

Background

- Neural and autonomic regulatory processes have been linked to behavioral outcomes and psychopathology
 - It is necessary to study multiple emotional processing indexes (e.g., neural and autonomic) in order to gain a holistic understanding of relations between biological and perceived stress and behavior
- Parenting behaviors and parentings stress impact child emotional development (Steinberg & Darling, 2017)
 - There is a lack of research investigating parental regulation in parenting situations and whether regulatory abilities, as measured through biological constructs, may predict parenting stress
- Delta-beta coupling, or neural regulation, has been theorized to represent the functional interaction between cortical regulation and subcortical limbic activity at baseline (e.g., Phelps, Brooker & Buss, 2016) and during stress inducing tasks (e.g., Knyazev, 2007)
 - Coupling has been linked to increased anxiety in clinically anxious populations while coupling may represent adaptive regulation during stressful tasks for individuals low in anxiety symptoms (e.g., community samples; Poppelaars et al., 2018)
- Respiratory sinus arrhythmia (RSA) is thought to measure parasympathetic regulation at trait and state levels.
 - Decrease in RSA from baseline is thought to indicate one's ability to engage in effective regulation while in emotion eliciting contexts (e.g., Calkins, 1997; Porges, 2001)
 - Increase in RSA from baseline in low threat environments is thought to indicate less adaptive regulation
 - Less RSA suppression, or less decrease in RSA, in parents contexts has been related to lower levels of maternal sensitivity, or ability to detect what the child needs (Leerkes et al., 2015)

Aim 1: Longitudinally investigate the relation between maternal coupling measured in parenting contexts and parenting stress

Aim 2: Longitudinally investigate the relation between maternal RSA measured in parenting contexts and parenting stress

Method

Participants and Procedures:

- Mother-child dyads ($N = 51$) participated in laboratory visits at child ages 2 years and 4 years.

Age 2 Laboratory Visit

- Fear Eliciting Episode
 - Mothers wore a heart rate monitor as their child sat on their lap. A toy spider atop a remote controlled car approached the dyad twice and finally, the child was asked to touch the spider.
- Anger Eliciting Episode
 - Mothers wore a heart rate monitor and while their child played with a toy. Mothers were instructed at two time points to gently restrain their child's arms from playing with the toy for 30 seconds.
- Neutral Eliciting Episode
 - Mothers wore a heart rate monitor as their child participated in a snack delay task where the child was told to wait to take a snack until a bell was rung.
- Maternal RSA
 - Voltage values were visually inspected for artifacts and missing/extraneous beats in Mindware software.
 - RSA was calculated using Spectral Analysis to determine variability among interbeat intervals at the standard rate of respiration for adults (.12 - .40 Hz) for each of the parenting contexts.

Maternal Electroencephalography (EEG) Visit – 2 weeks post Age 2 visit

- Maternal Delta-Beta Coupling
 - A 5 minute, eyes-open/eyes-closed EEG baseline data was collected
 - Mothers were instructed to watch and listen to emotion eliciting clips (same fear, anger, and neutral episodes) from the age 2 visit
 - Delta (0.5-4 Hz) and beta (18-30 Hz) power were extracted for electrodes F3/F4 and the Pearson correlation between delta and beta for each electrode was computed. Correlations were then averaged across F3 and F4 (Phelps et al., 2016) for each emotion separately

Age 4 Parenting Stress

- Parenting Stress Index – Short Form (PSI-SF)
 - Mothers reported on their own own parenting stress on the Parenting Stress Index Childrearing Stress subscale (Haskett et al., 2006)
 - Example: Rate item on 1-5 scale indicating agreeance of statements such as “I feel trapped by my responsibilities as a parent.”

Results

	B	SE	β	t	p
Coupling in Neutral Episode	-.152	.281	-.077	-.540	0.592

	B	SE	β	t	p
Coupling in Anger Episode	-.229	.305	-.116	-.753	0.455
Child Gender	.106	.125	.131	.854	.397

	B	SE	β	t	p
Coupling in Fear Episode	-.248	.282	-.125	-.880	0.383

	B	SE	β	t	p
RSA in Neutral Episode	-.248	.282	-.125	-.880	0.383
Maternal Age	.022	.012	.264	1.835	.073

	B	SE	β	t	p
RSA in Anger Episode	-.119	.071	-.254	-1.661	0.103
Mother Age	.014	.013	.173	1.127	0.266

	B	SE	β	t	p
RSA in Fear Episode	.007	.054	.019	.136	0.893
Mother Age	.024	.012	.292	2.083	0.043

Figures 1-6. Maternal delta-beta coupling and RSA as measured during neutral, anger, and fear emotion eliciting episodes did not significantly predict parenting stress longitudinally.

Discussion

- **Maternal delta-beta coupling, or neural regulation, as measured while mothers watched their children in emotion eliciting episodes, did not significantly predict maternal parenting stress two years later.**
- **Contrary to hypotheses, neural regulation does not predict perception of parenting stress in this sample.**
- **Maternal respiratory sinus arrhythmia, as measured while mothers interacted with their children in emotion elicited episodes, did not significantly predict maternal parenting stress two years later.**
- **Again, contrary to hypotheses, it appears that autonomic regulation does not predict perception of parenting stress in this sample.**
- **Interestingly, maternal age positively related to maternal RSA, but not maternal delta-beta coupling. It is possible that maternal age plays an important role in understanding autonomic regulation and parenting outcomes.**
- **It is possible that measure of neural and autonomic regulation relate more significantly to parenting behaviors rather than perceived stress.**

Limitations and Future Directions:

- **Results will be investigated with a larger sample size as data collection is continuing.**
- **Participants were primarily middle-class, European Americans, and increasing diversity in the sample will provide insight to how these results may generalize.**
- **Future directions will include controlling for baseline delta-beta coupling and RSA.**
- **Future directions will include outcome variables of observed and self-reported maternal parenting behaviors.**