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A Cross-Sectional Examination of the Internalization of Emotion Co-regulatory Support in Children with ASD

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Abstract

Cross-sectional data from Fenning et al. (*J Autism Dev Disord*, 48:3858–3870, 2018) were used to examine age differences in processes related to the development of emotion regulation in children with autism spectrum disorder (ASD). Forty-six children with ASD between the ages of 4 and 11 years and their primary caregivers participated in structured laboratory tasks from which parental scaffolding and child dysregulation were coded. Moderation analyses suggested increased internalization of parental co-regulatory support with age, as evidenced by more coherence in dysregulation across dyadic and independent contexts and a stronger inverse relation between parental scaffolding and independent dysregulation. Children's estimated mental age did not account for these effects. Implications for understanding and promoting the development of emotion regulation in children with ASD are discussed.

Keywords

Autism spectrum disorder; Emotion regulation; Parent–child interaction; Co-regulation; Cross-sectional

Children with ASD exhibit high rates of comorbid emotional and behavioral disorders, which can impair functioning and cause distress for the children and those who support them (Brereton et al. 2006; Lecavalier et al. 2006). Difficulty with regulating emotion has been increasingly proposed as a transdiagnostic factor thought to underlie a variety of social-emotional difficulties in this population (Mazefsky et al. 2013; Weiss 2014). Indeed, in comparison to peers with neurotypical development, children with ASD engage in fewer beneficial and more maladaptive emotion regulation strategies (Jahromi et al. 2012; Samson et al. 2015) which, in turn, have been associated with increased psychiatric problems in this population (Mazefsky et al. 2014; Pouw et al. 2013).

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Author Contributions JB, RF, and JM conceived of the study, participated in its design and coordination, performed the measurement and drafted the manuscript. JB performed the statistical analysis. All authors read and approved the final manuscript.

Ethical Approval All procedures performed were in accordance with the ethical standards of our institutional and the national research committee and with the 1964 Helsinki declaration and its later amendments.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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The potential for emotion dysregulation to explain individual differences in comorbid difficulties in children with ASD underscores the importance of identifying contributors to regulation in this population. Mazefsky and colleagues (Mazefsky et al. 2013; Mazefsky and White 2014), theorized that certain factors commonly associated with, or intrinsic to, ASD predispose children to challenges with emotion regulation. A recent study by Fenning et al. (2018) empirically tested this notion and identified consistent associations between core ASD symptom levels (as measured through direct assessment) and observed emotion dysregulation across contexts in children with ASD between the ages of 4 and 11 years.

Common conceptualizations of the development of emotion regulation emphasize the importance of parenting in the emergent regulation abilities of children with neurotypical development (see Cole et al. 2004; Morris et al. 2007, for reviews). These parent contributions can take many forms, including general responsivity, modeling, emotion contagion, explicit discourse about emotion, reactions to child emotion, and “emotion coaching,”—the latter of which involves several of these elements occurring simultaneously in the context of a parent–child interaction. (Baker et al. 2011; Cole et al. 2004; Gottman et al. 1996; Morris et al. 2007). Children with certain developmental challenges, such as early cognitive delays, seem to particularly benefit from an integration of emotion coaching with more didactic interaction that also emphasizes instruction in problem-solving, promotion of motivation/persistence, and attentional refocusing. This form of co-regulatory “scaffolding” has predicted social-skill development across the period of school entry in young children with early developmental delays (Baker et al. 2007), and may reduce the probability of later intellectual disability through its positive effect on the acquisition of adaptive behavior (Fenning and Baker 2012).

Children are believed to move from being primarily co-regulated by parents in infancy toward an internalization of relevant processes, eventuating in independent regulation (Calkins 1994; Kopp 1982, 1989). Consistent with theoretical accounts suggesting that parental environments characterized by responsive involvement, sensitive structuring, and support for child autonomy facilitate a shift from external to internal regulatory control (Grolnick and Farkas 2002), Norona and Baker (2014) provided support for the importance of scaffolding to children’s emotion regulation utilizing a carefully controlled cross-lagged design across middle childhood. Little is known about the degree to which internalization processes may operate similarly or differently for children with ASD. The few somewhat relevant studies have produced mixed evidence, with concurrent links reported between parent co-regulatory quality and response to distress in toddlers with ASD (Gulsrud et al. 2010), but the absence of links observed between parent–child emotion discussion and regulation strategies generated independently by school-aged children with ASD (Ting and Weiss 2017). The aforementioned study by Fenning et al. (2018) found that parental co-regulatory scaffolding during a dyadic challenge task was related to observed child dysregulation *in the moment*, but was unrelated to the children’s dysregulation during an *independent* frustration task. Given that these children were generally within the age range for which some internalization of parent co-regulatory efforts would have been expected for children with neurotypical development (Kopp 1982), the authors speculated that this process may be significantly delayed for children with ASD.

Fenning et al. (2018) reported that main effects of child age on dysregulation were not present and that the primary findings associating ASD symptoms with dysregulation did not differ significantly by child age; however, consideration of age-related differences in the apparent internalization of parental efforts was beyond the scope of the original study. The current study utilized the wide age range of this sample in order to apply a cross-sectional approach to examine age differences in processes related to the development of emotion regulation in children with ASD. We proposed that internalization of parent co-regulatory support would be observed with increased child age, as evidenced by (1) increased stability of dysregulation across dyadic and independent contexts (suggestive of increased autonomous engagement of externally-supported processes), and (2) a stronger inverse relation between parent co-regulatory scaffolding and children's independent dysregulation (Grolnick and Farkas 2002). We also considered the degree to which any evidence of internalization could be accounted for by cognitive maturation (represented by higher child *mental* age) rather than indexing environmental exposure over time, which would be suggested from chronological age.

Method

Participants

The original Fenning et al. (2018) study included 46 community-recruited children with ASD between the ages of 4 and 11 years (80% male) and their primary caregivers. The sample was diverse with regard to cognitive and ASD symptom levels (see Table 1), and race/ethnicity (44% Caucasian, non-Hispanic, 24% Hispanic, 11% Asian American, 9% African American, 11% multi-racial or "other"). See Fenning et al. (2018) for additional sample characteristics.

Procedures

All procedures were approved by our institutional review board. The children and caregivers engaged in a series of established laboratory tasks, which included the focal dyadic and independent regulation tasks. A licensed clinical psychologist with expertise in ASD also performed direct assessments of children's intellectual functioning and ASD-related symptoms. A detailed description of all study procedures can be found in Fenning et al. (2018).

Regulation Tasks—(Fenning et al. 2018). For the dyadic co-regulation task, the parents and children were provided with 32 colorful block tiles and a photo of a completed fish puzzle, and the child was instructed to make the structure depicted in the photo. The parent was asked to let the child try it on his or her own, and then to provide any help that the parent deemed necessary (Baker et al. 2007). Children also participated alone in a "locked box" independent regulation task in which the child was asked to retrieve a desired toy from a locked translucent hard-plastic box using a key chain with several non-functional keys (Goldsmith et al. 2001; Jahromi et al. 2012). Each task was five-minutes long.

Measures

Control Variables (Fenning et al. 2018)—Estimated child IQ and mental age were obtained using the Stanford-Binet Intelligence Scales-5th Edition ABIQ (Roid 2003). Level of ASD symptoms was indexed through the comparison score of the Autism Diagnostic Observation Schedule-2 (ADOS-2; Lord et al. 2012). A score of one is indicative of minimal to no evidence of ASD-related symptoms, and ten reflects a high level of symptoms.

Child Age—Parents provided their children's birthdate on a demographic questionnaire and age in months was derived by subtracting the birthdate from the date of the visit.

Emotion Dysregulation—The quality of child emotion regulation was coded from videotape using the Dysregulation Coding System (Hoffman et al. 2006). Derived from parameters presented by Cole et al. (1994), the system was designed to measure key indices of dysregulation, including overall lability and soothability as well as the appropriateness of the type, duration, and intensity of emotional expressions. The system also measures the behavioral manifestation of poor regulatory control that impedes task engagement. The overall dysregulation scores range from zero (*no evidence of dysregulation*) to four (*significant dysregulation*). A emotion dysregulation score of one reflects a low degree of dysregulation and describes individuals who: (a) displayed only one or two brief emotional expressions that were inappropriate to the situation and who were able to regroup or (b) displayed one or two brief instances of emotional lability and/or variability in intensity of emotional expression and recovered quickly from inappropriate emotional experiences. Behaviorally, a child receiving a score of one displayed only one or two brief interfering behaviors during the segment, with no instances of intense behavior disruption. In contrast, a score of four was provided to children showing significant dysregulation evidenced by several intense emotional expressions or less intense but frequent emotional expressions for the majority of the segment. Children receiving a score of four were virtually unable to regroup and were very labile, showing extreme variability in the intensity of emotion and/or very slow recovery from emotional experiences. The children who received the highest rating also displayed several intense disruptive behaviors or displayed less intense, but frequent disruptive behaviors for the majority of the segment. Emotion and behavior dysregulation scores were averaged for each child to obtain an overall dysregulation score. See Fenning et al. (2018) and additional studies (e.g., Baker et al. 2007; Hoffman et al. 2006) for further details, including psychometric support for the use of this system with children with neurodevelopmental disorders. Interrater reliability for the present study was based upon 30% of tapes and resulted in an intraclass correlation (*ICC*) of .90.

Scaffolding—Parental co-regulatory support was coded from videotapes of the dyadic task using the parental scaffolding observation system (Baker et al. 2007; Hoffman et al. 2006). This system considers parents' ability to provide motivational (e.g., focusing attention, fostering enthusiasm, encouraging mastery), emotional (affective attunement, emotional encouragement, emotion coaching), and technical support (instruction, graduated prompting) to their children during a challenging activity. Scores for each type of support range from one (*very low or absent support*) to five (*characteristically high support*), and are averaged for the overall composite score. This system has demonstrated reliability and validity for

children with ASD (Baker et al. 2018; Fenning et al. 2018; Gulsrud et al. 2010; Ting and Weiss 2017), and inter-rater reliability for the current study based on 43% of cases was $ICC = .73$.

Data Analysis

Two linear regressions were used to test study hypotheses. The first regression predicted children's independent dysregulation from any necessary control variables, child age, dyadic dysregulation, and the interaction term of the latter two continuous variables. Scaffolding replaced dyadic dysregulation in the second regression. Follow-up analyses for significant interactions were conducted in accordance with common guidelines and involved estimation of the relevant simple slopes at the average value of the moderator (age) and at $+1\ SD$ and $-1\ SD$ from the mean (Aiken and West 1991; Roisman et al. 2012).

Results

As reported in Fenning et al. (2018), one family needed to end the visit early and did not complete the majority of the tasks, and independent regulation data were missing for two additional children due to difficulties understanding the task. The latter two children were retained in the current sample by estimating the missing data using multiple imputation across five data sets.

The full range of scores were coded for scaffolding (1–5), and dysregulation in each context (0–4), with means and SD s noted in Table 1. Although the tasks and ages differed, scaffolding scores in the current study were roughly consistent with those obtained for parents of early school-aged children with and without early developmental delays, and dysregulation scores for the dyadic task fell between those reported for these two child groups (Norona and Baker 2014). As reported in Fenning et al. (2018), children's ASD symptoms demonstrated the clearest associations with children's dysregulation, and were therefore controlled in the current analyses. No other demographic variable was significantly related to independent dysregulation. The original study also reported the significant bivariate association between dyadic and independent dysregulation, and that parental scaffolding was related to dyadic, but not to independent, dysregulation (Table 1; Fenning et al. 2018). Average estimated mental age (ABIQ age equivalent) was 5.77 years ($SD = 2.37$ years, range = 2–10.5 years).

The first regression revealed an interaction between child age and dyadic dysregulation (Table 2), with a stronger positive association present between dysregulation with and without the parent for older children (estimated at $+1\ SD$ of age), $t = 2.48$, $p = .017$, as compared to children in the middle, $t = 1.21$, $p = .234$, or younger age range, $t = -.87$, $p = .388$ (Fig. 1). Regions of significance were calculated to estimate the values of age at which the association became significant (Roisman et al. 2012). Findings suggested that cross-context consistency occurred at around age seven and a half years (7.63 years).

Child age also moderated the relation between parental scaffolding and children's independent dysregulation (Table 2), with a stronger negative association observed with increased age (Fig. 2). Although the interaction was significant and the moderation effect

was in the hypothesized direction, the simple slope estimated at $+1$ *SD* above the mean age was significant at only a trend level, $t = -1.91$, $p = .063$. As predicted, the associations were less strongly negative for children in the middle, $t = -.85$, $p = .401$, and younger age ranges, $t = 1.15$, $p = .226$. Despite a high correlation with chronological age, $r = .72$, $p < .001$, estimated mental age did not similarly moderate the association between scaffolding and children's independent dysregulation, $t = -.59$, $p = .556$, nor did it predict differential stability in dysregulation across settings, $t = .74$, $p = .465$.

Discussion

The current cross-sectional re-analysis of data from Fenning et al. (2018) suggested some evidence for internalization of parental co-regulatory support in the development of emotion regulation in school-aged children with ASD. In this sample of children between the ages of 4 and 11 years, higher child age was associated with more consistency in dysregulation scores across parent-child and independent contexts, and a stronger inverse relation between parent scaffolding quality and children's independent dysregulation. This effect was not replicated using children's mental age as a substitute for chronological age, suggesting that exposure over time to parental support may account for these associations rather than simply cognitive maturation.

Evidence of greater correspondence between externally-supported and autonomous regulatory quality with age suggests that processes of internalization conceptualized for children with neurotypical development may take on a similar form for children with ASD (Grolnick and Farkas 2002). However, although an increased inverse association between parental scaffolding and children's independent dysregulation was observed as a function of higher child age, this association was only significant at the level of a trend, even when estimated at one standard deviation above mean age (approximately 8.81 years). This trajectory suggests that the independent regulation abilities of children with ASD may eventually demonstrate some concordance with the quality of parent co-regulatory support, but that this process exhibits a substantial lag as compared to what would be expected of children with neurotypical development (Grolnick and Farkas 2002; Kopp 1982), perhaps not occurring until much later in middle childhood. Although replication is necessary, these results validate the experience of some parents of children with ASD regarding an apparent disconnect between the quality of support they provide and their children's independent regulation. The findings also offer hope that the influence of parental efforts upon children's regulatory functioning may manifest more completely later in development. Additionally, as noted in Fenning et al. (2018), the potential developmental lag in the internalization of regulatory processes may help to explain why so many children with ASD benefit from, or even require, continued one-to-one support in settings that typically demand more independent regulation in early and middle childhood (e.g., school).

Although the identification of age-related differences through cross-sectional analysis can serve as a proxy for development, only longitudinal designs can truly investigate change over time. Similarly, it remains possible that causality may be reversed in the associations under consideration such that increased consistency in children's dysregulation across settings may have driven relations between children's independent regulation and parental

scaffolding rather than vice versa (e.g., parents reacting to their children's dysregulated behavior). Nonetheless, the identification of increased consistency across these factors is intriguing and represents an important first step in understanding the role of parenting in the emotional development of children with ASD over time. Prospective longitudinal studies that examine the potential bidirectionality of parent support and children's regulatory abilities are needed.

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Fig. 1.
Child age as a moderator for the coherence between dyadic and independent dysregulation

Fig. 2. Child age as a moderator for the association between parental scaffolding and children's independent dysregulation

Table 1

Descriptive statistics and correlations among variables of interest

	1	2	3	4	5	<i>M (SD)</i>
1. Age in months	–					81.51 (24.18)
2. IQ	–.04	–				84.73 (22.71)
3. ASD symptom level	.03	–.26 ⁺	–			7.20 (2.17)
4. Dysregulation: dyadic	–.24	–.33 [*]	.38 [*]	–		1.02 (1.21)
5. Dysregulation: independent	–.08	–.08	.44 ^{**}	.36 [*]	–	1.83 (1.11)
6. Parental scaffolding	–.06	.23	–.11	–.38 [*]	–.13	3.33 (1.12)

ASD Autism spectrum disorder⁺
p < .10^{*}
p < .05^{**}
p < .01

Table 2

Linear regressions predicting children's independent dysregulation

Independent dysregulation					
	<i>B</i>	<i>SE</i>	β	<i>t</i>	<i>p</i> <i>R</i> ²
<i>Regression 1</i>					
ASD symptom level	.213	.075	.42**	2.83	.005
Child age	-.001	.007	.03	-.22	.826
Dyadic dysregulation	.305	.254	.19	1.20	.231
Child age $\times$ dyadic dysregulation	.025	.010	.33*	2.43	.015
<i>Regression 2</i>					
ASD symptom level	.230	.071	.45**	3.25	.001
Child age	-.002	.007	-.04	-.26	.797
Parental scaffolding	-.119	.140	-.12	-.085	.397
Child age $\times$ parental scaffolding	-.014	.007	-.30*	-1.99	.047

ASD Autism spectrum disorder. Standardized betas and *R*² scores are pooled (averaged) across the five imputations. Confidence intervals for the significant interactions involving dyadic dysregulation and scaffolding were .005 to .045, and -.027 to -.000, respectively

* *p* < .05

** *p* < .01