

**Adolescent Emotionality and Emotion Regulation in the Context of Parent Emotion Socialization  
Among Adolescents with Neurodevelopmental Disorders: A Call to Action with Pilot Data**

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### Abstract

To date, only three studies have examined the role of emotion socialization in the emotional functioning of youth with neurodevelopmental disorders. As such, this review article with pilot data sought to provide a call to action and first step in addressing this limited research body. Pilot data was collected with 18 adolescents ( $M_{age}=13.5$ ,  $SD=1.6$ ; 70% male) with a neurodevelopmental disorder and their primary caregiver. All adolescents were diagnosed with attention-deficit/hyperactivity disorder and displayed a range of comorbid disorders: autism spectrum disorder (27.8%), anxiety (66.7%), depression (44.4%), and disruptive behavior disorders (50%). Adolescents and caregivers completed a conflict discussion task while physiological, observational, and self-report measures of emotion socialization and emotional functioning were measured. Observed supportive parent emotion socialization behaviors were significantly associated with more observed adaptive emotion regulation strategies, and decreased observed and adolescent-reported negative affect, whereas non-supportive emotion socialization behaviors were associated with more observed negative affect and less observed adaptive emotion regulation strategies. Our pilot findings support growing research suggesting that adaptive parent emotion socialization practices can help foster less negative emotionality and better emotion regulation in youth with neurodevelopmental disorders. We make a call to action for more emotion socialization research focused on youth with neurodevelopmental disorders, and propose four important directions for future research: 1) Research examining emotion socialization behaviors during daily life, 2) Understanding the nuanced role of emotion socialization practices, 3) Considering diversity in emotion socialization practices with clinical populations, and 4) Longitudinal and intervention research studies.

Emotional functioning is critical for adolescent social, behavioral, and academic well-being (e.g., Laible et al., 2010). Emotional functioning is often divided into two components—**emotionality** (*the ease with which emotions are aroused and expressed*; Laible et al., 2010) and **emotion regulation** (ER; *subjective, physiological, and behavioral responses that vary in their intensity, escalation, and modulation to fit the situation*; Eisenberg & Spinrad, 2004). There is growing evidence that **youth with neurodevelopmental disorders** (i.e., disorders associated primarily with the functioning of the neurological system and brain) including attention-deficit/hyperactivity disorder (ADHD; Bunford et al., 2015; Graziano & Garcia, 2016) and autism spectrum disorder (ASD; Cai et al., 2018; Mazefsky, 2015) **experience extremes in emotionality and have significant ER difficulties**. In fact, ER difficulties are a **transdiagnostic feature among youth with neurodevelopmental disorders** (see England-Mason, 2020), with emotion dysregulation explaining some of the social, behavioral, and academic impairments observed in both youth with ADHD and ASD (e.g., Bunford et al., 2015; Cai et al., 2018). The developmental literature suggests that parents play a critical role in youth emotional functioning through emotion socialization practices (i.e., how parents model, discuss, and respond to emotions; Brand & Klimes-Dougan, 2010). However, only two studies of youth with ASD (Baker et al., 2019; Wilson et al., 2013) and only one study of youth with ADHD (Breux et al., 2018) have examined whether parental factors contribute to the negative emotionality and ER difficulties seen in these clinical populations. **In addition, there has been no research examining these links in adolescents with neurodevelopmental disorders, despite evidence suggesting that adolescence is a developmental period characterized by intense emotionality and emotion dysregulation** (Hollenstein & Lanteigne, 2018). As such, this manuscript provides a call to action, with pilot data that begins to address the gaps in the current limited literature.

### **The Role of Parent Emotion Socialization in the Emotionality and ER of Adolescents**

Parent socialization of youth's emotions and emotion-related behaviors includes a range of parenting behaviors such as expression/modeling of emotions, discussion of emotions, and reactions to youth's emotions (Eisenberg et al., 1998). The emotion socialization literature originated with preschool and middle childhood samples (e.g., Eisenberg et al., 1998; Gottman et al., 1997); as such, the majority of research has focused on these developmental periods.

However, over the past 15 years, there has been growing interest in parent emotion socialization during adolescence (see Brand & Klimes-Dougan, 2010). Parent reactions to adolescent emotionality are of particular salience. When parents respond to youth emotional displays, they can either encourage, coach, and facilitate problem-solving (referred to as supportive reactions) or discourage, dismiss, punish, or magnify the expression of emotion (referred to as non-supportive reactions). When parents frequently respond with supportive reactions that validate and legitimize adolescent's negative feelings, adolescents learn to manage emotions in a relatively regulated and constructive manner; in contrast, when parents frequently use non-supportive responses, their adolescents often develop inflexible, inconsistent, or unpredictable ways of experiencing emotion and have poor ER abilities (Brand & Klimes-Dougan, 2010).

Additionally, research suggests that emotion socialization practices are linked to ER abilities and social-emotional outcomes for adolescent clinical populations such as anxiety and depression (see Miller-Slough & Dunsmore, 2016). However, this has yet to be examined specifically among adolescents with neurodevelopmental disorders. Parent emotion socialization may have particular relevance for adolescents with neurodevelopmental disorders, who frequently experience extreme emotionality and emotion dysregulation (e.g., Bunford et al., 2015; Faraone et al., 2019) and may play a role in the etiology and maintenance

of their emotion dysregulation (Bunford et al., 2015). Only three published studies have examined the role of emotion socialization in the emotional functioning of children with neurodevelopmental disorders. Specifically, to date there are two publications with an ASD sample (Baker et al., 2019; Wilson et al., 2013) and one with an ADHD sample (Breux et al., 2018). The Wilson et al. (2013) study examined the role of emotion socialization in youth's emotionally driven externalizing behaviors in a sample of 66 children (22 with ASD) ages 3-6, and found that parents of children with ASD who were more supportive had children who displayed less emotionally driven externalizing behaviors. However, this study did not directly measure ER. The Baker et al. (2019) study examined emotion socialization (as measured by scaffolding and co-regulation during a laboratory task) among 46 children with ASD ages 4-11, and found the association between parent emotion socialization and youth ER was stronger for older children. Finally, the Breux et al., (2018) study found that among 61 children (23 with ADHD) ages 8-12, more frequent parent-reported supportive reactions predicted better parent-rated ER skills and normalized physiological reactivity specifically for children with high ADHD symptom levels. In addition, they found parent-reported non-supportive reactions predicted more parent-rated emotional lability for children with high ADHD symptoms.

### **Gaps in the Emotion Socialization Literature with Neurodevelopmental Disorders**

Despite being few in number, these three studies provide an important foundation for the critical role of parent emotion socialization in the emotional, social, and behavioral functioning of youth with neurodevelopmental disorders. However, these studies have a number of limitations: (1) limited use of multi-method assessment; (2) failure to consider the role of emotion socialization processes in adolescent emotional functioning; and (3) sample characteristics that limit generalizability.

Since emotionality and ER are multi-faceted constructs (Bunford et al., 2015; Ramos, & Mormède, 1997), a multi-method assessment is imperative. Although informant-report measures provide insight into perspectives of ER in general (i.e., over a variety of situations), they provide less insight into ER in specific situations that can be controlled or manipulated to elicit certain emotions. Less commonly used measures of emotionality and ER that address the limitations of informant-report are behavioral observations (e.g., Maedgen & Carlson, 2000; Melnick & Hinshaw, 2000) and physiological reactivity measures during laboratory tasks (e.g., Beauchaine et al., 2013; Lugo-Candelas et al., 2017; Musser et al., 2011). Observations can provide insight into how youth respond in frustrating or stressful situations. Similarly, physiological reactivity, such as autonomic nervous system (ANS) reactivity, plays a critical biological role in adaptive ER, with ANS reactivity during stress or conflict being interpreted as physiological manifestations of emotionality and emotion dysregulation (Murray-Close, 2013; Porges, 2011). Respiratory sinus arrhythmia (RSA) is a commonly used index of ANS activity, which measures vagal influence on the heart that reflects heart rate variability based on the respiratory cycle (Berntson et al., 1997). According to polyvagal theory (Porges, 2011), during a threatening or stressful event, decreases in RSA (termed RSA withdrawal, reflecting a decrease in vagal influence) facilitate mobilization of metabolic resources in support of effective coping and responding to the environment. For youth with neurodevelopmental disorders, some work suggests that they are less likely to display RSA withdrawal to stress (McQuade & Breaux, 2017) and have a pattern of inflexible RSA reactivity across tasks (Morris et al., 2019; Musser et al., 2011). Yet other work suggests that youth with ADHD may be characterized by over-reactivity as indicated by an exaggerated RSA withdrawal (Beauchaine et al., 2013; Ward et al., 2015).

Adolescence is an important developmental period to examine emotional functioning, as

this is when multiple psychological, neurophysiological, and social changes are occurring (e.g., Fuhrmann et al., 2016; Shulman et al., 2016). Despite this developmental period being characterized by extreme emotionality and emotion dysregulation (Hollenstein & Lanteigne, 2018), adolescents are expected for the first time to regulate their emotions without help (Bakracevic Vukman & Licardo, 2010). Given these shifts in emotionality, ER, and autonomy from childhood to adolescence, it is important to consider the implications of parent emotion socialization for the emotional functioning of adolescents with neurodevelopmental disorders.

Finally, the samples used in prior research limit the generalizability of conclusions. Specifically, two of the prior studies used predominantly white and middle to upper-class families (Breux et al., 2018; Wilson et al., 2013). Child samples also predominantly included mothers (Baker et al., 2019; Breux et al., 2018; Wilson et al., 2013). As such, it is critical that future samples studying emotion socialization practices are representative of the population from which they are drawn. In addition, two of the prior studies compared effects across children with and without a specific symptom presentation (Breux et al., 2018; Wilson et al., 2013). Given heterogeneity within, and frequent comorbidities across, neurodevelopmental disorders, studies that focus on differences in youth with versus without a neurodevelopmental disorder may fail to detect important factors that explain within-group differences.

### **Pilot Data to Begin Addressing These Gaps**

Additional work is clearly needed to examine the potential role of parent emotion socialization in the emotional outcomes of adolescents with neurodevelopmental disorders. Such research could provide direct insight into the benefit of parent-focused interventions for this at-risk clinical population. This has the potential to reduce the significant negative outcomes (e.g., Shaw et al., 2012) and societal costs (e.g., Doshi et al., 2012) associated with adolescents and

adults with neurodevelopmental disorders. As such, we conducted a pilot study in order to take a first step in addressing these three critical gaps in the literature. Specifically, we took a multi-method approach to examining the association between parent emotion socialization and adolescent emotionality and ER in a racially and socioeconomically diverse clinical sample of adolescents with a neurodevelopmental disorder. Observed parent emotion socialization, observed and self-reported adolescent negative state emotionality, and observed and physiological ER were measured during a conflict discussion task between the parent and adolescent. Consistent with prior research with children with neurodevelopmental disorders and polyvagal theory (Breux et al., 2018; Porges, 2011), it was hypothesized that observed supportive emotion socialization would be associated with less observed and self-reported negative emotionality and better adolescent ER, as indexed by use of adaptive ER strategies and RSA withdrawal. Non-supportive emotion socialization was hypothesized to be associated with more observed and self-reported negative emotionality and worse adolescent ER, as indexed by use of maladaptive ER strategies and RSA activation.

## Method

### Participants

Participants were part of an intervention study targeting emotion dysregulation and family conflict in adolescents with a neurodevelopmental disorder (Breux & Langberg, 2020); all data from the current pilot study came from the baseline assessment visit. Participants included 18 adolescents (70% boys) with ADHD (61.1% Predominately Inattentive Presentation, 38.9% Combined Presentation) and a range of comorbid disorders who were 11 to 16 years old ( $M = 13.5$ ;  $SD = 1.6$ ). Participants were racially diverse, with 55.6% identifying as Black, 38.9% identifying as white, and 5.6% identifying as bi- or multi-racial; 11.1% identified as Latinx. The



majority of adolescents were on ADHD medication (77.8%), and a minority were on medication for anxiety or depression (16.7%). Primary caregivers included 14 mothers, three fathers, and one grandmother ( $M_{age} = 46.71$ ,  $SD = 7.2$ , range = 33-61). The mean household income was \$64,400 ( $SD = \$37,700$ ; range = \$15,000-\$120,000), with 40% of families falling below the median family income for Richmond, Virginia (US \$38,000) and 40% of families having a two-parent household. Approximately half of the caregivers had a college degree or higher (53.9%).

Adolescents with ADHD with various comorbidities characterized by ER difficulties were included given the transdiagnostic role of ER (Beauchaine, 2015; McLaughlin et al., 2011) and theory suggesting that parent emotion socialization may underlie both ER difficulties and comorbidity in youth with ADHD (Steinberg & Drabick, 2015). As part of the larger study, a comprehensive psychodiagnostic evaluation to confirm ADHD diagnosis and to assess for and confirm comorbidity was conducted. The Children's Interview for Psychiatric Syndromes (ChIPS; Weller et al., 2000) was administered for all families by the principal investigator (first author). All adolescents met criteria for ADHD predominately inattentive or combined presentation based on the parent ChIPS interview using Diagnostic and Statistical Manual of Mental Disorders, 5th Edition criteria<sup>1</sup>. For comorbid disorders, if either the parent or adolescent endorsed clinically significant symptoms on the ChIPS, that disorder was considered to be present. Since the ChIPS does not assess for ASD, this diagnosis was assessed based on parent report and confirmed using the Checklist for Autism Spectrum Disorder interview (Mayes, 2012). All adolescents who met criteria for ASD based on this interview also had prior parent-

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<sup>1</sup> Parent and teacher ratings on the Vanderbilt ADHD Diagnostic Rating Scale (Wolraich et al., 2003) were also examined to confirm ADHD diagnoses; all included adolescents displayed clinical symptom levels based on either parent or teacher report.

reported diagnoses of ASD. High rates of comorbidity were observed: 50% had comorbid oppositional defiant disorder, 27.8% had an ASD, 66.7% had an anxiety disorder, 44.4% had a depressive disorder, and 5.5% had conduct disorder.

### **Procedure**

Additional information about study procedures and inclusion/exclusion criteria can be found at [Masked for Review]. Families were recruited between December 2018 and February 2019 via distribution of flyers, posting on clinicaltrials.gov, and emails to research participant databases and community clinic waitlists. Baseline visits were 2 hours long and consisted of administration of the ChIPS interview independently to parents and adolescents; parent and adolescent completion of questionnaires on the computer; adolescent completion of the cognitive test; and completion of the conflict discussion task. Families were compensated \$25 for their participation in the baseline visit. Study procedures were approved by the Virginia Commonwealth University Institutional Review Board and conducted in accordance with ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments. All parents and adolescents provided written consent and assent to participate, respectively at the onset of this baseline visit.

### **Measures**

**Conflict Discussion Task.** Parents and adolescents participated in a conflict discussion task adapted from Hersh and Hussong (2009). As an initial talking baseline, families were instructed to discuss a recent positive family experience for 3 min. Next, adolescents were instructed to share their perspective on a recent or ongoing parent-adolescent conflict. The dyad was instructed to discuss the conflict for 5 min, with parents instructed to respond how they normally would to help solve the conflict. Conflict discussions were videotaped for later coding,

with the examiners leaving the room during the discussions to provide privacy for the families and to reduce the possibility of families changing their behaviors due to being observed. The conflict discussion task was the last task of the baseline assessment visit; following the discussion, the principal investigator (first author) began a discussion with the family on how the intervention would address emotion dysregulation and family conflict and equip the family with strategies to discuss and problem solve through similar conflicts in the future.

**Observed Emotion Socialization.** The recorded discussions were coded using a system developed by Hersh and Hussong (2009) which captured parent emotion socialization behaviors: emotion-focused (empathy and validation of affect), problem-focused (targeting the stressor itself with questions and advice), minimizing (dismissing the affect or perspective as unimportant), punitive (blaming the adolescent for the affect or conflict); magnifying (intensifying adolescents' affect), autonomy-inhibiting (interfering with adolescents' independence in dealing with their affect or the conflict), and facilitative engagement (general sensitivity and responsiveness to adolescents' attempts to discuss their affect). Responses were coded on a 4-point scale representing an (1) absence, (2) minimal, (3) moderate, or (4) strong presence of the behavior. Given moderate to strong correlations between behaviors ( $r_s=.37-.73$ ) and to reduce the number of analyses and be consistent with other emotion socialization research (e.g., Fabes et al., 2001), responses were collapsed into supportive (emotion-focused, problem-focused, facilitative engagement) and non-supportive (minimizing, magnifying, autonomy inhibiting) reactions. Punitive reactions were coded but only occurred once in two families and thus were not included in the composite. Two independent coders rated all videos, with the 5 min task divided into 30 second epochs. Inter-rater reliability across the codes ranged from fair to almost perfect agreement (emotion focused: kappa = .55, problem focused: kappa = .27,

minimizing: kappa = .41, punitive: kappa = 1.00, magnifying: kappa = .30, autonomy-inhibiting: kappa = .27, facilitative engagement, kappa = .80). Coders included a graduate and undergraduate research assistant who were trained by and met weekly with the first author; coders were unaware of study hypotheses. Supportive and non-supportive reaction scores reflect average codes across the two reviewers averaged across the epochs.

**Adolescent-Reported State Negative Emotionality.** Following the completion of the conflict discussion task, adolescents rated how strongly they were feeling discrete negative emotions during the conflict discussion on a 7-point Likert scale ranging from 1 (*Not At All*) to 7 (*Very Much*). Adolescents rated four different emotions (anger, frustration, worry, and sadness), which were summed to create a composite of self-reported state negative affect (NA;  $\alpha = .89$ ;  $M = 7.50$ ,  $SD = 4.19$ ). As has been done in prior research (e.g., Breaux et al., 2018; Silk et al., 2012), the specific negative emotions assessed were chosen based on those that were expected to be most relevant for the task. Adolescents were provided with questions on a sheet of paper attached to a clipboard to provide privacy in answering.

**Observed Adolescent State Negative Emotionality.** Using a system for coding affect developed by Rolon-Arroyo et al. (2018), coders rated the frequency and intensity of observed adolescent NA (e.g., irritation, annoyance, frustration, sadness, and/or anger). NA was rated on both frequency and intensity, both on a 4-point Likert scale, with 1 representing *No instances of NA* for frequency and intensity and 4 representing *Very often expresses NA* for frequency and *Strong NA* for intensity. Using the same coding procedures described previously, observed NA was computed as the sum of the NA frequency and intensity averaged across the two raters (range = 2-8;  $M = 1.95$ ,  $SD = 0.55$ ), averaged across the 30 second epochs. Inter-rater reliability across reviewers was moderate, frequency: kappa = .47; intensity: kappa = .57.

**Observed Adolescent Emotion Regulation.** Using a coding system developed by Suveg et al. (2008), two independent coders rated adolescent ER strategies during the conflict discussion. In 30-second epochs, raters coded both *adaptive*, problem-solving strategies (e.g., use cognitive or behavioral strategies to constructively manage feelings) and *maladaptive* strategies (e.g., avoidance or distancing oneself from the situation, engaging in revengeful or other behaviorally or relationally aggressive strategies). Twenty percent of tapes were double coded for reliability purposes; inter-rater reliability was fair between reviewers for adaptive ( $\kappa=.33$ ) and maladaptive ( $\kappa=.35$ ) strategies. The adaptive and maladaptive ER strategies variables represent a count of the number of epochs where these ER strategies were used.

**Physiological Emotion Reactivity.** Adolescents' RSA reactivity during the family conflict discussion was assessed with an ambulatory physiology system (Biolog UFI 3991). RSA was assessed with an EKG: three electrodes were placed in a bipolar configuration on the left and right rib cage and the sternum. Interbeat intervals were extracted, and data was visually inspected and edited for movement or measurement artifacts using CardioEdit software to correct for outliers (Brain-Body Center, 2007). RSA was calculated in CardioBatch based on procedures outlined by Porges (1985). A frequency band consistent with the spontaneous respiration of adolescents (.12 to 1.00 Hz) was used to control for spontaneous breathing. Amplitude of RSA was calculated based on the natural logarithm of the variances of 30-second epochs, which were averaged. RSA is reported in  $\ln(\text{ms})^2$  units. To examine changes in RSA in response to the conflict discussion, the difference between adolescent's RSA arousal during the 5 min conflict task was compared to their arousal during a 3 min discussion of a recent positive family

experience, which served as a talking baseline<sup>2</sup>. RSA-reactivity was calculated as the difference between baseline arousal and arousal during the conflict discussion (reactivity = task arousal – baseline arousal). Positive RSA-reactivity values indicate an increase in RSA activity (*RSA activation*) and negative values indicate a decrease in RSA activity (*RSA withdrawal*).

### **Analytic Plan**

Independent sample *t*-tests were run to compare adolescents with and without various comorbidities (i.e., adolescents with and without ASD, oppositional defiant disorder/conduct disorder, or depression/anxiety diagnosis). Additionally, paired sample *t*-tests were used to compare parental use of supportive and non-supportive practices, adolescent use of adaptive and maladaptive ER strategies, and change in RSA from baseline to during the conflict discussion. Descriptive statistics and correlations between study variables and demographic variables were then examined. Next, a series of regression analyses were conducted in Mplus version 8.4 (Muthén & Muthén, 1998-2019) using maximum likelihood estimation with robust standard errors (MLR) to examine if parent emotion socialization was associated with adolescent negative state emotionality and ER, controlling for any relevant demographic variables. Given that baseline physiological arousal is systematically related to reactivity (Graziano & Derefinko, 2013), baseline RSA prior to the task was included as a covariate in relevant models. All analyses were run both with and without medication for ADHD or anxiety/depression included as covariates. As the pattern of significant results remained consistent with or without medication statuses included as covariates, these variables were not included to reduce the number of

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<sup>2</sup> A resting baseline was also collected prior to the talking baseline. The pattern of results was the same regardless of if the resting or talking baseline was used. The talking baseline was used as it is most analogous to the conflict discussion task where reactivity was measured.

coefficients and possibility of Type I Error. Unstandardized and standardized coefficients are presented; standardized coefficients can be interpreted such that .1 = weak, .3 = moderate, and .5 = strong associations. Complete observational and self-report data was available for all participants; psychophysiological data for two participants was unusable due to equipment failure and was estimated using MLR. Given the small sample size and that adolescent medication status and comorbidities may also influence study variables, follow-up tests of robustness were also run with medication status (ADHD or depression/anxiety medication) or comorbidity (internalizing disorders, externalizing disorders, or ASD) included as a covariate.

### Results

No significant differences between adolescents with and without specific comorbidities emerged on any study variable ( $ps > .087$ ). Parents were observed to use more supportive ( $M = 2.32$ ,  $SD = 0.43$ ) than non-supportive ( $M = 1.58$ ,  $SD = 0.34$ ) reactions on average during the conflict discussion task,  $t(17) = 5.02$ ,  $p < .001$ . There was not a significant difference in adolescents observed use of adaptive ( $M = 2.69$ ,  $SD = 2.18$ ) and maladaptive ( $M = 3.22$ ,  $SD = 2.13$ ) ER strategies,  $t(17) = -.73$ ,  $p = .476$ . Participants demonstrated a significant decrease in RSA from baseline to the conflict task,  $t(17) = 3.17$ ,  $p = .006$ , suggesting that, on average, adolescents evidenced physiological reactivity reflected in RSA withdrawal; this is also reflected in the negative mean for RSA-reactivity ( $M = -0.51$ ,  $SD = 0.68$ ).

Correlations between demographics, comorbidities, and study variables are presented in Supplemental Table 1. ADHD and depression/anxiety medication status were not significantly related with any study variable, but displayed moderate correlations with study variables. Similarly, comorbid internalizing, externalizing, and ASD were not significantly related with study variables, but displayed moderate correlations. The only demographic variables to display

significant correlations with study variables were adolescent sex and family income, with parents observed to use more non-supportive reactions with daughters than sons and parents with higher family incomes observed to use more supportive reactions with their adolescents. As such adolescent sex and family income were included as covariates in all main analyses.

Supportive reactions displayed a moderate, negative, but non-significant correlation with non-supportive reactions. Adaptive ER strategies and RSA reactivity displayed a significant, moderate negative relation such that individuals who used more adaptive ER strategies displayed greater RSA withdrawal. In contrast, a weak, non-significant correlation was found between adolescent maladaptive ER strategies and RSA reactivity. A significant, strong positive correlation was found between observed and self-reported NA, and between supportive reactions and adolescent adaptive ER strategies. A strong negative correlation was found between supportive reactions and adolescent-reported state NA. A moderate, non-significant negative correlation was found between supportive emotion socialization and observed NA.

Consistent with our hypothesis that supportive behaviors would be associated with less negative state emotionality and better ER, more observed supportive emotion socialization behaviors were significantly associated with less adolescent-reported and observed NA and use of more adaptive ER strategies (Table 1), with moderate to large effects observed ( $|\beta|s = .49-.66$ ). Additionally, observed parent use of more non-supportive emotion socialization behaviors was significantly related to more observed NA and use of less adaptive ER strategies (Table 2), with moderate to large effects observed ( $|\beta|s = .49-.51$ ). In contrast to our hypotheses, supportive reactions were not significantly associated with observed maladaptive ER strategies or RSA reactivity (Table 1), and non-supportive reactions were not significantly related with adolescent-reported NA, observed maladaptive ER strategies, or RSA reactivity (Table 2). Follow-up tests



of robustness were run with medication status or comorbidity variables added as a covariate in the three models with significant findings. All significant findings remained, and in some cases were strengthened, when each relevant covariate was included in analyses ( $ps = .002-.041$ ).

### Discussion

Parent emotion socialization likely has particular relevance for youth with neurodevelopmental disorders, given the extreme emotionality and emotion dysregulation that can be observed in this population (e.g., Bunford et al., 2015; Faraone et al., 2019). Despite this, only three studies to date have examined these relations in youth with ADHD or ASD (Baker et al., 2019; Breaux et al., 2018; Wilson et al., 2013), and none have examined these relations in adolescence. This pilot study takes a first step at examining the relation between parent emotion socialization and adolescent emotionality and ER in a diverse sample of adolescents with ADHD with a broad range of comorbidities, utilizing a multi-method assessment of emotional functioning. Multiple significant relations were found between parent emotion socialization and adolescent emotionality and ER, underscoring the importance of considering parent effects on the emotional outcomes of adolescents with neurodevelopmental disorders. We briefly review these preliminary findings, prior to providing a call to action for more research in this area.

Results suggest that parents who used more frequent supportive practices had adolescents who had lower self-reported and observed negative emotionality and were observed to use more adaptive ER strategies during the conflict discussion. In contrast, parents who were observed to use more non-supportive emotion socialization behaviors had adolescents who were observed to display more negative emotionality and used less adaptive ER strategies. Together, the present findings support the importance of parent emotion socialization in understanding negative emotionality and ER in adolescents with neurodevelopmental disorders, and suggest that

interventions targeting adaptive parent emotion socialization in these populations (Breux & Langberg, 2020; Chronis-Tuscano et al., 2016; Herbert et al., 2013) are a promising avenue to continue exploring. Unfortunately, only one intervention study to date has focused on parent emotion socialization and youth ER abilities in an adolescent sample of youth with ADHD (Breux & Langberg, 2020), and no study has explored if improvements in parent emotion socialization directly lead to improvements in adolescent ER.

Although this pilot study provides initial evidence that parent emotion socialization is important for adolescents with neurodevelopmental disorders, findings should be interpreted within the context of several limitations. First, our small sample limits the power and potential generalizability of the findings. Relatedly, given the sample size, we were unable to examine moderation effects by factors such as adolescent or parent sex, age, family race/ethnicity, or socioeconomic status, which is critical given prior evidence of differences in emotion socialization based on these demographic factors (e.g., Klimes-Dougan et al., 2007; Lugo-Candelas et al., 2015). Additionally, given the small sample size and limited power, we were not able to adjust for possible Type I Error. To reduce the possibility of this, we used supportive and non-supportive composites, focused only on interpreting coefficients for the main study variables, and only included relevant covariates in main analyses. Second, and related to sample characteristics, although our ADHD diagnoses were comprehensively provided, comorbid conditions were assessed based on parent and adolescent report on interviews. Disorders such as ASD are typically assessed via a comprehensive developmental interview and semi-structured observations; as such, it will be important for future research to include more rigorous procedures for assessing comorbidity and to include a broader sample of youth with neurodevelopmental disorders. Third, our observational data are nested within parent-adolescent

dyads; given the small sample size, we were unable to control for the nesting of adolescents within parent-adolescent dyads. It will be important for future research with larger samples to examine intra-class correlations between parents and adolescents to determine the proportion of variance at the dyad level. Related to our measures, although observational measures of emotion socialization hold strength over parent or adolescent-report measures, it is possible that the way parents and adolescents acted and responded in the conflict discussion may have been influenced by the fact that this discussion was being recorded and took place in a laboratory environment. Although the conflict discussion approximates discussions in daily life, this task may not fully capture the range and intensity of adolescent NA or parent emotion socialization practices (Gardner, 2000). Additionally, as the coded emotion regulation strategies were added for the current study (as opposed to emotion socialization and NA, which were coded for the larger study), only 20% of discussions were coded by two raters. Fourth, although we used a self-reported emotionality measure similar to what has been done in other prior research (e.g., Breaux et al., 2018; Silk et al., 2012), our measure of self-reported state NA is not a validated measure such as the Positive and Negative Affect Scale for Children (Laurent et al., 1999). Fifth, many factors can influence RSA (e.g., caffeine use, physical activity); we did not collect data on these measures and thus could not account for any noise they may have introduced to the data. Finally, as this study is cross-sectional in nature, directionality cannot be determined.

### **Call to Action for More Emotion Socialization Research with Youth with Neurodevelopmental Disorders**

The results of this pilot study highlight the potential critical importance of parent emotion socialization for the emotional development of youth with neurodevelopmental disorders, and the need for more research. Youth with neurodevelopmental disorders often

experience extreme emotionality and emotion dysregulation (e.g., Bunford et al., 2015; Faraone et al., 2019), with such difficulties in emotional functioning being linked to the functional impairments observed in this clinical population (e.g., Bunford et al., 2020; Cai et al., 2018). From a clinical standpoint, it is important to understand malleable factors that may lead to less negative emotionality and better ER abilities. The larger parenting literature suggests that parents play a critical role in adolescent's emotional functioning through their use of emotion socialization practices (Brand & Klimes-Dougan, 2010). The present pilot study, and the three prior studies that have examined the role of parent emotion socialization in the emotional development of youth with neurodevelopmental disorders, provide an important foundation; however, many gaps in this literature remain. As such, we offer four directions for future emotion socialization research with youth with neurodevelopmental disorders.

**1) Research Examining Emotion Socialization Behaviors during Daily Life.** The majority of emotion socialization research has largely relied on informant report (via rating scales or interviews), which are limited by social desirability or other possible informant biases. Observational measures during lab tasks, such as was used in this pilot study, provide more insight into behaviors seen in daily life relative to informant report measures. However, observational measures are still susceptible to the Hawthorne Effect (i.e., changing behavior when they know they are being observed) and may present a reduced variability of true emotion socialization behaviors and emotionality. These limitations underscore the importance of multimethod assessment. Additionally, they highlight the need for future research to examine parent emotion socialization using recorded interactions that take place naturalistically in the home environment, or using parent and adolescent report via ecological momentary assessment in daily life. This will be particularly important to capture parental responses in the heat of an

emotional or conflictual situation. There is some evidence that observations in a naturalistic setting may lead to the presence of more non-supportive practices being observed. For example, when families were sent home with a cassette player to record interactions during challenging times, parents were observed to display more non-supportive reactions than supportive reactions (Lugo-Candelas et al., 2015). This finding stands in contrast to the majority of emotion socialization research, including results from this pilot study, finding that parents report using (e.g., Silk et al., 2012; Warren & Stifter, 2008) and are observed using (e.g., Hersh & Hussong, 2009; Warren & Stifter, 2008) more supportive than non-supportive practices.

**2) Understanding the Nuanced Role of Emotion Socialization Practices.** Although the majority of research suggests that, on average, supportive parent emotion socialization is associated with better emotional functioning and non-supportive emotion socialization is associated with worse emotional outcomes (e.g., Breaux et al., 2018; Eisenberg et al., 1998; Gottman et al., 1996; Hurrell et al., 2015; Morris et al., 2020; Ramsden & Hubbard, 2002), these relations are likely much more nuanced, especially in the adolescent developmental period. Specifically, non-supportive reactions such as minimizing or not responding may be appropriate, especially among youth with neurodevelopmental disorders who often have frequent highly reactive responses. It will be critical for future research to explore under what circumstances it may be helpful for parents to minimize or ignore an emotion, and when it may be potentially problematic to give attention to the emotion by validating and encouraging discussion and problem solving, and if these findings differ among youth with various neurodevelopmental disorders (e.g., ADHD vs. ASD). Such nuances likely also differ across developmental periods. For example, relative to younger children who may be particularly distressed by parents dismissing their emotions or blaming them, adolescents may have the cognitive ability to

recognize and take ownership in cases where this may be true. Anecdotally, some support for this notion was observed in some of the conflict discussions in the current pilot study, where the parent would engage in what would be considered blaming the adolescent (a non-supportive reaction), and the adolescent would in fact recognize their role in the conflict and often seem to accept this rather than become upset/distressed by this response. Similarly, although these pilot data and prior research provide insight into the associations between parental emotion socialization and youth emotional functioning, they do not consider the transactional processes of social interactions that are critical to understand contingencies between parents and youth with neurodevelopmental disorders (Bakeman & Gottman, 1997). As such, future research should focus on such transactional processes; for example, through the use of timed event sequential data, which allows for investigation of the extent to which parents versus youth lead and respond to the other, better capturing the complexity of real-life interactions. Time-window sequential analyses could capture the timing of interactions at a microanalytic level, permitting stronger inferences about temporally causal relations (Bakeman & Quera, 2011).

### **3) Considering Diversity in Emotion Socialization Practices with Clinical**

**Populations.** This pilot study sought to be a first step at addressing limitations regarding generalizability of findings on parent emotion socialization and emotional functioning of youth with neurodevelopmental disorders by including a diverse and representative sample.

Specifically, our participants had a range of racial and ethnic identities, came from a range of socioeconomic statuses based on parent education, family income, and two-parent status, and displayed a range of comorbidities consistent with what is the norm for adolescent ADHD samples (Becker & Fogleman, 2020). Although we attempted to have representation of various caregivers, 77.8% were mothers, underscoring the importance of research specifically recruiting

the involvement of fathers or other caregivers. Unfortunately, our sample size precluded the examination of differences based on these various relevant demographic factors. Within the larger emotion socialization literature, there is limited but growing evidence of differences in emotion socialization practices based on parent biological sex (e.g., Brand & Klimes-Dougan, 2010; Klimes-Dougan et al., 2007), family socioeconomic status (e.g., Chaplin et al., 2010), and family race/ethnicity (e.g., Keller & Otto, 2009; Lugo-Candelas et al., 2015; Morelen et al., 2013). However, to our knowledge, only one study has examined such aspects of diversity within a sample of preschoolers at-risk for neurodevelopmental disorders (Lugo-Candelas et al., 2015). These researchers found that Latina mothers were more likely to minimize child negative affect but that this did not result in negative ramifications for their children (Lugo-Candelas et al., 2015). As such, it is critical for future research to consider demographic and cultural differences that may influence emotion socialization practices and related outcomes for youth with developmental disorders. Additionally, future research should conduct comparisons of the relation between emotion socialization practices and emotional outcomes among youth with neurodevelopmental disorders relative to youth with other mental health disorders (e.g., anxiety, depression). Such research could provide important insight regarding to what extent these processes are transdiagnostic versus unique to clinical presentations. To conduct this research, it will be critical for researchers to consider how the nuanced role of parent emotion socialization (discussed above) may differ across clinical populations. For example, it could be that non-supportive practices may actually be appropriate at times for youth with neurodevelopmental disorders who are often overly reactive, versus youth with depression who often display blunted reactivity. Additionally, differences may exist among various neurodevelopmental disorders. This area of research has significant clinical importance regarding personalized interventions.

**4) Longitudinal and Intervention Research Studies.** As this is the first study to examine parent emotion socialization practices among adolescents with neurodevelopmental disorders, it is currently impossible to discuss potential developmental differences in these relations. Longitudinal research with multiple assessments over time is needed to see how parent emotion socialization and youth emotional development may shift over time among this clinical population. Only one emotion socialization study to date with youth with neurodevelopmental disorders was longitudinal in nature (Breux et al., 2018); however, this study included only a 1-year follow-up and did not assess initial levels of child ER, precluding examination of changes over time. Perhaps of even more importance, will be utilization of intervention research that examines how changes in parent emotion socialization relate to changes in youth emotionality and ER over time. The intervention study that these pilot data come from found that both parent emotion socialization and adolescent ER improved following completion of the intervention based on observational data and parent, adolescent, and clinician report (Breux & Langberg, 2020). However, given the sample size of the pilot study we could not examine whether change in parent emotion socialization predicted change in adolescent ER. Future intervention research examining this question is a logical next step.

In conclusion, this review article and call to action with pilot data provides a first step in understanding the potential critical importance of parent emotion socialization for the emotional development of adolescents with neurodevelopmental disorders using a multi-method assessment and a diverse clinical population. These findings extend the limited parent emotion socialization research with children with neurodevelopmental disorders. Our call to action provides four suggestions for future research directions in this area.



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Table 1

*Supportive Parental Emotion Socialization Practices and Adolescent Emotionality and Emotion**Regulation*

	<i>b</i>	<i>SE</i>	$\beta$	<i>p</i>	<i>R</i> <sup>2</sup>
Adolescent-Reported Negative Affect					
Adolescent sex	-2.02	2.23	-.23	.380	.05
Family income	0.02	0.02	.19	.369	
Supportive emotion socialization	-6.64	1.97	-.69	.005	
Observed Negative Affect					
Adolescent sex	-0.15	0.65	-.05	.824	.19
Family income	0.02	0.01	.42	.096	
Supportive emotion socialization	-1.50	0.66	-.49	.038	
Observed Adaptive ER Strategies					
Adolescent sex	0.50	1.09	.11	.656	.16
Family income	0.02	0.01	.41	.112	
Supportive emotion socialization	3.34	0.94	.66	.003	
Observed Maladaptive ER Strategies					
Adolescent sex	-1.07	1.07	-.24	.331	.16
Family income	0.02	0.01	.27	.331	
Supportive emotion socialization	-0.39	1.27	-.08	.764	
Respiratory Sinus Arrhythmia-Reactivity					
Baseline respiratory sinus arrhythmia	-0.31	0.14	-.49	.046	.39
Adolescent sex	-0.18	0.29	-.03	.538	
Family income	0.00	0.00	-.01	.976	
Supportive emotion socialization	-0.55	0.36	-.35	.154	

*Note.* ER = emotion regulation. Adolescent sex coded: male = 0, female = 1.

Table 2

*Non-Supportive Parental Emotion Socialization Practices and Adolescent Emotionality and Emotion Regulation*

	<i>b</i>	<i>SE</i>	$\beta$	<i>p</i>	<i>R</i> <sup>2</sup>
Adolescent-Reported Negative Affect					
Adolescent sex	-2.58	2.41	-.30	.301	.05
Family income	-0.00	0.03	-.04	.893	
Non-supportive emotion socialization	2.37	3.41	.19	.498	
Observed Negative Affect					
Adolescent sex	-0.63	0.60	-.23	.314	.19
Family income	0.01	0.01	.35	.124	
Non-supportive emotion socialization	1.99	0.85	.51	.035	
Observed Adaptive ER Strategies					
Adolescent sex	1.27	1.04	.28	.244	.16
Family income	0.03	0.01	.48	.046	
Non-supportive emotion socialization	-3.17	1.47	-.49	.049	
Observed Maladaptive ER Strategies					
Adolescent sex	-1.54	1.12	-.35	.191	.16
Family income	0.01	0.01	.22	.377	
Non-supportive emotion socialization	1.92	1.58	.30	.245	
Respiratory Sinus Arrhythmia Reactivity					
Baseline respiratory sinus arrhythmia	-0.41	0.14	-.64	.012	.39
Adolescent sex	-0.15	0.34	-.10	.671	
Family income	0.00	0.00	.08	.720	
Non-supportive emotion socialization	0.06	0.47	.03	.904	

*Note.* ER = emotion regulation. Adolescent sex coded: male = 0, female = 1.