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Special Issue Article

Early adversity and children's emotion regulation: Differential roles of parent emotion regulation and adversity exposure

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Abstract

Exposure to early life adversity (ELA) is associated with increased rates of psychopathology and poor physical health. The present study builds on foundational work by Megan Gunnar identifying how ELA results in poor long-term outcomes through alterations in the stress response system, leading to major disruptions in emotional and behavioral regulation. Specifically, the present study tested the direct effects of ELA against the role of parent socialization to shed light on the mechanisms by which ELA leads to emotion regulation deficits. Children ages 4–7 years ($N = 64$) completed interviews about their experiences of deprivation and threat, a fear conditioning and extinction paradigm, and an IQ test. Parents of the children completed questionnaires regarding their own emotion regulation difficulties and psychopathology, their children's emotion regulation, and child exposure to adversity. At the bivariate level, greater exposure to threat and parental difficulties with emotion regulation were associated with poorer emotion regulation in children, assessed both via parental report and physiologically. In models where parental difficulties with emotion regulation, threat, and deprivation were introduced simultaneously, regression results indicated that parental difficulties with emotion regulation, but not deprivation or threat, continued to predict children's emotion regulation abilities. These results suggest that parental socialization of emotion is a robust predictor of emotion regulation tendencies in children exposed to early adversity.

Keywords: abuse, DMAP, early adversity, emotion regulation, neglect, socialization

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The field of early life adversity (ELA) has seen a recent surge of empirical work focused on understanding how ELA impacts children's developmental trajectories and ultimately the health and well-being of individuals across the lifespan. Moreover, clinicians and policy makers are placing increased attention on the critical role of ELA in the development of psychopathology and rates of morbidity and mortality (e.g., About Adverse Childhood Experiences, 2019). In part, this increased focus is the direct result of pioneering work by Megan Gunnar examining how ELA shapes biological risk, particularly the stress response system, leading to major disruptions in emotional and behavioral regulation (Gunnar, Frenn, Wewerka, & Van Ryzin, 2009; Gunnar & Quevedo, 2007, 2008; Gunnar & Vazquez, 2001; Gunnar, Wewerka, Frenn, Long, & Griggs, 2009, 2010; Hostinar, Sullivan, & Gunnar, 2014; Loman & Gunnar, 2010; Tarullo, Bruce, & Gunnar, 2007; Tarullo & Gunnar, 2006; Tottenham et al., 2010). Here we build on this groundwork laid by Megan Gunnar by examining specific forms of adversity exposure and how they differentially relate to deficits in emotion regulation, including those measured using physiology. We adopt a recent model intended to account for differential effects of adversity types, the Dimensional Model of Adversity and Psychopathology (DMAP; McLaughlin, Sheridan, & Lambert, 2014; Sheridan & McLaughlin, 2014). Within this model, exposure to threat (e.g., physical abuse, violence) is expected to be associated with enhanced emotion reactivity and reduced emotion regulation. Conceptually within the DMAP model, threat exposure during childhood is expected to directly impact emotion regulation capabilities because it provides enhanced learning opportunities about violence exposure during early childhood when neural systems are maximally plastic (McLaughlin & Sheridan, 2016; McLaughlin, Sheridan, & Lambert, 2014). This early learning is expected to result in alterations in neural systems which support emotion reactivity and regulation (McLaughlin, Peverill, Gold, Alves, & Sheridan, 2015). However, a number of studies have posited that, particularly when threat takes the form of family violence, it is not the actual exposure to violence, per se, but the accompanying lack of appropriate socialization around emotion regulation which leads children to exhibit deficits in emotion regulation (Eisenberg, Cumberland, & Spinrad, 1998). In this conceptualization, it is the implicit (modeling of emotion regulation) and explicit (teaching of emotion regulation strategies) behaviors whereby children learn when and how to regulate emotions, which matter most (Peisch, Dale, Parent, & Burt, 2019;

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Rogers, Halberstadt, Castro, MacCormack, & Garrett-Peters, 2016; Shipman & Zeman, 2001). The present study tests the direct effects of adversity against the role of parent's own emotion regulation tendencies, as a marker of parental socialization, to shed light on the mechanisms by which ELA leads to emotion regulation deficits.

Emotion regulation deficits and early adversity exposure

Findings on emotion regulation in children exposed to adversity are almost universally consistent, with studies generally concluding that regardless of age, gender, or ethnicity, adversity-exposed children have poorer emotion regulation relative to nonexposed children (Chang, Schwartz, Dodge, & McBride-Chang, 2003; Ellis, Alisic, Reiss, Dishion, & Fisher, 2014; Hébert, Langevin, & Oussaïd, 2018; Kim & Cicchetti, 2009, 2010; Kim-Spoon, Cicchetti, & Rogosch, 2013; Maughan & Cicchetti, 2002; Milojevich, Levine, Cathcart, & Quas, 2018; Romens & Pollak, 2012; Shields & Cicchetti, 1998; Shields, Cicchetti, & Ryan, 1994; Thabet, Tischler, & Vostanis, 2004). Moreover, in studies that have measured children's use of specific emotion regulation strategies, findings indicate that adversity-exposed children tend to use maladaptive regulation strategies, such as disengagement, expressive suppression, and rumination, more frequently and use effective strategies, including cognitive reappraisal, less often than nonexposed children (Boyes, Hasking, & Martin, 2016; Epstein-Ngo, Maurizi, Bregman, & Ceballo, 2013; Maughan & Cicchetti, 2002; Milojevich et al., 2018; Robinson et al., 2009). To date, most studies on early adversity exposure and emotion regulation have examined children exposed to maltreatment, with less research considering other types of adversity or comparing across exposure types. Within child maltreatment, studies often combine across subtypes (e.g., physical abuse, neglect) to create a single maltreated sample, which is then compared to a nonmaltreated comparison sample of matched controls (Alink, Cicchetti, Kim, & Rogosch, 2009; Kim-Spoon et al., 2013; Milojevich et al., 2018; Shields et al., 1994). As such, little is known about the relative contribution of various forms of adversity exposure to children's emotion regulation or the impact of adjacent variables such as parent emotion socialization.

Direct effects of early adversity on children's emotion regulation

A useful conceptual framework for studying the direct effects of early adversity exposure is DMAP (McLaughlin, Sheridan, & Lambert, 2014; Sheridan & McLaughlin, 2014). Within DMAP, a central distinction is made between adverse experiences, which are characterized by deprivation and threat. Importantly, although exposure to deprivation and threat may co-occur for children, DMAP posits that these dimensions can be measured separately and have unique effects on developmental outcomes. *Deprivation* is the absence of species- or age-expectant cognitive and social inputs (McLaughlin, Sheridan, & Lambert, 2014; Sheridan & McLaughlin, 2014, 2016). Exposure to *threat*, on the other hand, refers to the presence of atypical events in which a child experiences actual or threatened physical harm. These dimensions encompass numerous adverse experiences that share an underlying exposure to threat or deprivation to a varying degree. For instance, threat is a primary feature of physical abuse, sexual abuse, and community violence, whereas deprivation is a primary feature of neglect, institutionalization, and the lack of psychosocial stimulation that can occur in poverty.

Of note, DMAP specifies unique emotional, cognitive, and neurobiological pathways linking early dimensions of experience with developmental outcomes. Exposure to deprivation is hypothesized to be selectively linked with age-specific reductions in complex cognitive function. In contrast, exposure to threat leads to changes in neural circuits that underlie emotion reactivity and regulation, resulting in changes in fear learning and enhanced reactivity to negative affective stimuli. Evidence suggests that, in models where both exposures are simultaneously included, exposure to threat is uniquely associated with deficits in automatic and deliberate emotion regulation processes, altered emotion reactivity, and disrupted fear learning, while exposure to deprivation is uniquely linked to poor cognitive control, working memory, and language ability (Busso, McLaughlin, & Sheridan, 2016; Lambert et al., 2017; McLaughlin et al., 2016; Miller et al., 2018; Milojevich, Norwalk, & Sheridan, 2019; Sheridan, Peverill, Finn, & McLaughlin, 2017). Many of these studies have used exposure to physical and sexual abuse as primary indicators of threat exposure.

Parent socialization of emotion regulation

Importantly, children exposed to physical and sexual abuse, and other forms of adversity, tend to have parents who display ineffective regulation strategies (Criss, Morris, Ponce-Garcia, Cui, & Silk, 2016; Kliewer et al., 2006; Shipman et al., 2007), produce less prototypical facial expressions of emotions (Camras et al., 1988), report greater expression of negative emotions (Raver & Spagnola, 2002), and are less accurate in recognizing facial expressions of emotions (Balge & Milner, 2000). In maltreatment contexts, parents also often fail to teach their children effective ways to reduce distress and negative feelings, and instead respond by invalidating their children's feelings or neglecting them in emotional situations (Shipman et al., 2007).

Parents are a crucial source of environmental input and, as such, have a profound impact on the ways in which children come to learn about emotions and how to alter emotional reactions (Brophy-Herb, Stansbury, Bocknek, & Horodynski, 2012; Chaplin, Cole, & Zahn-Waxler, 2005; Denham, Zoller, & Couchoud, 1994; Dunsmore, Booker, & Ollendick, 2013; Dunsmore, Her, Halberstadt, & Perez-Rivera, 2009; Dunsmore & Karn, 2001; Eisenberg et al., 1998; Halberstadt, Fox, & Jones, 1993; Katz & Rigterink, 2012; Kliewer et al., 2006; Meyer, Raikes, Virmani, Waters, & Thompson, 2014; Perez Rivera & Dunsmore, 2011; Shaffer, Suveg, Thomassin, & Bradbury, 2012). For one, children constantly observe their parents' emotional displays and interactions and how parents express and manage their emotions (Brophy-Herb et al., 2012; Halberstadt et al., 1993) and learn about emotion regulation through these observations (Morris et al., 2011). Children of parents who display effective emotion regulation are more likely to learn about successful emotion regulation strategies and the appropriateness of specific emotions across multiple contexts. In contrast, children of parents who utilize ineffective regulation strategies may struggle to appropriately regulate their emotions (Bariola, Gullone, & Hughes, 2011, 2012). Other forms of parental socialization of emotion regulation include parents actively teaching their children about emotion regulation through conversations about emotional events and strategies to cope with emotions (Cole, Dennis, Smith-Simon, & Cohen, 2009; Ellis et al., 2014; Morris et al., 2011; Shaffer et al., 2012), as well as the overall emotional climate of the family (Davies & Cummings, 1994; Fosco & Grych, 2013;

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Table 1. Descriptive statistics for the sample

	Minimum	Maximum	Mean	*SD*
Age in Months	51	95	74.14	14.06
IQ	61	131	99.60	15.27
Parent Total Symptoms	0	172	26.59	40.21
Deprivation	−3.92	6.06	.00	2.15
Threat	−2.60	7.63	.00	2.33
Child Emotion Regulation	16	32	26.62	4.17
Child Negativity/Liability	15	47	26.23	7.04
Parent Total DERS	36	116	68.86	20.31
	Percentage	*N*		
Female	57.1	36		
Race				
African American	34.9%	22		
White	50.8%	32		
Multiracial	11.1%	7		
Other	3.2%	2		

Note. Parent Total Symptoms is the Positive Symptoms Total from the SCL-90 (Derogatis et al., 1973), which indicates the total number of self-reported symptoms of psychopathology. Parent Total DERS reflects parents' total score on the Difficulties with Emotion Regulation Scale (Gratz & Roemer, 2004). Child Emotion Regulation and Negativity/Liability were children's scores from the parent-report Emotion Regulation Checklist (Shields & Cicchetti, 1995).

Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002; Gottman & Katz, 1989; Milojevich & Haskett, 2018; Sturge-Apple, Davies, Cicchetti, & Manning, 2012).

In sum, while direct exposure to family violence could shape future emotion reactivity and regulation via the basic learning mechanisms proposed by DMAP, it is also possible that children exposed to early adversity simply lack a crucial source of environmental input about emotions and may be taught poor emotion regulation strategies because of their parent's own compromised emotion regulation profile. In one study that examined parent socialization (specifically the family emotional climate) in a sample of exclusively threat-exposed children, parent socialization was a consistent predictor of children's emotional functioning both concurrently and longitudinally across a span of three years (Milojevich & Haskett, 2018).

Current study

The present study examined the relative contributions of parent socialization and the direct effects of adversity on children's emotion regulation in a sample of 4–7-year-olds. We focused on parental modeling, as one form of parent socialization, assessed via parent's own difficulties regulating emotions, in line with previous socialization research (Kliewer et al., 2006; Meyer et al., 2014). Parents who have difficulty regulating their own emotions model ineffective, maladaptive strategies, which their children may in turn imitate (Bariola, Hughes, & Gullone, 2012). Moreover, because young children may struggle to accurately report on their emotion regulation (Cole, Martin, & Dennis, 2004), we included both parent-report and physiological measures of children's emotion regulation.

Consistent with the extant adversity literature and DMAP predictions, we hypothesized that, at the bivariate level, parent socialization and threat, but not deprivation, would be associated with children's emotion regulation. To date, however, no study has examined the differential roles of parent socialization, deprivation, and threat on children's emotion regulation. We hypothesized that in models where parent socialization, deprivation, and threat were all simultaneously included, parent socialization, but not deprivation or threat, would continue to predict children's emotion regulation.

Method

Participants

Children ($N = 64$) aged 4–7 years old ($M = 74.14$ months, $SD = 14.06$; 57.1% female) and a parent or legal guardian participated in the current study, which was conducted in a rural and suburban region in the southeast United States. Table 1 presents descriptive data on the sample. Slightly more than half of the children were White and about a third were African American. The remaining children identified as multiracial or another race or ethnicity. Roughly 12% were Hispanic or Latinx. Nearly 35% of the families were living below 200% of the poverty line, as defined by an income-to-needs ratio below 2. In 25% of the families, parents had completed less than a high school degree.

Participants were recruited across 1.5 years using approaches to target families with low socioeconomic status (SES) through listservs, ad postings, other studies recruiting low socioeconomic status populations, and screening procedures previously detailed (Machlin, Miller, Snyder, McLaughlin, & Sheridan, 2019). Parents or legal guardians provided written consent in accordance with the Institutional Review Board. If children were 7 years old at the time of participation, they provided written assent. Otherwise, they provided verbal assent to study procedures. Exclusion criteria for the study included major medical conditions, neurological illness, and diagnosis of a pervasive developmental disorder (e.g.,

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autism, Down syndrome). Children were not excluded from the study for other diagnoses of psychopathology or psychological treatment.

Procedures

The study was completed in one three-hour visit to a psychology laboratory. After consent/assent procedures, parents of children in the study completed questionnaires assessing demographic information, symptoms of psychopathology in the parent, child exposure to threatening and depriving experiences. Children completed an IQ test, interviews about their experiences of deprivation and threat, and a fear conditioning and extinction paradigm. Following the study visit, parents completed additional questionnaires online using Qualtrics assessing parent emotion regulation and child emotion regulation abilities.

Out of 64 initial participants, one child who participated in the study was unable to complete any component of the study due to behavioral issues. In addition, parent and child emotion regulation questionnaire data were missing for seven children due to lack of completion of questionnaires at home. Thus, 56 children had complete questionnaire data. Regarding fear conditioning data, out of the 63 children with any usable data, seven children aborted the task or did not consent to complete the task. Due to technical problems, data from an additional six children were unusable. As a result, 50 children had usable data from fear extinction.

Measures

IQ

IQ was assessed through administration of the Kaufman brief intelligence test (KBIT-2), which is a brief measure of verbal and nonverbal cognitive abilities for children as young as 4 years old. Reliability of the composite IQ score from the KBIT-2 is 0.93 in a normative sample (Bain & Jaspers, 2010).

Parent emotion regulation

Parent emotion regulation was measured by the total score on the Difficulties in Emotion Regulation Scale (DERS), a widely used self-report measure of emotion regulation ability (Gratz & Roemer, 2004). Prior research has found that the DERS has high internal consistency in normative and treatment-seeking populations and good test–retest reliability (Gratz & Roemer, 2004; Hallion, Steinman, Tolin, & Diefenbach, 2018). The DERS has high internal consistency (Cronbach's alpha = 0.81 in the current sample).

Parental psychopathology

Parental psychopathology was measured by the Symptom Checklist-90 (Derogatis, Lipman, & Covi, 1973), a 90-item self-report measure used to measure psychological symptoms with high internal consistency and reliability (Cronbach's alpha = 0.98 in the current sample).

Child emotion regulation

Child emotion regulation was assessed using the Emotion Regulation Checklist (ERC), which is a parent report of child emotion regulation with high internal consistency in prior studies (Shields & Cicchetti, 1995). The present study utilized the subscales for liability/negativity and emotion regulation (Cronbach's alpha = 0.87 for liability/negativity and 0.82 for emotion regulation in the current sample). Higher scores reflect greater liability/negativity and better emotion regulation, respectively.

Child exposure to threat

Threatening experiences were comprised of a score derived from three measures that were standardized by a z score and then summed to create a total threat score. First, the children's exposure to violence was measured using the Violence Exposure Scale for Children interview measure (VEX-R), which uses cartoon items to assess children's exposure to abuse, domestic violence, and witnessing community violence (Fox & Leavitt, 1995). The current study utilized the sum of the total items in which children reported on exposure to violence perpetrated by a teenager or an adult (Cronbach's alpha = 0.81 in the current sample). Second, domestic violence was assessed using the Conflict Tactics Scale (CTS-2), a parental report of domestic violence in the home (Straus, Hamby, Boney-McCoy, & Sugarman, 1996). The sum of items on physical assault, psychological aggression, injury, and sexual coercion were used in the present study (Cronbach's alpha = 0.94 in the current sample). Third, the statistical likelihood of physical abuse was measured using the Child Abuse Potential Inventory (CAPI), a parent-report that screens for parental attitudes associated with child abuse (Milner, Charlesworth, Gold, Gold, & Friesen, 1988). The total sum score of Child Abuse Scale was used in the present study (Cronbach's alpha = 0.90 in the current sample).

Child exposure to deprivation

Experiences of deprivation were comprised of a score derived from three measures that were standardized by a z score and then summed to create a total deprivation score. First, child neglect was assessed using the Multidimensional Neglectful Behavior Scale (MNBS-CR), which uses cartoon images to assess neglect. The reliability of the MNBS-CR ranges from 0.66 to 0.94 depending on the sample (Kantor et al., 2004). The current study utilized the sum of the emotional neglect, cognitive neglect, physical neglect, supervisory neglect, and abandonment items (Cronbach's alpha = 0.71 in the current sample). Second, cognitive stimulation was measured using the Home Screening Questionnaire, which is a parent-report based on the Home Observation for the Measurement of the Environment (HOME) for use in a laboratory setting (Bradley, Caldwell, & Corwyn, 2003; Frankenburg & Coons, 1986). The HSQ has good test-retest reliability (Frankenburg & Coons, 1986). The current study used the sum of the HSQ with five items removed that assessed spanking and parental decision-making in the household (Cronbach's alpha = 0.77 in the current sample). Third, parental education was measured as the average of educational attainment for both caregivers of a child or one caregiver if there was one primary caregiver. Possible responses ranged from "Less than high school diploma (1)" to "Professional degree (5)" (Adler & Stewart, 2007).

Fear extinction paradigm

Children completed a block-design fear conditioning and extinction paradigm using a loud sound as the aversive stimuli (UCS) designed for young children. The paradigm has separate blocks of reinforced threat cues (UCS), nonreinforced threat cues (CS+), and stimuli unassociated with the unconditioned stimulus (CS−). Block-design fear conditioning paradigms have been successfully used to show differential fear conditioning in preschool-age children (Jovanovic et al., 2014; Silvers et al., 2016). Children viewed 12 stimulus blocks during acquisition: four blocks of the reinforced

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Table 2. Correlations among main predictor and child regulation scores

	Emotion Regulation	Negativity/Liability	Early SCR Extinction	Late SCR Extinction
Deprivation	−.20	.05	.03	.02
Threat	**−.29***	.20	**.32***	.07
Age	−.23	.12	.08	.08
Sex	.25	**−.38****	−.10	−.09
IQ	**−.28***	**.27***	.17	.17
Parent Total Symptoms	−.16	.13	**.30***	.15
White	−.01	.21	−.01	.05
African American	.05	−.25	−.13	−.03
Parent Total DERS	**−.46****	**.62****	**.31***	.08

Note. Sex: female = 1, male = 0; *p < .05; **p < .01.
DERS = Difficulties in Emotion Regulation Scale; SCR = skin conductance response

threat cues (UCS) with a reinforcement rate of 80%, four blocks of the nonreinforced threat cues (CS+), and four blocks of the CS−. The first three blocks of fear acquisition were presented in the following order for all participants: CS−, UCS, and CS+. Blocks were randomized after the first three blocks. During extinction, children viewed eight randomized stimulus blocks: four blocks of the CS+ (non-reinforced threat cues) and four blocks of the CS−. On 2/10 of trials across blocks, children pressed to a dot to ensure attention during the task.

Fear learning was measured by the amplitude of skin conductance response (SCR) across fear acquisition and extinction. Skin conductance was measured through two electrodes filled with sodium chloride gel attached to the palm of the left hand. Data were sampled at 1,000 Hz. Data were filtered and preprocessed using Mindware. SCR was calculated with a minimum response of 0.05 μs (Braithwaite, Watson, Jones, & Rowe, 2013). All data were visually inspected and edited if needed to verify peaks in skin conductance. A range correction was done to correct for inter-individual variance by dividing each skin conductance amplitude value by the maximum skin conductance value for each participant and conducting a square root transformation of the data after range-correction (Boucsein, 2012; Lykken, 1972; Lykken & Venables, 1971). The four blocks of fear acquisition and fear extinction were divided into early blocks (Blocks 1–2) and late blocks (Blocks 3–4) based on prior literature (Jovanovic et al., 2014; McLaughlin et al., 2016).

The present study utilized data from early and late blocks of fear extinction to evaluate emotion regulation following fear conditioning. Prior frameworks have identified fear extinction processes within implicit, automatic emotion regulation processes (Braunstein, Gross, & Ochsner, 2017; Mauss, Bunge, & Gross, 2007). Automatic emotion regulation processes typically involve affective learning, where a person updates information about a stimulus due to a shift in the context associated with a stimulus, as seen in fear extinction (Braunstein et al., 2017). Data from the early and late blocks of fear acquisition have been published previously (Machlin et al., 2019).

Data analytic plan

Correlations were examined between all study variables. Then, multiple linear regression models were used to predict child emotion regulation separately for each measure of child emotion regulation. In the first set of models, child emotion regulation was measured by the two subscales of the ERC. In the second set of models, child emotion regulation was measured by the amplitude of SCR to the CS+ relative to the CS− during fear extinction. Separate regression models were conducted for early and late fear extinction. All models were conducted in a stepwise manner. First, we tested deprivation and threat as separate predictors of children's emotion regulation controlling for age, gender, IQ, and parental psychopathology. Second, we tested whether parents' difficulties with emotion regulation predicted child emotion regulation, above and beyond children's exposure to deprivation and threat, again controlling for relevant covariates.

Results

Bivariate associations

Correlations among potential predictor variables and child emotion regulation scores are presented in Table 2. First, greater threat, higher IQ, and more parental difficulties with emotion regulation were associated with lower scores on the emotion regulation subscale of the ERC. Second, being male, higher IQ, and more parental difficulties with emotion regulation were associated with greater negativity/liability on the ERC. Finally, greater exposure to threat, more parental symptoms of psychopathology, and more parental difficulties with emotion regulation were associated with higher amplitudes of SCR to the CS+ versus CS− during early fear extinction, which suggests less extinction of the differential skin conductance response and is reflective of less automatic emotion regulation during fear extinction. No significant correlations were found for amplitudes of SCR during late fear extinction. Of note, exposure to deprivation and threat were not significantly correlated (r = .15, p = .23). Age, gender, IQ, and parent total symptoms of psychopathology were used as covariates in all analyses.

Parent socialization, dimensions of adversity, and children's emotion regulation

The primary goal of the present study was to examine whether dimensions of adversity exposure and parental socialization of emotion differentially predicted emotion regulation abilities in young children. In particular, we expected that, in models

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Table 3. Regression results for emotion regulation checklist

	Model 1				Model 2			
	Beta	*SE*	*t*	*p*	*Beta*	*SE*	*T*	*p*
Emotion Regulation								
Age	−.11	.04	−.92	.36	−.17	.04	−1.39	.17
Sex	.23	1.03	1.90	.06	.16	1.01	1.30	.20
IQ	−.37	.04	−2.87	**.01****	−.28	.03	−2.20	**.03***
Parent Total Symptoms	.33	.02	1.40	.17	.27	.02	1.18	.25
Deprivation	−.18	.25	−1.35	.19	−.19	.24	−1.46	.15
Threat	−.48	.42	−1.98	**.05***	−.30	.42	−1.23	.23
Parent Total DERS					−.34	.03	−2.52	**.02***
ΔR^2					**.08***			
Negativity/Liability								
Age	.05	.06	.36	.72	.13	.05	1.23	.23
Sex	−.41	1.74	−.31	**<.01****	−.28	1.51	−2.63	**.01***
IQ	.33	.06	2.55	**.01****	.18	.05	1.62	.11
Parent Total Symptoms	−.20	.04	−.83	.41	−.09	.03	−.46	.65
Deprivation	.06	.43	.42	.68	.07	.21	.57	.57
Threat	.27	.71	1.09	.28	−.04	.62	−.17	.87
Parent Total DERS					.56	.04	4.67	**<.01****
ΔR^2					**.23****			

Note. Sex: female = 1, male = 0; *$p \leq .05$; **$p \leq .01$.
DERS = Difficulties in Emotion Regulation Scale

where parent socialization, threat, and deprivation are all simultaneously included, parent socialization, but not threat or deprivation, would predict children's emotion regulation. As illustrated in Table 3, when considering children's emotion regulation based on the parent-report ERC, controlling for demographic factors, scores on the emotion regulation subscale differed significantly by threat exposure, with higher threat exposure being associated with poorer emotion regulation. In this model we also observed that greater IQ predicted poorer emotion regulation. However, once parental difficulties with emotion regulation was added to the model, threat was no longer significant. Instead, scores on the emotion regulation subscale differed significantly by parental difficulties with emotion regulation, such that children had poorer emotion regulation when their parents with more difficulty regulating their emotions. IQ remained a significant predictor.

For the negativity/liability subscale of the ERC, in Model 1, only sex and IQ emerged as significant predictors. Higher IQ was associated with more negativity/liability and boys were also rated as having more negativity/liability relative to girls. In Model 2, once again, parental difficulties with emotion regulation remained a significant predictor. Children had more negativity/liability when their parents reported greater difficulty regulating their own emotions.

Next, we examined whether adversity exposure and parental socialization of emotion differentially predicted physiological measures of emotion regulation. Given that the amplitude of SCR during late fear extinction was not associated with any of our main predictor variables at the bivariate level, we focused the regression analyses to early fear extinction. As shown in Table 4, in Model 1, extinction to the CS− was the only significant predictor. In Model 2, controlling for adversity exposure, demographic factors, and the amplitude of SCR to the CS−, amplitudes of SCR to the CS+ during early fear extinction differed significantly by parental difficulties with emotion regulation. Children had greater SCR amplitudes to the CS+ during early extinction when their parents with more difficulty regulating their emotions.[1]

Discussion

In the present study, we examined the relative contributions of parent socialization and the direct effects of adversity on children's emotion regulation in a sample of 4–7-year-olds. Consistent with hypotheses, we found that parent socialization, in the form of parental difficulties with emotion regulation, consistently predicted parent-report and physiological measures of children's emotion regulation. Moreover, in line with expectations, threat exposure was associated with children's emotion regulation, but these associations did not hold after accounting for parent socialization. Finally, in keeping with our hypotheses, deprivation was unrelated to children's emotion regulation.

We hypothesized, and found, that parents' difficulties with emotion regulation would be a consistent predictor of children's emotion regulation, over and above children's adversity exposure or parents' symptoms of psychopathology. Ample evidence

[1]Of note, for all three regression models we tested relevant interactions. Specifically, we tested Gender x Deprivation (and Threat), as well as Deprivation (and Threat) x Parental difficulties with emotion regulation interactions. None of the interaction models were significant.

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Table 4. Regression results for amplitude of SCR (skin conductance response) to the CS+ during fear extinction

	Model 1				Model 2			
	Beta	*SE*	*T*	*p*	*Beta*	*SE*	*t*	*p*
Early extinction								
Extinction to CS−	.71	.12	5.69	**<.01****	.75	.11	6.24	**<.01****
Age	.08	.00	.65	.52	.14	.00	1.18	.25
Sex	−.06	.06	−.51	.61	−.01	.06	−.01	.99
IQ	.16	.00	1.26	.22	.11	.00	.90	.38
Parent Total Symptoms	−17	.00	−.72	.48	−.11	.00	−.52	.61
Deprivation	.07	.02	.53	.60	.07	.01	.60	.55
Threat	.19	.02	.83	.42	.02	.02	.07	.95
Parent Total DERS					.27	.00	2.18	**.04***
					.05*			

Note. Sex: female = 1, male = 0; *$p < .05$; **$p \leq .01$.
DERS = Difficulties in Emotion Regulation Scale

demonstrates the role of parental modeling of emotion regulation on the development of emotion regulation abilities in both community samples of children and adversity-exposed children (Bariola et al., 2012; Brophy-Herb et al., 2012; Morris et al., 2011). Furthermore, Milojevich and Haskett (2018) found that, even in an exclusively threat-exposed sample, parental socialization is a strong, consistent predictor of children's emotional skills across development. One explanation for the robust link between parent socialization and children's emotion regulation is the chronic and pervasive nature of socialization – children see emotions modeled daily by their caregivers from the moment they are born and throughout their development. Threat and deprivation, though also potentially chronic, are likely not occurring at the same frequency. In addition, or perhaps alternatively, parents' and children's difficulties with emotion regulation might have a genetic component that is being captured in our measure of parent socialization. Future work is needed to tease apart genetic from socialization contributions. On a final note, it is important to point out that the findings between parent socialization and children's emotion regulation held for both parent-report and physiological measures of children's emotion regulation. This consistency in findings reduces concern over shared method variance and suggests that parental socialization is a particularly strong predictor of emotion regulation in children exposed to early adversity.

In line with this argument, we found, as expected, that although threat was associated with children's emotion regulation, this association did not hold after accounting for parents' emotion regulation difficulties. Threat exposure is undoubtedly detrimental to children's development and directly affects neural networks associated with emotion reactivity and regulation (Busso et al., 2016; Lambert et al., 2017; McLaughlin, Sheridan, Alves, & Mendes, 2014; McLaughlin, Sheridan, & Lambert, 2014; Miller et al., 2018; Milojevich et al., 2019). However, our findings suggest that threat may not be the primary mechanism behind emotion regulation difficulties in children exposed to adversity. Rather, threat-exposed children may have difficulties regulating their emotions in large part because abusive parents often fail to teach their children a range of appropriate and adaptive regulation strategies and instead model maladaptive, ineffective regulation strategies (Shipman et al., 2007). As such, threat-exposed children may not develop the regulation skills in emotionally-taxing situations and thereby experience deficits in emotion regulation.

Consistent with hypotheses from the DMAP and our previous work (Milojevich et al., 2019), even at the bivariate level, deprivation was unrelated to children's emotion regulation. Previous studies have found associations between certain forms of deprivation (e.g., neglect) and emotion regulation deficits in children (Kim & Cicchetti, 2010; Robinson et al., 2009; Shipman, Edwards, Brown, Swisher, & Jennings, 2005; Tottenham et al., 2010). Here we examine a wider range of deprivation exposures, in line with the conceptualization in the DMAP model, which focuses on the absence of species-expected learning experiences in cognitive and social domains. In addition, previous studies have compared deprivation-exposed children to nonexposed children, with children exposed to deprivation demonstrating poorer emotion regulation (Kim & Cicchetti, 2010; Robinson et al., 2009; Shipman et al., 2005; Tottenham et al., 2010). In our study, however, deprivation was measured continuously with children experiencing a range of deprivation. A comparison of exposed to nonexposed children is a more extreme contrast and may not capture the range of emotion regulation abilities in children exposed to various levels of deprivation. By examining deprivation continuously, we were able to test whether difficulties in emotion regulation increased as severity of deprivation increased. Our results suggest that this is not the case – there was not a linear increase in emotion regulation difficulties as a function of deprivation exposure. To compare our results to previous studies with exposed versus nonexposed children, we conducted a mean-split of deprivation exposure and compared emotion regulation scores for high- versus low-deprivation children. Results indicated that high-deprivation children had lower scores on the emotion regulation subscale of the ERC ($M = 25.31$) relative to low-deprivation children ($M = 27.80$); t (37.68) = 37.65, $p = .03$,[2] consistent with

[2]The difference between high-deprivation ($M = 27.77$) and low-deprivation ($M = 24.90$) scores on the negativity/liability subscale of the ERC was also trending in the expected direction, t (54) = −1.54, $p = .13$. The two groups did not differ in their early extinction amplitudes of skin conductance to the CS+ controlling for the CS− amplitude, F (1,44) = .31, *n.s.*

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previous studies. This finding highlights the need to carefully consider how deprivation (and adversity more broadly) are measured. By conceptualizing and measuring deprivation and threat as continuous dimensions and focusing on exposures which confer risk for a lack of learning experiences generally, we move away from a dichotomous categorization of adversity that treats all exposed children as the same and create a more nuanced assessment of deprivation.

Limitations and future directions

The present study is not without limitations that should be addressed in future work. First is the small sample size of included participants. Future work is needed to determine whether our findings hold in larger samples of children exposed to a range of adversities. Second, although we included multiple levels of analysis for our outcome of interest, future work should examine whether these associations emerge when using child-report or observational measures. Although child-reports of emotion regulation are challenging given linguistic and cognitive limitations (Cole et al., 2004), methodologies utilizing vignettes or play-based tasks (Cole et al., 2009) could provide additional insight into the emotion regulation abilities of adversity-exposed children. Moreover, for parental socialization of emotion it would be particularly meaningful to include observational measures that do not rely on parental report. Parents prone to emotion dysregulation may not always recognize their emotional difficulties and observational measures might provide novel insight into their functioning. That being said, in our sample, parental reports on the DERS varied widely (*range* = 36–118), suggesting that some parents willingly reported high levels of emotional difficulties. Moreover, our results held even when controlling for parental psychopathology, which is often highly linked to emotion regulation tendencies (Sheppes, Suri, & Gross, 2015) and children's exposure to adversity (Berlin, Appleyard, & Dodge, 2011; Stith et al., 2009).

Third, the present study sheds light on the difficulties in emotion regulation faced by children exposed to early adversity; however, future studies should further investigate the nature of these difficulties. Specifically, studies are needed to examine the types of emotion regulation strategies that adversity-exposed children use and how those strategies are differentially associated with parent socialization, deprivation, and threat. Previous studies indicate that adversity-exposed children may rely on certain emotion regulation strategies (e.g., disengagement, avoidance) more so than nonexposed children (Boyes et al., 2016; Epstein-Ngo et al., 2013; Maughan & Cicchetti, 2002; Milojevich et al., 2018; Robinson et al., 2009). The findings of the present study should be extended to specific forms of emotion regulation.

Finally, future studies should examine the associations among parent socialization, dimensions of adversity, and children's emotion regulation across development. The present study focused on young children as early childhood is a time of rapid development of emotion regulation (Denham, 1998). Moreover, in early childhood children rely on their parents for help regulating their emotions (Thompson & Meyer, 2007). As such, the relative contribution of parent socialization and the direct effects of adversity may change with age, as children come to rely more on themselves and less on their parents when regulating their emotions.

Implications for interventions

The present study also has important implications for the development and implementation of evidence-based interventions. Many interventions designed to help when maltreatment has occurred or with parents who are exhibiting harsh discipline focus on identifying strategies other than physical punishment that parents can use when disciplining their child. The goal with these interventions is often to end the coercive cycle of physical punishment. While this is a worthwhile and meaningful goal, our work suggests that if we want to improve outcomes for children (e.g., emotional and behavioral functioning) we also need to teach parents how to better regulate their emotions and how to teach their children more adaptive, successful emotion regulation. By targeting parents' own emotion regulation tendencies and the emotional messages that parents send to their children, we may be able to more robustly improve children's outcomes in addition to preventing further abuse. These implications are in need of direct testing, but hold promise for improving the well-being of children, parents, and families as a whole.

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Conflicts of Interest. None.

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