Emotion regulation strategy knowledge moderates the link between cumulative stress and anxiety symptoms in childhood

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Abstract
Experiencing chronic stress early in life has been linked to anxiety symptoms and related outcomes. This study examined whether emotional self-regulatory processes, specifically children's awareness of emotion regulation strategies, would qualify the link between cumulative stress and anxiety symptoms in childhood. One hundred and twenty-nine 6- to 11-year-olds ($M = 8.84$; $SD = 1.61$; 47% girls) participated in the study. We derived an index of nine environmental stressors and quantified children's emotion regulation strategy awareness from an interview about their emotional experiences. Parents reported on children's anxiety symptoms. As expected, cumulative stress was positively associated with anxiety symptoms. Emotion regulation strategies moderated the effect of cumulative stress on anxiety symptoms, such that children with larger repertoires had fewer symptoms in the context of low stress, but more symptoms in the context of high stress. Results offer new insight in understanding anxiety symptoms in childhood and demonstrate the importance of children's emotion regulation strategy knowledge as a novel facet of regulatory skill that may characterize the specific emotion dysregulation implicated in the emergence of psychopathology.

Introduction

Difficulties with self-regulation appear to be a mechanism by which maladaptive trajectories toward psychopathology become solidified (Cisler, Olatunji, Feldner, & Forsyth, 2010; Werner, Goldin, Ball, Heimberg, & Gross, 2011). Anxiety disorders are among the most common forms of psychopathology in childhood (Beidel, Turner, & Morris, 1999; Child Mind Institute Children's Mental Health Report, 2015). Lifetime prevalence rates indicate that 5–15% of adolescents will be affected by these symptoms (Heimberg, Stein, Hiripi, & Kessler, 2000) which have been linked to early stress (Ford, Goodman, & Meltzer, 2004), dysregulated patterns of stress physiology, poor emotion regulation, and other problems (Cisler et al., 2010). Although difficulties with self-regulation are often seen in children experiencing anxiety symptoms, it is not clear what specific aspect of self-regulation is compromised for these children. Emotion dysregulation could be driven by a lack of *knowledge* of ways to change how one feels, by a decreased ability to *implement* strategies, or perhaps by a combination of regulatory deficits. There is evidence that children's awareness of emotion regulation (ER) strategies supports their growing regulatory abilities and often precedes effective use and implementation (Cole, Dennis, Smith-Simon, & Cohen, 2009; Ştefan, Avram, & Miclea, 2017). But, very little work has explicated the specific contexts in which ER strategy knowledge may be particularly important with respect to anxiety. The goal of the current study was to do so.

Environmental Stressors Influence the Development of Anxiety Symptoms

There is substantial evidence of the negative consequences of stress on children's healthy development (e.g., Evans, Kim, Ting, Tesher, & Shannis, 2007; Hidalgo, Barnett, & Davidson, 2001). Environmental stressors like poverty and parental psychopathology put children at risk for experiencing psychopathology, academic failure, and premature morbidity and mortality (Brook & Schmidt, 2008; Buss, Davis, & Kiel, 2011; Evans & English, 2002). There is also evidence that exposure to environmental stressors early in life can influence the development of anxiety (e.g., Hidalgo et al., 2001). The effects of environmental challenges are often studied individually, but the common co-occurrence of many of these risks suggests that a more informative approach would be to examine the *accumulation* of stressors. For example, growing up in poverty is associated with a low parental level of education, household crowding, and neighborhood violence (Evans et al., 2007). Studies that have examined the effects of accumulating stressors have shown associations with maladaptation in youth samples (e.g., Blair et al., 2011; Evans & English, 2002).

The Protective Effects of ER

ER encompasses the intrinsic and extrinsic processes that people use to change their emotional responses (Campos, Mumme, Kermoian, & Campos, 1994; Cole, Martin, & Dennis, 2004). This ability supports effective social interactions, enables better performance on cognitive tasks, and facilitates enhanced coping with stressful experiences

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(Denham et al., 2003; Raver et al., 2011). But, environmental risks like parental psychopathology (Thompson & Calkins, 1996) and poverty (Evans & English, 2002) are associated with poorer ER.

Anxiety disorders are typically marked by affective dysregulation, such as experiencing emotions with great intensity (Mennin, Turk, Heimberg, & Carmin, 2004). Studies with adults have shown that anxiety is associated with the use of maladaptive strategies (Werner et al., 2011). Studies with children suggest that problems with ER are implicated in the development and maintenance of anxiety disorders, even when controlling for emotional reactivity (Cisler et al., 2010; Suveg & Zeman, 2004). Thus, ER is important for understanding anxiety, but more research is needed to clarify what specific aspects of the process most strongly relates to the emergence of symptoms.

The Current Study

A growing body of research on adults suggests that ER strategy repertoires are useful indicators of people's adaptive regulatory abilities (Bonanno & Burton, 2013; Sheppes et al., 2014). Examining children's awareness of ER strategies would provide a greater insight into children's growing autonomy in ER that general measures of children's dispositional soothability do not provide. Stressful life events have been robustly linked to unhealthy functioning (Blair et al., 2011; Evans & English, 2002; Evans et al., 2007). A crucial next step is to identify the risk and protective factors that moderate this association. In the current study, we did this by examining whether children's knowledge of ER strategies moderated the relation between cumulative stress and anxiety symptoms. We hypothesized that cumulative stress would be positively associated with anxiety symptoms. Additionally, we expected awareness of ER strategies to moderate the effect of cumulative stress on anxiety symptoms, such that the effects of stress would be less strongly associated with anxiety for children who described more strategies.

Method

Participants

One hundred and twenty-nine 6- to 11-year-olds ($M = 8.84$; $SD = 1.61$; 47% girls) and their caregivers participated in the study. The sample was ethnically diverse; the children's races/ethnicities were Hispanic (31%), White (18%), African-American (12%), Asian (2%), other (1%), or multiracial (36%). Only one caregiver accompanied the child, resulting in 21 fathers and 107 mothers participating (one parent did not self-report gender).

Household income ranged from less than US$15,000 (12%) to more than US$100,000 annually; 41% reported income between US$16,000 and US$50,000, 32% indicated an income above US$51,000, and 15% did not report income. For parental education, 12% of fathers' and 10% of mothers' educational level was reported as "some high school" or less, 35% of fathers and 30% of mothers were high school graduates, 44% of fathers and 57% of mothers had a technical, college, or advanced degree. No information was provided for 9% of fathers and 3% of mothers. All study procedures were approved by the institutional review board before research began.

Procedure

Families came to the laboratory for one visit. Parents provided consent, and assent was obtained from children. Parents reported about themselves (e.g., depressive symptoms), their family (e.g.,

Table 1. Descriptive Statistics for Cumulative Stress Index.

	Mean	SD	Min–Max	Number of children with risk
Maternal education	4.95	1.35	1–8	13
Paternal education	4.74	1.41	1–8	16
Income	5.25	3.28	1–11	38
Violence	.03	.17	0–1	4
Death	.13	.34	0–1	17
Serious illness	.07	.25	0–1	9
Serious family trouble	.05	.23	0–1	7
Parental conflict	.18	.38	0–1	23
Parental depression	14.23	11.43	0–59	40

Note. $n = 129$.

income) and their children (e.g., anxious symptoms) via surveys. Children completed an interview about past emotional experiences from which we derived a measure of ER knowledge. Families were debriefed and compensated for their time at the end of the study.

Stimuli and Measures

Sociodemographic information. Sociodemographic characteristics (e.g., level of education, family income) were assessed via parent-report.

Parent depression. Parental depression was assessed using the *Center for Epidemiological Studies-Depression Scale* (CES-D) (Radloff, 1977). The CES-D consists of 20 items that assess depressive mood with possible scores ranging from 0 to 60. A person with a score above 16 is considered clinically meaningfully depressed. Participants indicated how often they felt as described in each item in the past six months with a 4-point scale (0 = *rarely or none of the time*; 3 = *most or all of the time*; $\alpha = .90$).

Recent major stressful life events. Parents indicated the stressful life events their child had experienced in the past year using the *Children's Stressful Life Events Questionnaire* (CSLEQ) (Sandler & Ramsay, 1980). Parents were asked about 32 stressors, but we focused on 15 that captured children's exposure to violence, death, serious illness, serious parental conflict, or serious family trouble as these represented other major stressors not captured by our other measures (e.g., two of the removed questions asked about changes in mood). Two items assessed violence, four assessed children's exposure to death, four serious illness, two a family member experiencing serious trouble, and three assessed children's exposure to parental conflict. If the parent indicated that the child had experienced any or all the events within one of the categories (e.g., exposure to death because of the death of a friend, parent, or both) the child was scored as having that risk.

Cumulative stress index. We created an index of the accumulation of stressors experienced by children in this study; a higher score indicates the experience of more stressors. Each stressor was characterized as present or absent for each child. The clinical cutoff for CES-D was used for this risk, children with parents who scored 16 or higher had the risk. For parental education, children had the risk if the parent had not completed high school. Children who lived in a household with an income below US$30,000 (the 25th percentile in our sample) were endorsed as having this risk (see Table 1 for

Table 2. Correlations among Components of the Cumulative Stress Index.

	1	2	3	4	5	6	7	8	9
1. Maternal education	–								
2. Paternal education	.187*	–							
3. Income	−.008	.009	–						
4. Violence	−.059	−.067	−.039	–					
5. Death	−.053	−.076	−.046	.063	–				
6. Serious illness	−.091	−.102	.062	.127	.164+	–			
7. Serious family trouble	.034	.014	.046	.155+	.110	.338**	–		
8. Parental conflict	−.087	−.174*	.038	.268**	.239**	.112	.247**	–	
9. Parental depression	−.111	−.047	.325**	−.022	.087	.146+	.210*	.215*	–

Note. $n = 129$; 0 = risk absent, 1 = risk present; $+p < .10$; $*p < .05$; $**p < .01$.

descriptives and Table 2 for correlations among the risks). Income was missing for 20 participants (15%).

All present stressors were summed to create our cumulative stress index. Because all children had data for at least one stressor, children missing data for any stressor had scores calculated based on the sum of the other stressors, resulting in a conservative calculation of cumulative stress. Similar approaches have been used in other studies to capture the range of stressors that children experience (Dich, Doen, & Evans, 2015; Suurland, van der Heijden, Huijbregts, Van Goozen & Swaab, 2018). Nine stressors were included in the index: Low income, low maternal education, low paternal education, high parental depressive symptoms, exposure to violence, exposure to death, high parental conflict, exposure to serious family trouble, and exposure to serious illness ($M = 1.28$, $SD = 1.23$; observed scores ranged from 0 to 6). Thirty-eight children (29.2%) had none of these stressors, 48 children (36.9%) had one, 24 (18.5%) had two, 13 (10.0%) had three, four (3.1%) had four, two (1.5%) had five, and one (.8%) had six.

Emotion regulation knowledge. Children were interviewed about events that made them feel different negative emotions. The order of the emotions was fixed across participants (sad, fear, then anger). For this investigation, we examined children's responses during the fear phase of the interview only (as anxiety has been linked with the non-normative experience and regulation of fear; e.g., Buss et al., 2011). The experimenter said, "I'd like to know about a time recently that you felt very scared. Think about what happened and about all of the little details you can remember about it." Children were given a minute to think. After the children described the event, the experimenter asked, "When you felt that way, what did you try to do or think about to make yourself feel less scared?" Two prompts for additional information were provided; children were asked about strategy use three times but could provide as many responses as they wanted.

Responses were transcribed, and strategies were coded by trained research assistants. The coding scheme consisted of seven categories: Problem-solving, changing thoughts, changing goals, changing physiology, social support, religious activity, and acceptance (e.g., Quiñones-Camacho & Davis, 2018). Each category was subdivided into multiple strategies, enabling us to assess the range of strategies children can describe for fear. For example, the *changing thoughts* category included reframing, cognitive distraction, thought suppression, sleep/change mental state, and imagined social support. If a child said they thought about playing a game, this was coded as cognitive distraction; if a child endorsed thinking about their mother being next to him, that was coded as imagined

social support. This was done for each response the child gave to the ER prompts. Because children could answer the questions about strategies by saying they did not do anything or that they did not remember, some children ($n = 10$) were coded as describing zero regulatory strategies even though they completed the interview. Inter-rater reliability was calculated on 30% of responses and was good ($k = .87$).

We operationalized strategy repertoire as the number of *unique* strategies described during the fear portion of the interview. A smaller group of putatively adaptive strategies for regulating fear was derived: Reframing, cognitive distraction, behavioral distraction, imagined social support, seeking social support, breathing, calming down, goal reinstatement, and agent-focused problem-solving. These strategies were chosen based on previous studies showing that some strategies are preferentially used for fear compared to other emotions (Davis, Levine, Lench, & Quas, 2010; Quiñones-Camacho & Davis, 2018).

Anxiety symptoms. Children's anxiety symptoms were measured using the parent-reported *Screen for Child Anxiety Related Disorders* (SCARED) (Birmaher et al., 1997). Parents indicated on a three-point scale how much each statement was true of/like their child (0 = *not true* or *hardly ever true*; 2 = *very true* or *often true*). The SCARED consists of 41 items; we used the general score for analyses, computed as the sum of all items ($\alpha = .90$).

Results

Preliminary Analyses

There were no significant gender differences in cumulative stress ($t_{(128)} = 1.049$, $p = .296$), strategy repertoire ($t_{(127)} = -1.154$, $p = .251$), or anxiety ($t_{(125)} = .898$, $p = .371$). As expected, cumulative stress was positively correlated with anxiety symptoms ($r = .324$, $p < .001$). Age was not correlated with any variables. Given our large age range and previous research on gender differences in anxiety and ER, we covaried age and gender in primary analyses. Table 3 displays descriptive statistics and intercorrelations.

Primary Analyses

A hierarchical linear regression tested the hypotheses that cumulative stress would relate to anxiety symptoms, and that children's strategy awareness would moderate this relation. In step one, child age and gender were entered. At step two, cumulative stress and

Table 3. Correlations among Study Variables.

	Mean	SD	Min	Max	1	2	3	4	5
1. Cumulative stress	1.28	1.23	0	6	–				
2. Fear repertoire	1.11	.84	0	4	.120	–			
3. Anxiety symptoms	12.63	9.45	0	48	.324**	−.014	–		
4. Age	8.84	1.61	6.00	11.75	.077	.135	.086	–	
5. Gender	–	–	–	–	−.092	.102	−.080	−.130	–

Note. $n = 129$; Boy = 0.
**$p < .01$.

Table 4. Regression Model Predicting Anxiety Symptoms.

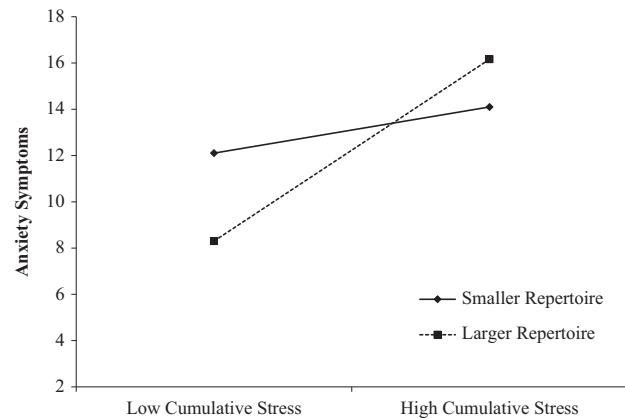|	R^2	ΔR^2	ΔF	Δp	b	95% CI	p
Step 1	.012	.012	.757	.471			
Age					.445	[-.591, 1.482]	.402
Gender					-1.302	[-4.636, 2.033]	.446
Step 2	**.114**	**.102**	**7.008**	**.001**			
Age					.386	[-.616, 1.388]	.451
Gender					−.602	[-3.828, 2.625]	.715
Cumulative stress					**2.458**	**[1.169, 3.747]**	**<.001**
Fear repertoire					−.646	[-2.556, 1.263]	.509
Step 3	**.145**	**.031**	**4.369**	**.039**			
Age					.400	[-.589, 1.389]	.429
Gender					−.504	[-3.688, 2.680]	.757
Cumulative stress					**1.997**	**[.654, 3.340]**	**.004**
Fear repertoire					−.517	[-2.405, 1.370]	.592
Cumulative stress × Fear repertoire					**1.414**	**[.088, 2.740]**	**.039**

Note. $n = 129$;
Bold = $p < .05$.

Figure 1. Two-way interaction of cumulative stress and fear strategy repertoire plotted at -1SD (smaller repertoire) and +1SD (larger repertoire) from the mean ($n = 129$). Smaller repertoire: $b = .808$, 95%CI [-1.219, 2.835], $t = .791$, $p = .430$. Larger repertoire: $b = 3.186$, 95%CI [1.724, 4.648], $t = 4.327$, $p < .001$.

strategy repertoire were entered. At step three, the two-way interaction of cumulative stress and strategy repertoire was entered. To unpack this interaction, we plotted simple slopes at +/-1SD from the mean (Aiken & West, 1991).

The first step of the model was not significant, $F_{(2, 124)} = .757$, $p = .471$ (Table 4). Step two was an improvement to the model, $F_\Delta (2,122) = 7.008$, $p = .001$. Cumulative stress predicted anxiety symptoms ($b = 2.458$, $t = 3.738$, 95% CI [1.157, 3.760]. Step three improved the model $F_\Delta (1,121) = 4.369$, $p = .039$. The interaction of cumulative stress and strategy repertoire was significant ($b = 1.414$, $t = 2.090$, 95% CI [.075, 2.754]; Figure 1).[1] For children with larger repertoires, increasing cumulative stress was associated with more symptoms ($b = 3.186$, $t = 4.327$, $p < .001$). But, for children with smaller repertoires, cumulative stress was not associated with symptoms ($b = -.808$, $t = .791$, $p = .430$).

Discussion

The goals of this study were to assess whether cumulative stress would relate to children's anxiety symptoms and whether children's knowledge of ER strategies moderated this relation. In line with previous studies, we found that cumulative stressors were associated with more anxiety symptoms (Hidalgo et al., 2001), results additionally showed that this association was moderated by children's ER knowledge.

Contrary to expectations, the buffering effect of greater strategy awareness was present only for children in low stress contexts. Children who described *fewer* strategies to regulate fear were not

disadvantaged in the presence of high stress. In high stress, multiple unsuccessful attempts at changing one's feelings may be particularly harmful, as this would increase distress. Awareness of strategies may be particularly beneficial in low-stress contexts in which children are at reduced risk of negative environmental feedback from trying strategies they may *know* but perhaps cannot yet *implement* well.

Previous research has shown that anxious children tend to interpret ambiguous situations as more negative and threatening than non-anxious children, avoid such situations, and ruminate about perceived negative events (Barrett, Rapee, Dadds, & Ryan, 1996). Anxious children also tend to underestimate their ability to cope with these situations (Bögels & Zigterman, 2000). In low-stress environments, greater awareness of ER strategies would give children the means to engage with normative (but potentially anxiety-inducing) experiences that they might otherwise avoid, allowing them opportunities to change their appraisal of those experiences. In high-stress environments, routinely accessing a smaller set of strategies that have previously been found effective may be more adaptive (Sturge-Apple et al., 2016).

Although knowing different ER strategies is distinct from being able to use or implement them, children's awareness of strategies is an important precursor to effective agentic regulation (Cole et al., 2009; Ştefan et al., 2017). Knowing more ways to change feelings offers children a larger skill set that through practice can be internalized and automatized. Over time, this supports more flexible regulation as children (and adults) become better at matching their regulatory attempts to the contextual demands.

Thinking about ER as comprising processes including awareness, effective deployment, and flexibility in their use of strategies will ultimately help refine thinking about emotion dysregulation and its implications for child psychopathology. Assessing children's strategy knowledge offers a novel means of examining this connection, but more research is needed to clarify what effect other aspects of ER (e.g., flexibility) may have as well.

This study extends our understanding of the relation between cumulative stress, ER, and anxiety symptoms in childhood by underscoring the importance of examining children's awareness of ER strategies. Our findings are tempered, however, by some

limitations. Our socioculturally and socioeconomically diverse community sample is an important strength of this study, but this was a sample with low levels of anxiety. Because our study is cross-sectional, we cannot determine whether limited awareness of ER strategies leads to more anxiety symptoms or vice versa. Despite these limitations, this study identifies promising new directions for future longitudinal studies to take to explore the effect of children's awareness of ER strategies on emerging psychopathology.

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Note

1. To further refine our findings on the moderating role of a fear-specific repertoire on the relation between cumulative stress and anxiety symptoms, we ran an alternative model using a strategy repertoire for anger instead of the fear repertoire. The anger repertoire did not predict anxiety symptoms ($b = -.722$, $SE = 1.053$, $p = .493$). The interaction of cumulative stress and anger repertoire also did not predict anxiety symptoms ($b = 1.415$, $SE = .833$, $p = .092$).

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