Research in Autism Spectrum Disorders 91 (2022) 101911

Contents lists available at ScienceDirect

Research in Autism Spectrum Disorders

journal homepage: www.elsevier.com/locate/rasd

Emotion dysregulation in children with autism: A multimethod investigation of the role of child and parent factors

Annie S. Mills [a], Paula Tablon-Modica [a], Carla A. Mazefksy [b], Jonathan A. Weiss [a,*]

[a] Department of Psychology, York University, 4700 Keele Street, Toronto, M3J 1P3, Canada
[b] Department of Psychiatry, University of Pittsburgh, USA

ARTICLE INFO

No. of reviews completed is 3

Keywords:
Autism
Emotion regulation
Parents
Mental health

ABSTRACT

Background: Children with autism have been found to experience greater difficulties with emotion regulation than peers without autism. Characteristics related to autism (i.e., social communication challenges, restricted repetitive behaviours, inhibitory control difficulties) and external parent factors (i.e., parent stress, mindful parenting) have been suggested to contribute to the emotion dysregulation (ED) experienced by youth with autism.
Method: The current study evaluated associations between child and parent factors and two indices of child ED (parent report and observational behaviour coding), in 44 children with autism, ages 8–13 years.
Results: Child autism symptomology, inhibitory control difficulties, parental stress and mindful parenting were all associated with parent reported ED, but not with observed ED. Similarly, linear regressions revealed that these factors jointly predicted parent reported ED, but not observed ED. Restricted interests/repetitive behaviours and inhibitory control difficulties emerged as unique positive predictors of parent reported ED.
Conclusions: Findings highlight the importance of using a multimethod approach and of considering child- and parent-level factors when investigating ED in children with autism.

1. Introduction

Children with autism often experience co-occurring depression, anxiety, or anger as a result of difficulties with emotion regulation (Cai et al., 2018), with many meeting criteria for at least one co-occurring mental health disorder (Salazar et al., 2015). Emotion regulation is described as "the extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, especially their intensive and temporal features, to accomplish one's goals" (Thompson, 1994, pp. 27–28). Difficulty employing these processes leads to emotion dysregulation (ED; Weiss, Burnham Riosa, Mazefsky, & Beaumont, 2017), which can present as tantrums, outbursts, and sustained negative responses (Samson et al., 2014). For children with autism, ED is particularly salient during frustrating situations, where they are noted to demonstrate greater negative affectivity, more venting, and more avoidance behaviours than peers without autism (Jahromi et al., 2012; Samson et al., 2015). More recently, Northrup et al. (2020), conducted a study of observed ED (observed negative affect and recovery from negative affect) in psychiatrically hospitalized youth with autism. During a set of frustrating tasks, they found that age was negatively associated with mean negative affect, while adaptive functioning and verbal ability were negatively associated with both mean negative affect and emotional recovery (return to baseline

* Corresponding author.
E-mail address: jonweiss@yorku.ca (J.A. Weiss).

https://doi.org/10.1016/j.rasd.2021.101911
Received 10 June 2021; Received in revised form 23 December 2021; Accepted 23 December 2021
Available online 18 January 2022

emotional state following a frustration task), suggesting that different child characteristics may differentially contribute to ED. Gaining a better understanding of the factors that contribute to ED for youth with autism will allow for more targeted supports to increase their emotional well-being.

The Emotion Dysregulation in ASD Model (Mazefsky et al., 2013) suggests that autism characteristics are related to ED. The model posits that neural mechanisms shared with psychiatric conditions, in combination with behavioural and cognitive characteristics of autism, interact to produce a heterogeneous presentation of ED. More specifically, the challenges with social communication experienced by individuals with autism, such as with taking the perspectives of others (Samson et al., 2012), describing emotional states (Mazefsky et al., 2011), and socioemotional cue perception have been suggested to interfere with regulation and result in high levels of ED (Mazefsky & White, 2014). Additionally, restricted patterns of behaviour have been found to be associated with ED, with approximately one quarter of repetitive behaviours reported to be in response to emotional triggers (Militerni et al., 2002), and which may serve a regulatory function (Samson et al., 2015). Up to 50% of children with autism may experience inhibitory control challenges (Murray, 2010), which is defined as the ability to resist distraction, decrease perseveration, and maintain concentration (Jahromi et al., 2019), and which has been linked to ED (Laurent & Rubin, 2004). Mazefsky et al. (2013) propose that if a child has difficulty inhibiting automatic, rigid responses to an emotional event, they may also have difficulty responding flexibly and implementing adaptive regulation responses, thus experiencing high ED.

While many child level factors may contribute to ED, parents have also been suggested to play a crucial role in the development of child regulatory skills. The transactional model suggests that child self-regulation processes are the product of dynamic, bidirectional interactions between self-regulation and other-regulation (i.e., their social environments over time; Sameroff, 2009). The development of regulatory skills in children with autism can also be understood within this framework. More specifically, the social, behavioural, and sensory challenges that children with autism can experience may impact the transactions that facilitate the development of ER skills. Parents of children with autism report higher levels of stress compared to parents of children without autism (Baker-Ericzén et al., 2005), and maternal stress has been found to be associated with greater emotion regulation difficulties in children with autism (Davis & Carter, 2008). There is also evidence to suggest that "mindful parenting" could be an important consideration in relation to child ED. Mindful parenting is the practice of non-judgemental awareness and reduced reactivity of parents while in their parenting role (Wong et al., 2019). Mindful parenting is posited to improve parent emotion regulation, foster parent-child co-regulation, and as a result, reduce child ED (Duncan et al., 2009). Zhang et al. (2019) found that in preschoolers, mindful parenting facilitated parent-child attunement, thus contributing to lower emotional lability/negativity in their children. In children with developmental disabilities, it has been found that mindful parenting mediates the relationship between parental stress and child emotion regulation (Chan & Neece, 2018; Jones et al., 2014). A study involving parents of children with autism found that mindful parenting was related to lower parental stress and lower levels of child behaviour problems, though did not mediate the relationship between parent stress and child behaviour (Beer et al., 2013). These findings suggest that greater parental stress and lower levels of mindful parenting may reduce parents' capacity for "other-regulation," which is outlined in Sameroff's model as a key factor in the development of child regulation process.

While associations between child autism characteristics (e.g., social communication difficulties, restricted interests, repetitive behaviours, inhibitory control difficulties) and child ED, and parent factors (e.g., parental stress, mindful parenting) and child ED have been supported separately in the literature, there are few studies investigating the potential combination of child-level and parent-level characteristics in explaining ED in children with autism. Baker et al. (2018) found that parental scaffolding moderated the link between child physiological under-arousal (indexed by electrodermal activity during a regulatory task), and child externalizing problems. That is, under-arousal was associated with dysregulated behaviour in the context of low, but not high, levels of parental scaffolding. An additional study found that parents of children with autism between the ages of 3 and 13 years interacted significantly less with their children than parents of children without autism, and that quantity of observed parent-child interaction explained the relation between children's autism diagnosis and children's ED (Costa et al., 2019). No studies to date have investigated the combined explanatory power of child autism characteristics, parental stress and mindfulness in explaining child ED. Further, while many methods are used to index child ED in the literature, such as parent-report, behavioural observation, self-report, and physiological measures, most studies of ED in children with autism rely on only one method per study (Weiss et al., 2014). Emotion regulation is described as a dynamic and multicomponent process (Thompson, 1994), and it has been suggested that research on ED in children with autism requires a multi-method approach in order to parse apart the factors which may contribute the heterogeneity of ED seen in this group (Mazefsky et al., 2013). As such, when investigating how child autism characteristics and parent-factors may contribute to ED in children with autism, it is also important to consider whether different ED measurement methods display similar patterns of relationships with these factors.

The current study addressed these gaps using a multi-method approach. The study aimed to investigate how child-level and parent-level characteristics in children with autism are associated with parent reported ED and behavioural observation of (observed) ED, based on the literature outlined above. Specifically, the following questions were addressed:

1. Is parent reported ED associated with observed ED during a frustrating task for children with autism?
   Hypothesis 1) Parent reported ED and observed ED will be significantly associated with one another.

2. How are parent and child-level characteristics in children with autism associated with different measurement methods of child ED (parent reported ED and observed ED)?
   Hypothesis 2 a) Higher levels of social communication difficulties, restricted interests/repetitive behaviours, and inhibitory control difficulties will be associated with higher levels of parent reported and observed ED.
   Hypothesis 2 b) Higher levels of parent stress, and lower mindful parenting will be associated with higher levels of parent reported and observed ED.

3. Do parent factors (parent stress and mindful parenting) moderate the relationship between child autism characteristics and child ED? This question was exploratory in nature due to limited research in this area and a small sample size.

2. Methods

2.1. Participants

This study examined data collected from 44 children with autism between 8 and 13 years of age (Female = 7; Age: *M* = 9.70, *SD* = 1.62, *Range* = 8–13; IQ: *M* = 103.89, *SD* = 15.85) and their primary caregivers, who participated in a larger randomized trial of cognitive behaviour therapy for emotion regulation (The Secret Agent Society: Operation Regulation; SAS:OR). Caregivers were primarily mothers (*N = 40 mothers,* Age: *M* = 44.36, *SD* = 5.71, *Range* = 29–54). The larger trial includes children with different neurodevelopmental disabilities (autism, attention-deficit-hyperactivity disorder, learning disability, fetal alcohol spectrum disorder, and cerebral palsy). Additionally, eligibility criteria for the broader trial includes having no intellectual disability and the presence of at least one anxiety, mood, or behavioural disorder, which was verified using the Anxiety Disorders Interview Schedule-Parent Interview (ADIS-P; Silverman & Albano, 1996). However, the current study only included children with an autism diagnosis, and parents provided copies of their children's autism diagnostic reports to confirm eligibility. Participants were recruited to the larger trial through a) a pool of participants who had previously participated in the lab's research projects; b) advertisements on the lab website; c) advertisements posted to relevant community organizations; and d) word of mouth.

As shown in Table 1, all children demonstrated IQ scores in the average range (*M* = 104, *SD* = 15.85, *Range* = 79–147) via the Wechsler Abbreviated Scale of Intelligence – Second Edition (WASI-II; Wechsler, 2011). Data collection was based on the baseline data collection period, and due to missing or corrupted video data, participants were included only if video files were available. Approximately 66% of the sample identified as White, 5 % as Black, 5% as Latin American/Hispanic, 2 % as Southeast Asian (e.g., Vietnamese, Cambodian), 2% as West Asian (e.g., Iranian), 8% as Multiethnic, and 2 % preferred not to disclose. Additionally, 77% of participating parents reported having achieved a bachelor's degree or greater, and 54.5% of the sample reported an annual household income of at least $100,000.

2.2. Measures

2.2.1. Outcome 1: observed emotion dysregulation

Children completed a computerized Mirror Tracing Persistence Task (MTPT; Strong et al., 2003). During this task, children attempted to trace a star with an inverted mouse cursor, and when errors occurred, an irritating alarm would sound. This task is designed to be difficult and to elicit feelings of frustration. The task consisted of "Easy," "Medium" and "Hard" practice phases. The Easy and Medium phases were 2 min in length, and the Hard phase was 1 min in length. The width of the star decreased across phases, causing the difficulty level to increase in each subsequent phase. Following the completion of the practice phases, children completed the "Test Phase," during which they were provided the opportunity to quit by hitting the spacebar on the computer. This task took between 6−13 min to complete, depending on how long the child persisted in the Test phase. The MTPT has been reported to be a valid

Table 1
Participant Demographics (n = 44).

	M (*SD*) or *N* (%)	Range
Age	9.70 (1.62)	8.00–13.00
Gender		
Female	7(16)	–
IQ		
WASI-II Composite Score	104 (15.85)	79 –147
Child Ethnicity		
White/Caucasian	29 (66)	–
Black	2 (5)	–
Latin American/Hispanic	2 (5)	–
Southeast Asian (Vietnamese, Cambodian, etc.)	1 (2)	–
West Asian (Iranian, Afghan, etc.)	1 (2)	–
Multiethnic	8 (18)	–
Prefer not to disclose	1 (2)	–
Parent Highest Level of Education		
High school/some college	10 (22)	–
Bachelor or Associate's degree	27 (61)	–
Master's degree/professional school	7 (16)	
Family Income		
< $49,999	5 (11.4)	–
$50,000 - $99,999	15 (34.1)	–
$100,000 -$200,000	11 (25)	–
> $200,000	6 (13.6)	–
Prefer not to disclose	7 (15.9)	–

Note. WASI-II = Weschler Abbreviated Scale of Intelligence – Second Edition.

measure of psychological distress tolerance in adults engaged in smoking cessation (Brown et al., 2005), with generalized anxiety disorder (Renna et al., 2018), and ED in adults with borderline personality disorder (Bornovalova et al., 2008). Relevant to the current study, the MTPT has successfully been used as a measure of frustration tolerance in youth ages 11–18 (Ellis et al., 2018), in children ages 10–14 with attention deficit hyperactivity disorder (Seymour et al., 2019), and in preliminary work with children with attention deficit hyperactivity disorder ages 6–10 years (Ocay, Rustia, & Palaoag, 2018).

Observed ED was measured in the frustration task via standardized observer coding of expressed reactivity and dysphoria using a coding scheme adapted from the Emotion Dysregulation Inventory-Short Form (EDI; Mazefsky et al., 2016), which is a questionnaire designed specifically for children with autism. The EDI includes two subscales: *Reactivity* (7 items) and *Dysphoria* (6 items) rated on a 5-point Likert scale, with responses ranging from 0 = "*Not at all*" to 4 = "*Very Severe*." To use it as an observational measure, the wording of items was adjusted to be more applicable to the MTPT context (e.g., "Appears uneasy throughout the day" was modified to "Appears uneasy"). The *Reactivity* subscale included the same 7 items as in the questionnaire version, such as "Has explosive outbursts" and "Has extreme or intense emotional reactions." The *Dysphoria* subscale included 5 items such as "Seems sad or unhappy". The *Dysphoria* items "Does not seem to *enjoy* anything" and "Very little makes him/her *happy*" were adapted and combined in this coding scheme due to their similarities in the context of the frustration task. Each item was rated from 0 = "Not at all" to 4 = "Severe," for each of the phases (Easy, Medium, Hard and Test) of the MTPT. Internal consistency was excellent (α ranging from .94 to .99).

Video coding of the MTPT task was divided equally between two coders (the first author and a research assistant). The master coder (first author) trained the secondary coder according to a developed coding manual, and two videos were coded together for training purposes. Interrater reliability for the EDI coding scheme was calculated using intraclass correlation coefficients (ICCs) for approximately 30 % of available videos ($n = 44$). Reliability coefficients were based on the two-way random effects ICC (2, 1) model (Koo & Li, 2016). Interrater reliability was excellent for the *Reactivity* and *Dysphoria* scales (ICC = .91, $p < .001$; ICC = .88, $p < .001$). Additionally, longer persistence and greater distance of the star successfully traced during the test phase of the task were associated with lower levels of observed ED in the practice phases ($r_s = -.37$ and $r_s = -.43$, respectively), demonstrating that higher observed ED was associated with lower perseverance during the frustration task. Notably, reasons for missing data included 4 children who did not complete the task due to time constraints, and 4 who were not included due to video recording malfunctions. Only participants with observed ED data were included in the current study.

2.2.2. Outcome 2: parent report of child emotion dysregulation

Parent reported child ED was assessed using the 24-item *Emotion Regulation Checklist* (ERC; Shields & Chicchetti, 1997). The ERC measures the frequency of child behaviours on a 4-point scale of 1 = "rarely/never" to 4 = "almost always", and consists of two subscales: *Lability/Negativity* and *Emotion Regulation*. The *Lability/Negativity* subscale was used for the current study, as it aligns more closely with the items from the EDI. This scale measures reactivity, mood swings, and negative emotional expression, with high scores indicating high negative affect. The ERC has been used in several studies investigating the ways in which children with autism manage their emotions, as reported by their parents (e.g., Berkovits et al., 2017; Weiss et al., 2018). For the current sample, internal consistency for the ERC *Lability/Negativity* scale was good (α = .87), with scores ranging from 23 to 55 ($M = 37.27$, $SD = 7.19$).

2.3. Child factors

2.3.1. Autism symptomology

The *Social Responsiveness Scale – Second Edition* (SRS-2; Constantino & Gruber, 2012) was used to measure social communication and restricted interests & repetitive behaviour (RIRB). The SRS-2 is 65-item parent report rating scale measuring challenges in social behaviour associated with autism, as outlined in the *Diagnostic Statistical Manual of Mental Disorder – Fourth Edition* (DSM-IV, American Psychiatric Association, 2000). The scale consists of five subscales: Social Awareness, Social Cognition, Social Communication, Social Motivation, and Restricted Interests and Repetitive Behaviour, and a total score. For the purpose of this study, the *Social Communication* (SRS-SC) and *Restricted Interests and Repetitive Behavior* (SRS-RIRB) subscales were used as indices of child autism symptomology. Higher scores indicate greater social communication difficulties, and more severe RIRB. The SRS-2 has adequate internal consistency (between .94 and .96) and interrater reliability (.77 for the school-age group). There is also extensive validity data, including predictive validity (sensitivity = .92, and specificity = .92) and mean difference data (Cohen's $d = 2.7$). For the current sample, internal consistency for the SRS-SC subscale was good (α = 0.81), with T-scores ranging from 58 to 90 ($M = 71.70$, $SD = 7.90$). Internal consistency for the SRS-RIRB subscale was adequate (α = 0.70), with t-scores ranging from 57 to 90 ($M = 74.60$, $SD = 8.92$).

2.3.2. Inhibitory control

The *Behavior Rating Inventory of Executive Function Parent Form – Second Edition* (BRIEF-2; Gioia et al., 2015) is a parent report measure of children's executive function difficulties. In the current study, the BRIEF-Inhibit subscale was used to index inhibitory control difficulties. This subscale includes items such as "Does not think before doing (is impulsive)" and, "Has trouble putting the brakes on his or her actions," which are rated on a 3-point Likert scale (1 = "Never"; 2 = "Sometimes"; 3 = "Often"). The reliability coefficients for the BRIEF-2 Parent Form are above .90, and it is moderately to strongly correlated with other measures of behaviour, including the Child Behaviour Checklist (CBCL; Achenbach & Rescorla, 2001) and the Behavior Assessment System for Children parent report (BASC-2 PRS; Reynolds & Kamphaus, 2004) across subscales (Hendrickson & McCrimmon, 2019). The BRIEF-Inhibit T-scores ranged from 54 to 87 ($M = 68.65$, $SD = 8.06$).

2.4. Parent factors

2.4.1. Parental stress

Parent stress levels were assessed using the Stress scale of the *Depression Anxiety Stress Scales-21* (DASS-21; Lovibond & Lovibond, 1995). The DASS-21 is a 21-item measure of depression, anxiety and stress in the past week, with items rated on a scale of 0 ("Did not apply to me at all") to 3 ("Applied to me very much or most of the time"). The measure includes the 7-item Stress scale with higher scores indicating greater levels of stress. The internal consistency, convergent validity, and divergent validity of the DASS-21 scales are strong (Norton, 2007), and in the current sample, internal consistency for the DASS-Stress subscale was good ($\alpha = 0.88$), with scores ranging from 0 to 19 ($M = 7.05$, $SD = 4.12$).

2.4.2. Mindful parenting

Mindful parenting was assessed using the *Bangor Mindful Parenting Scale* (BMPS; Jones et al., 2014). The BMPS is a 15-item questionnaire measure of mindfulness in the parenting role. The BMPS is comprised of 5 subscales: *Acting with awareness*, *Non-reactivity*, *Non-judgment*, *Observing*, and *Describing.* We did not intend to use the subscale scores, but rather the *Total Score,* which represents the general tendency to be mindful in parenting contexts. This measure has been found to have strong construct validity (Jones et al., 2014), and in the current sample, internal consistency for the BMPS was good ($\alpha = 0.85$), with scores ranging from 45 to 80 ($M = 67.26$, $SD = 8.28$).

2.4.3. Control variables

Two variables were considered as potential covariates: child age and child IQ (see Table 1 for details). Gender was not considered as a covariate, given the small number of girls in the current sample ($n = 7$). Child age was reported by parents in a general demographics form, and child IQ was measured using the WASI-II.

2.5. Procedures

The York University Research Ethics Board approved this study. Children and their parents came to the university for research assessment sessions. In accordance with Declaration of Helsinki, informed consent was obtained from caregivers and assent from children. Before the research visit, parents completed the SRS-2 and BRIEF-2 online. The remainder of the questionnaires were completed by parents during the first research appointment, while children completed the WASI-II with a research assistant. In a second visit, children completed a video-recorded MTPT frustration task with a research assistant, without their parent present. Recorded videos were coded using the EDI observation scheme.

2.6. Data analysis

Spearman-rho correlations were first calculated to measure bivariate associations between parent & child characteristics (i.e., SRS-CI, SRS-RIRB, BRIEF-Inhibit, BMPS, DASS-Stress), and observed and parent-reported ED (Research Question 1). Multicollinearity of predictor variables was considered by examining correlations among parent and child factors. Two linear regressions were conducted to assess whether the child- and parent-level variables predicted observed ED and parent-reported ED, respectively (Research Question 2). Child age and IQ were entered in the first step of each regression, followed by the child and parent variables in the second step. The PROCESS macro (Hayes, 2013) was used to assess whether parent stress and mindful parenting moderated the relationship between child-level factors (those that were significantly associated with ED outcomes), and both measures of ED (Research Question 3). The PROCESS macro is a regression modeling tool for SPSS which increases the ease of computing moderation analyses. For these analyses, PROCESS Model 1 was used, with 5000 bootstrap samples as an estimate of effects. Products were mean centered for moderation analyses. Due to the limited sample size, child age and IQ were not entered as covariates in moderation analyses.

3. Results

3.1. Degree of ED in the frustration task

Due to high correlations between *Reactivity* and *Dysphoria* scores across phases (r_s ranging from .76 to .96), a single "Observed ED" score was computed, taking the mean *Reactivity* and *Dysphoria* items across all practice phases. As such, Observed ED scores had a potential range of 0–4 ($M = 1.34$, $SD = .91$, Range: 0–3.57). While the *Reactivity* and *Dysphoria* subscales are intended to be considered separately in the questionnaire EDI format (Mazefsky et al., 2016), using one observed ED outcome variable for the current study allowed for a more parsimonious exploration of hypotheses. As shown in the descriptive statistics in Table 2, there was a range of ED seen across items for reactivity and dysphoria. The majority of child reactivity items were rated to be in the "mild" range. There was less dysphoria than reactivity, especially with regard to "refuses to do the activity," "not responsive to praise or good things happening in the task," and "seems sad or unhappy," where many children were noted to show none of these behaviours.

Table 2
Individual Item Frequency of Reactivity and Dysphoria.

Item	Severity Rating (%)				*Mean (SD)*
	None	Mild	Moderate	Severe	
Reactivity	6.8	68.2	20.5	4.5	1.35 (.96)
Has explosive outbursts	13.6	52.3	22.7	11.4	1.49 (1.05)
Cries or appears angry	6.8	54.5	31.9	6.8	1.49 (.93)
Has extreme or intense emotional reactions	11.4	52.2	25.0	11.4	1.58 (1.01)
Hard to calm him/her down when mad or upset	25.0	47.7	20.5	6.8	1.13 (.96)
Emotions go from 0 to 100 instantly	13.6	54.6	22.7	9.1	1.42 (1.01)
Has trouble calming him/ herself down	18.2	56.8	22.7	2.3	1.14 (.99)
Reactions are more severe than the situation calls for	20.5	50.0	20.5	9.0	1.22 (1.07)
Dysphoria	2.3	70.4	20.5	6.8	1.33 (.92)
Does not seem to enjoy any aspects of the activity/Very few aspects of the activity make him/her happy	6.8	50.0	29.6	13.6	1.61 (1.03)
Refuses to do the activity	72.7	9.1	13.6	4.6	.90 (1.03)
Not responsive to praise or good things happening in the task	59.1	15.9	18.2	6.8	1.20 (.88)
Seems sad or unhappy	47.7	13.7	31.8	6.8	1.36 (.98)
Appears uneasy	38.6	18.2	34.1	9.1	1.60 (.98)

Note. None = Score of 0; Mild = 1–1.99; Moderate = 2–2.99; Severe =. 3–4.

3.2. Bivariate correlations among variables

Notably, observed ED (EDI), and parent reported ED (ERC-LN), were not associated with each other, r_s (44) = .13, p = .40. As shown in Table 3, observed ED was not significantly associated with any of the predictor variables. Parent reported ED was significantly associated with child social communication difficulties, r_s (44) = .44, p =.003, child RIRB, r_s (44) = .67, p <.001, child inhibitory control difficulties, r_s (43) = .51, p < .001, parent stress, r_s (44) = .30, p = .05, and mindful parenting, r_s (44) = -.31, p = .04. Some of the predictor variables were related to each other. There was a strong correlation between child social communication difficulties and RIRB, r_s (44) = .62, p <.001, and moderate associations between child autism symptoms and inhibitory control difficulties (r_s (43) = .31, p = .04 for the SRS-SC subscale and r_s (43) = .32, p = .04 for the SRS-RIRB subscale). Inhibitory control difficulties were also positively associated with parental stress, r_s (43) = .45, p = .002. Additionally, there was a moderate correlation between social communication difficulties and mindful parenting, r_s (44) = −.33, p = .03. Finally, parent report of their own stress was negatively associated with mindful parenting, r_s (44) = −.56, p <.001.

3.3. Hierarchical regression

Hierarchical linear regressions were conducted to determine whether child factors (social communication difficulties, RIRB, and inhibitory control difficulties) and parent factors (parental stress and mindful parenting) predicted observed and parent reported ED. As shown in Table 4, an overall significant model emerged predicting parent reported ED, F (7, 35) = 8.36 p < .001, accounting for 55 % overall variance. Child RIRB emerged as a unique predictor (p < .001, sr^2 = .18), as did child inhibitory control difficulties (p = .02, sr^2 = .07). Additionally, child IQ emerged as a unique predictor (p = .01, sr^2 = .07). In contrast, the linear model failed to predict observed ED, F(7, 35) = .77, p = .61.

Table 3
Correlations Among Predictor and Dependent Variables.

	Predictor Variables						Dependent Variables	
	2 (n = 44)	3 (n = 44)	4 (n = 44)	5 (n = 43)	6 (n = 44)	7 (n = 44)	ED-O (n = 44)	ED-P (n = 44)
1.Age	−.13	.15	.07	−.15	−.03	.131	−.14	−.02
2. IQ		−.24	−.21	−.06	.21	−.43**	.18	.16
3. SRS-SC			.62**	.32*	.17	−.33*	.06	.44**
4. SRS- RIRB				.32*	.26	−.26	−.14	.67**
5. BRIEF-Inhibit					.45**	−.16	−.01	.51*
6. DASS- Stress						−.56**	.08	.30*
7. BMPS							−.22	−.31*

Note. ED-O = Observed emotion dysregulation coded using the Emotion Dysregulation Inventory; ED-P = Emotion Regulation Checklist – Lability/Negativity subscale; SRS-SC = Social Responsiveness Scale – Social Communication Subscale; SRS-RIRB = Social Responsiveness Scale – Restricted Interests and Repetitive Behavior Subscale; BRIEF-Inhibit = Behavior Rating Inventory of Executive Function Parent Form – Second Edition – Inhibit Scale; DASS = Depression Anxiety Stress Scales-21 – Stress Scale; BMPS = Bangor Mindful Parenting Scale.

** p < .01.

* p < .05.

Table 4
Hierarchical Linear Regressions Predicting Observed and Parent Reported ED by Child and Parent Factors (n = 43).

Predictor	Unstandardized coefficient		Standardized coefficient	*p*	*F*	Adjusted R^2
	B	*SE*	β			
ED – P	–	–	–	<.001**	8.36	.55
Constant	−2.77	1.16	–	.02		
Age	.01	.03	.02	.85		
IQ	.01	.004	.38	.01*		
SRS-SC	.004	.01	.07	.66		
SRS-RRBI	.03	.01	.57	< .001**		
BRIEF-Inhibit	.02	.01	.31	.02*		
DASS-21 Stress	.02	.10	.02	.87		
BMPS	.01	.01	.06	.70		
ED – O	–	–	–	.61	.77	−.04
Constant	4.12	3.35	–	.23		
Age	−.09	.09	−.16	.34		
IQ	−.001	.01	−.02	.92		
SRS-SC	.02	.03	.16	.48		
SRS-RIRB	−.03	.02	−.30	.16		
BRIEF-Inhibit	.01	.02	.07	.73		
DASS-21 Stress	−.12	.29	−.08	.69		
BMPS	−.04	.04	−.27	.26		

Note. ED-O = Observed emotion dysregulation coded using the Emotion Dysregulation Inventory; ED-P = Emotion Regulation Checklist – Lability/Negativity subscale; SRS-SC = Social Responsiveness Scale – Social Communication Subscale; SRS-RIRB = Social Responsiveness Scale – Restricted Interests and Repetitive Behavior Subscale; BRIEF-Inhibit = Behavior Rating Inventory of Executive Function Parent Form – Second Edition – Inhibit Scale; DASS-21 = Depression Anxiety Stress Scales-21; BMPS = Bangor Mindful Parenting Scale.
** $p = < .0$.
* $p = < .05$.

3.4. Moderation analysis

Simple moderation analyses (Hayes Process model 1) were conducted to assess whether parental stress and mindful parenting moderated the association between each significantly correlated child factor (social communication difficulties, RIRB and inhibitory control difficulties) and parent reported ED (ERC-LN). Moderation analyses were calculated only for parent reported ED due to the nonsignificant associations between predictors and observed ED. No moderation effects emerged for parent reported ED (*p* ranged from .38 to .98).

4. Discussion and implications

Previous studies on emotion regulation in children with autism have primarily relied on assessing ED using one method of measurement (Weiss et al., 2014). It has been suggested that using a combination of method types (i.e., observational-methods, informant-report, physiological methods) is most conducive to elucidating the multidimensional nature of emotion regulation (Adrian et al., 2011). To our knowledge, this is the first study to explore associations among child autism factors, parent factors and child emotion regulation using multiple methods.

True to the notion that ED may reflect different constructs depending on how it is measured (Adrian et al., 2011; Weiss et al., 2014), the current study found that parent-reported child ED (as reflected in emotional lability and negativity) and observed ED during a frustrating task were only weakly associated with each other, and not at the level of statistical significance, suggesting that the lab-based frustration task may not be reflective of the daily situations that elicit ED observed by parents. Additionally, while associations were found between parent-reported ED and child and parent factors (discussed further below), these same patterns were not found for observed ED during the frustration task. This weak association between ED constructs, as well as the different patterns of association found with child and parent factors, highlight the importance of considering how different measurement methods may elicit different ED patterns in children with autism. These findings also highlight the importance of considering differences in ED between a controlled lab environment and day-to-day life. The current lab task involved the presence of a neutral and unfamiliar adult (the research assistant), and previous research has shown that dysregulated behaviour can present differently when children are in the presence of an examiner versus their parent. For example, it was found that children (without autism) displayed more disruptive behaviour in a lab setting when a parent was present in the room versus a neutral examiner (De Los Reyes et al., 2009), demonstrating the relational nature of emotion regulation. If children had completed the lab-based task with their parents as administrators, there may have been a stronger relationship between parent reported ED and the ED that was observed in the current study.

All of the child and parent factors were significantly associated with parent reported ED. True to the ideas behind the Emotion Dysregulation in ASD Model, in the hierarchical regression analysis, the overall model accounted for a significant portion of variance (55%), suggesting the combined importance of child autism characteristics and parent factors (such as parent stress and mindfulness) in explaining parent reported ED. These findings are also in keeping with the transactional model (Sameroff, 2009), which suggests the dynamic interplay between child characteristics, and on-going interactions between child and parent in shaping child regulation.

Interestingly, RIRB and inhibitory control difficulties emerged as a unique predictor of parent-reported ED in the regression model, when other child and parent factors were held constant. This finding aligns with that of Samson et al. (2014), who similarly found that while all core aspects of autism symptomology (social communication challenges, RIRB, and sensory challenges) were moderately associated with parent reported ED, RIRB emerged as the only unique predictor. It may be that dysregulation can trigger compensatory control mechanisms in children with autism, which are expressed as restricted interests, inflexibility to change, and repetitive motor mannerisms (Ochsner & Gross, 2008; Samson et al., 2015). Alternatively, it has been suggested that perseveration (a repetitive behaviour) may lead to ED development and maintenance (Mazefsky et al., 2012). This suggests that the relationship between RIRB and ED may be an important area of targeted research for youth with autism, with implications for how best to develop and implement emotion regulation interventions for this group. Lower levels of inhibitory control (as demonstrated through a Stroop task) in children with autism have been linked to preoccupations, compulsive routines and ritualistic behaviour (Faja & Nelson Darling, 2019). Further, inhibiting impulsive reactions to emotional and sensory experiences can be a challenge for children with autism, and in conjunction with communication challenges, can lead to maladaptive behaviour (Laurent & Rubin, 2004). This aligns with suggestions that impulsive reactions to emotional cues can lead to difficulties in generating adaptive solution-focused behaviours to resolve a situation and any elicited negative affectivity (Sofronoff et al., 2007). Social communication difficulties were also associated with greater emotional lability and negativity in children. Social communication challenges can involve difficulties perceiving the social and emotional cues of others, alexithymia, and theory of mind, all of which have been suggested to interfere with the appropriate timing and implementation of regulatory strategies (Barrett et al., 2001; Mazefsky et al., 2011; Mazefsky & White, 2014; Samson et al., 2012). Notably, social communication and RIRB were strongly correlated in the current study, suggesting that shared variance might have prevented social communication from emerging as a stronger predictor variable in the regression model.

As expected, parents who reported higher levels of stress and lower levels of mindful parenting reported higher ED levels in their children. In keeping with Sameroff's transactional model, the association among parent psychological processes and reports of child ED are often noted to be transactional in nature (Sameroff, 2009), and parenting stress and mindfulness have been negatively associated with each other (Conner & White, 2014), and with child ED, in children with autism (Beer et al., 2013; Davis & Carter, 2008). It is encouraging to consider whether interventions focused on supporting parent mental health could indirectly support child emotional regulation abilities. Mindfulness interventions for parents of children with autism have been shown to reduce parental stress by increasing their mindful parenting, and reducing aggression and maladaptive behaviour in their children (Singh et al., 2006). More broadly, mindfulness-based interventions for parents have been shown to reduce parent stress, enhance perceptions of parent-child interactions, and reduce dysregulated behaviour in children with developmental disabilities (Neece, 2014; Singh et al., 2007) and similarly, have been associated with reduced ED in children with attention-deficit/hyperactivity disorder (Singh et al., 2010). At the same time, given that these measures share method variance, it could be that parents' stress levels and mindful traits shape the ways in which they view their child's behaviours, or that they influence each other. While the use of mindful parenting strategies, such as awareness in the moment and attention without judgment, may reduce parent stress, it is also likely that parents with lower levels of stress are better able to use these mindful parenting techniques.

4.1. Limitations & future directions

In light of these results, several limitations should be considered. The generalizability of these results may be limited, as the sample consisted of parents who were seeking treatment for their child's emotion regulation challenges. Their children did not have co-occurring intellectual disability, and all had at least one mood, anxiety, or behavioural disorder. Parents in this group may exhibit different levels of stress or mindful parenting than parents who are not seeking treatment, and children may exhibit certain reactions to emotionally eliciting stimuli not found in children with autism who do not require treatment. It is important to note that this was a somewhat homogenous sample, as 66% of families were White and the majority fell within a middle/upper income range (see Table 1). This also limits the generalizability of these findings.

A relatively small sample size could have increased the possibility of Type II error in the regression and moderation analyses. It is important to note that the regression and moderation analyses were underpowered to detect moderate effect sizes. Additionally, the cross-sectional design of this study limits our ability to understand the developmental trajectories of emotion regulation and associated child and parent characteristics in children with autism. Furthermore, it is notable that all predictor variables were based on parent report. As such, it is important to consider single-reporter bias when considering the associations found between the predictor variables and parent-reported ED. It is also important to note that the MTPT task was originally designed for adults. While it has been used with success with children and adolescents, frustration tasks designed specifically for youth may be more developmentally appropriate.

Notably, the frustration task elicited more observed reactivity than dysphoria, and the majority of dysphoria items from the EDI were reworded for coding purposes. It is possible that either the frustration task did not properly elicit dysphoria, or that the meaning of the original items was not fully captured. This highlights the importance of carefully considering how specific behavioural tasks may elicit different aspects of ED in future work. Future research in the area of ED for youth with autism should consider using multiple indices of ED, including observational tasks, which may emulate the daily environments of youth more closely (e.g., naturalistic observation, ecological momentary assessment, experience-based sampling approaches).

Finally, while we examined child and parent characteristics independently in the current study, we did not evaluate the quality of the parent-child relationship. It has been shown that securely attached children are able to successfully employ regulation strategies within and outside the attachment relationship (Brumariu, 2015), and that youth with autism are known to display a range of normative attachment behaviours (Dissanayake & Crossley, 1996; Keenan et al., 2017). Future studies evaluating the association

between parent-child relationship quality (i.e., attachment and parental sensitivity) and ED for youth with autism will further advance our understanding of regulatory processes for this group.

4.2. Conclusion

There is a need to better understand emotion regulation difficulties experienced by children with autism, considering the implications that ED has for mental health and wellness. The different patterns of association found between observed and parent reported ED in the current study highlight the importance of employing a multimethod approach when exploring factors that contribute to child emotion regulation and of carefully considering how various measurement methods may elicit different experiences and abilities. While associations were found between parent reported ED and child and parent factors, these same patterns were not found for observed ED during a frustrating lab task, suggesting that the factors contributing to ED for children with autism may vary across contexts. Our findings suggest that autism characteristics, parental stress, and mindful parenting are important factors to consider when exploring emotion regulation.

Data Aavailability

The dataset generated and/or analysed during the current study are not publicly available due to confidentiality and consent limitations, but may be made available from the corresponding author on reasonable request, following consultation with the university research ethics committee.

Credit authorship contribution statement

Annie S. Mills: Conceptualization, Methodology, Formal Analysis, Investigation, Writing. **Paula Tablon-Modica:** Investigation, Methodology, Data Curation, Writing. **Carla A. Mazefksy:** Resources, Writing. **Jonathan A. Weiss:** Conceptualization, Methodology, Resources, Writing, Project Administration, Funding Acquisition, Supervision.

Declaration of competing interest

The authors report no conflicts of interest.

Acknowledgements

The authors thank the families who participated in this research study. The author(s) disclose receipt of the following financial support for the research, authorship, and/or publication of this article: This study was supported by the Canadian Institutes of Health Research, a Social Sciences and Humanities Research Council of Canada Graduate Scholarship, Kids Brain Health Network, and the York Research Chair in Autism and Neurodevelopmental Disability Mental Health. Development of the Emotion Dysregulation Inventory (EDI) was supported by the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (R01HD079512).

References

Achenbach, T. M., & Rescorla, L. A. (2001). *Manual for the ASEBA school-age forms & profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth, & Families.

Adrian, M., Zeman, J., & Veits, G. (2011). Methodological implications of the affect revolution:A 35-year review of emotion regulation assessment in children. *Journal of Experimental Child Psychology, 110*(2), 171–197. https://doi.org/10.1016/j.jecp.2011.03.009

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders (4th ed., text revision)*. Washington, DC: American Psychiatric Association.

Baker, J. K., Fenning, R. M., Erath, S. A., Baucom, B. R., Moffitt, J., & Howland, M. A. (2018). Sympathetic under-arousal and externalizing behavior problems in children with autism spectrum disorder. *Journal of Abnormal Child Psychology, 46*(4), 895–906. https://doi.org/10.1007/s10802-017-0332-3

Baker-Ericzén, M. J., Brookman-Frazee, L., & Stahmer, A. (2005). Stress levels and adaptability in parents of toddlers with and without autism spectrum disorders. *Research and Practice for Persons with Severe Disabilities, 30*(4), 194–204. https://doi.org/10.2511/rpsd.30.4.194

Barrett, L. F., Gross, J., Christensen, T. C., & Benvenuto, M. (2001). Knowing what you're feeling and knowing what to do about it: Mapping the relation between emotion differentiation and emotion regulation. *Cognition and Emotion, 15*(6), 713–724. https://doi.org/10.1080/02699930143000239

Beer, M., Ward, L., & Moar, K. (2013). The relationship between mindful parenting and distressin parents of children with an autism spectrum disorder. *Mindfulness, 4*(2), 102–112. https://doi.org/10.1007/s12671-012-0192-4

Berkovits, L., Eisenhower, A., & Blacher, J. (2017). Emotion regulation in young children withautism spectrum disorders. *Journal of Autism and Developmental Disorders, 47*(1), 68–79. https://doi.org/10.1007/s10803-016-2922-2

Bornovalova, M. A., Gratz, K. L., Daughters, S. B., Nick, B., Delany-Brumsey, A., Lynch, T. R., Kosson, D., & Lejuez, C. W. (2008). A multimodal assessment of the relationship between emotion dysregulation and borderline personality disorder among inner-city substance users in residential treatment. *Journal of Psychiatric Research, 42*(9), 717–726. https://doi.org/10.1016/j.jpsychires.2007.07.014

Brown, R. A., Lejuez, C. W., Kahler, C. W., Strong, D. R., & Zvolensky, M. J. (2005). Distress toleranceand early smoking lapse. *Clinical Psychology Review, 25*(6), 713–733. https://doi.org/10.1016/j.cpr.2005.05.003

Brumariu, L. E. (2015). Parent-child attachment and emotion regulation. *New Directions for Child and Adolescent Development, 2015*(148), 31–45. https://doi.org/10.1002/cad.20098

Cai, R. Y., Richdale, A. L., Uljarević, M., Dissanayake, C., & Samson, A. C. (2018). Emotion regulation in autism spectrum disorder: Where we are and where we need to go. *Autism Research, 11*(7), 962–978. https://doi.org/10.1002/aur.1968

Chan, N., & Neece, C. L. (2018). Parenting stress and emotion dysregulation among children with developmental delays: The role of parenting behaviors. *Journal of Child and Family Studies, 27*(12), 4071–4082. https://doi.org/10.1007/s10826-018-1219-9

Conner, C. M., & White, S. W. (2014). Stress in mothers of children with autism: Trait mindfulness as a protective factor. *Research in Autism Spectrum Disorders, 8*, 617–624. https://doi.org/10.1016/j.rasd.2014.02.001

Constantino, J. N., & Gruber, C. P. (2012). *Social responsiveness scale—second edition (SRS-2)*. Torrance, CA: Western Psychological Services.

Costa, A. P., Steffgen, G., & Vögele, C. (2019). The role of alexithymia in parent–child interaction and in the emotional ability of children with autism spectrum disorder. *Autism Research, 12*(3), 458–468. https://doi.org/10.1002/aur.2061

Davis, N. O., & Carter, A. S. (2008). Parenting stress in mothers and fathers of toddlers with autism spectrum disorders: Associations with child characteristics. *Journal of Autism and Developmental Disorders, 38*(7), 1278–1291. https://doi.org/10.1007/s10803-007-0512-z

De Los Reyes, A., Henry, D. B., Tolan, P. H., & Wakschlag, L. S. (2009). Linking informant discrepancies to observed variations in young children's disruptive behavior. *Journal of Abnormal Child Psychology, 37*(5), 637–652. https://doi.org/10.1007/s10802-009-9307-3

Dissanayake, C., & Crossley, S. A. (1996). Proximity and sociable behaviours in autism: Evidence for attachment. *Child Psychology & Psychiatry & Allied Disciplines, 37*(2), 149–156. https://doi.org/10.1111/j.1469-7610.1996.tb01386.x

Duncan, L. G., Coatsworth, J. D., & Greenberg, M. T. (2009). A model of mindful parenting: Implications for parent–child relationships and prevention research. *Clinical Child and Family Psychology Review, 12*, 255–270. https://doi.org/10.1007/s10567-009-0046-3

Ellis, A. J., Salgari, G., Miklowitz, D., & Loo, S. K. (2018). Is distress tolerance an approach behavior? An examination of frontal alpha asymmetry and distress tolerance in adolescents. *Psychiatry Research, 267*, 210–214. https://doi.org/10.1016/j.psychres.2018.05.083

Faja, S., & Nelson Darling, L. (2019). Variation in restricted and repetitive behaviors and interests relates to inhibitory control and shifting in children with autism spectrum disorder. *Autism, 23*(5), 1262–1272. https://doi.org/10.1177/1362361318804192

Gioia, G. A., Isquith, P. K., Guy, S. C., & Kenworthy, L. (2015). *BRIEF-2: Behavior rating inventory of executive function*. Lutz, FL: Second Psychological Assessment Resources.

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York: The Guilford Press.

Hendrickson, N., K, & McCrimmon, A., W (2019). Test Review: Behavior Rating Inventory of Executive Function®, Second Edition (BRIEF®2) by Gioia, G. A., Isquith, P. K., Guy, S. C., & Kenworthy, L. *Canadian Journal of School Psychology, 34*(1), 73–78. https://doi.org/10.1177/0829573518797762

Jahromi, L. B., Chen, Y., Dakopolos, A. J., & Chorneau, A. (2019). Delay of gratification in preschoolers with and without autism spectrum disorder: Individual differences and links to executive function, emotion regulation, and joint attention. *Autism, 23*(7), 1720–1731. https://doi.org/10.1177/1362361319828678

Jahromi, L. B., Meek, S. E., & Ober-Reynolds, S. (2012). Emotion regulation in the context of frustration in children with high functioning autism and their typical peers. *Journal of Child Psychology and Psychiatry, 53*(12), 1250–1258. https://doi.org/10.1111/j.1469-7610.2012.02560.x

Jones, L., Hastings, R. P., Totsika, V., Keane, L., & Rhule, N. (2014). Child behavior problems and parental well-being in families of children with autism: The mediating role of mindfulness and acceptance. *American Journal on Intellectual and Developmental Disabilities, 119*(2), 171–185. https://doi.org/10.1352/1944-7558-119.2.171

Keenan, B. M., Newman, L. K., Gray, K. M., & Rinehart, N. J. (2017). A qualitative study of attachment relationships in ASD during middle childhood. *Attachment & Human Development, 19*(1), 1–21. https://doi.org/10.1080/14616734.2016.1246580

Koo, T. K., & Li, M. Y. (2016). A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *Journal of Chiropractic Medicine, 15*(2), 155–163. https://doi.org/10.1016/j.jcm.2016.02.012

Laurent, A. C., & Rubin, E. (2004). Challenges in emotional regulation in asperger syndrome and high-functioning autism. *Topics in Language Disorders, 24*(4), 286–297. https://doi.org/10.1097/00011363-200410000-00006

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the depression anxiety stress scales (DASS) with the beck depression and anxiety inventories. *Behaviour Research and Therapy, 33*(3), 335–343. https://doi.org/10.1016/0005-7967(94)00075-U

Mazefsky, C. A., & White, S. W. (2014). Emotion regulation: Concepts & practice in autism spectrum disorder. *Child and Adolescent Psychiatric Clinics of North America, 23*(1), 15–24. https://doi.org/10.1016/j.chc.2013.07.002

Mazefsky, C. A., Day, T. N., Siegel, M., White, S. W., Yu, L., & Pilkonis, P. A. (2016). Development of the emotion dysregulation inventory: A promis®ing method for creating sensitive and unbiased questionnaires for autism spectrum disorder. *Journal of Autism and Developmental Disorders, 48*(11), 3736–3746. https://doi.org/10.1007/s10803-016-2907-1

Mazefsky, C. A., Herrington, J., Siegel, M., Scarpa, A., Maddox, B. B., Scahill, L., & White, S. W. (2013). The role of emotion regulation in autism spectrum disorder. *Journal of the American Academy of Child & Adolescent Psychiatry, 52*(7), 679–688. https://doi.org/10.1016/j.jaac.2013.05.006

Mazefsky, C. A., Kao, J., & Oswald, D. P. (2011). Preliminary evidence suggesting caution in the use of psychiatric self-report measures with adolescents with high-functioning autism spectrum disorders. *Research in Autism Spectrum Disorders, 5*(1), 164–174. https://doi.org/10.1016/j.rasd.2010.03.006

Mazefsky, C. A., Pelphrey, K. A., & Dahl, R. E. (2012). The need for a broader approach to emotion regulation research in autism. *Child Development Perspectives, 6*(1), 92–97. https://doi.org/10.1111/j.1750-8606.2011.00229.x

Militerni, R., Bravaccio, C., Falco, C., Fico, C., & Palermo, M. T. (2002). Repetitive behaviors in autistic disorder. *European Child & Adolescent Psychiatry, 11*(5), 210–218. https://doi.org/10.1007/s00787-002-0279-x

Murray, M. (2010). Attention-deficit/hyperactivity disorder in the context of autism spectrum disorders. *Current Psychiatry Reports, 12*, 382–388. https://doi.org/10.1007/s11920-010-0145-3

Neece, C. L. (2014). Mindfulness-based stress reduction for parents of young children with developmental delays: Implications for parental mental health and child behavior problems. *Journal of Applied Research in Intellectual Disabilities, 27*(2), 174–186. https://doi.org/10.1111/jar.12064

Northrup, J. B., Goodwin, M., Montrenes, J., Vezzoli, J., Golt, J., Peura, C. B., Siegel, M., & Mazefsky, C. (2020). Observed emotional reactivity in response to frustration tasks in psychiatrically hospitalized youth with autism spectrum disorder. *Autism, 24*(4), 968–982. https://doi.org/10.1177/1362361320908108

Norton, P. J. (2007). Depression anxiety and stress scales (DASS-21): Psychometric analysis across four racial groups. *Anxiety, Stress & Coping: An International Journal, 20*(3), 253–265. https://doi.org/10.1080/10615800701309279

Ocay, A., B, Rustia, R., A, & Palaoag, T., D (2018). Utilizing Augmented Reality in Improving the Frustration Tolerance of ADHD Learners: An Experimental Study. *ICDTE 2018: Proceedings of the 2nd International Conference on Digital Technology in Education*, 58–63. https://doi.org/10.1145/3284497.3284499

Ochsner, K. N., & Gross, J. J. (2008). Cognitive emotion regulation: Insights from social cognitive and affective neuroscience. *Current Directions in Psychological Science, 17*(2), 153–158. https://doi.org/10.1111/j.1467-8721.2008.00566.x

Renna, M. E., Chin, S., Seeley, S. H., Fresco, D. M., Heimberg, R. G., & Mennin, D. S. (2018). The use of the mirror tracing persistence task as a measure of distress tolerance in generalized anxiety disorder. *Journal of Rational-Emotive & Cognitive-Behavior Therapy, 36*(1), 80–88. https://doi.org/10.1007/s10942-017-0274-2

Reynolds, C. R., & Kamphaus, R. W. (2004). *Behavior assessment system for children* (2nd ed.). Circle Pines, MN: American Guidance Service.

Salazar, F., Baird, G., Chandler, S., Tseng, E., O'sullivan, T., Howlin, P., Pickles, H., & Simonoff, E. (2015). Co-occurring psychiatric disorders in preschool and elementary school-aged children with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 45*(8), 2283–2294. https://doi.org/10.1007/s10803-015-2361-5

Sameroff, A. (2009). The transactional model. In A. Sameroff (Ed.), *The transactional model of development: How children and contexts shape each other*. American Psychological Association. https://doi.org/10.1037/11877-000 (pp. 3–21, Chapter xiv, 290 Pages).

Samson, A. C., Hardan, A. Y., Podell, R. W., Phillips, J. M., & Gross, J. J. (2015). Emotion regulation in children and adolescents with autism spectrum disorder. *Autism Research, 8*(1), 9–18. https://doi.org/10.1002/aur.1387

Samson, A. C., Huber, O., & Gross, J. J. (2012). Emotion regulation in Asperger's syndrome and high-functioning autism. *Emotion, 12*(4), 659–665. https://doi.org/10.1037/a0027975

Samson, A. C., Phillips, J. M., Parker, K. J., Shah, S., Gross, J. J., & Hardan, A. Y. (2014). Emotion dysregulation and the core features of autism spectrum disorder. *Journal of Autism and Developmental Disorders, 44*(7), 1766–1772. https://doi.org/10.1007/s10803-013-2022-5

Seymour, K. E., Macatee, R., & Chronis-Tuscano, A. (2019). Frustration tolerance in youth with ADHD. *Journal of Attention Disorders, 23*(11), 1229–1239. https://doi.org/10.1177/1087054716653216

Shields, A., & Cicchetti, D. (1997). Emotion regulation among school-age children: The development and validation of a new criterion Q-sort scale. *Developmental Psychology, 33*(6), 906–916. https://doi.org/10.1037/0012-1649.33.6.906

Silverman, W., & Albano, A. (1996). *Anxiety Disorders Interview Schedule (ADIS-IV) - Parent Interview Schedule.* Graywind Publications.

Singh, N. N., Lancioni, G. E., Winton, A. S. W., Adkins, A. D., Singh, J., & Singh, A. N. (2007). Mindfulness training assists individuals with moderate mental retardation to maintain their community placements. *Behavior Modification, 31*(6), 800–814. https://doi.org/10.1177/0145445507300925

Singh, N. N., Lancioni, G. E., Winton, A. S., Fisher, B. C., Wahler, R. G., Mcaleavey, K., & Sabaawi, M. (2006). Mindful parenting decreases aggression, noncompliance, and self injury in children with autism. *Journal of Emotional and Behavioral Disorders, 14*, 169–177. https://doi.org/10.1177/10634266060140030401

Singh, N. N., Singh, A. N., Lancioni, G. E., Singh, J., Winton, A. S. W., & Adkins, A. D. (2010). Mindfulness training for parents and their children with ADHD increases the children's compliance. *Journal of Child and Family Studies, 19*(2), 157–166. https://doi.org/10.1007/s10826-009-9272-z

Sofronoff, K., Attwood, T., Hinton, S., & Levin, I. (2007). A randomized controlled trial of a cognitive behavioural intervention for anger management in children diagnosed with Asperger syndrome. *Journal of Autism and Developmental Disorders, 37*(7), 1203–1214. https://doi.org/10.1007/s10803-006-0262-3

Strong, D., Lejuez, C., Daughters, S., Marinello, M., Kahler, C., & Brown, R. (2003). *The computerized mirror tracing task, Version 1* (Unpublished Manual).

Thompson, R. A. (1994). Emotion regulation: A theme in search of definition. *Monographs of the Society for Research in Child Development, 59*, 25–52. https://doi.org/10.2307/1166137

Wechsler, D. (2011). *Wechsler abbreviated scale of intelligence–second edition (WASI-II)*. San Antonio, TX: NCS Pearson.

Weiss, J., A, Burnham Riosa, P., Mazefsky, C., A, & Beaumont, R. (2017). Emotion regulation in autism spectrum disorder.. *Emotion regulation and psychopathology in children and adolescents.* (pp. 235–258). Oxford University Press.

Weiss, J. A., Thomson, K., Burnham Riosa, P., Albaum, C., Chan, V., Maughan, A., Tablon, P., & Black, K. (2018). A randomized waitlist-controlled trial of cognitive behavior therapy to improve emotion regulation in children with autism. *Journal of Child Psychology and Psychiatry, 59*(11), 1180–1191. https://doi.org/10.1111/jcpp.12915

Weiss, J. A., Thomson, K., & Chan, L. (2014). A systematic literature review of emotionregulation measurement in individuals with autism spectrum disorder. *Autism Research, 7*(6), 629–648. https://doi.org/10.1002/aur.1426

Wong, K., Hicks, L. M., Seuntjens, T. G., Trentacosta, C. J., Hendriksen, T. H. G., Zeelenberg, M., & van den Heuvel, M. (2019). The role of mindful parenting in individual andsocial decision-making in children. *Frontiers in Psychology, 10*. https://doi.org/10.3389/fpsyg.2019.00550

Zhang, W., Wang, M., & Ying, L. (2019). Parental mindfulness and preschool children's emotion regulation: The role of mindful parenting and secure parent-child attachment. *Mindfulness, 10*, 2481–4297. https://doi.org/10.1007/s12671-019-01120-y