencies and disrupted biological synchrony, suggesting either that:
 - Disruptions in biological synchrony may represent the product of an interactive history between parent and child in which RRBs may have challenged interaction, or
 - Synchronous parent-child interaction may actually reduce RRB tendencies over time in children with ASD.
- Observed behavioral synchrony was not as strongly related to ADOS RRB tendencies; however, this type of synchrony seemed somewhat more tied to in-the-moment RRBs (at a trend level of significance).**

Key References

- Baker, J.K., Fenning, R.M., Howland, M., & Murakami, C. (2014, March). I second that emotion: Concordance and synchrony in physiological arousal between children with ASD and their parents. In A. Esbensen (Chair), *Expanding research on family environment: How, who, and when to measure*. Symposium presented at the 47th Annual Gattinburg Conference on Intellectual and Developmental Disabilities. Chicago, IL.
- Feldman, R. (2012). Biobehavioral synchrony: A model for integrating biological and microsocial behavioral processes in the study of parenting. *Parenting: Science and Practice*, 12, 154-164.