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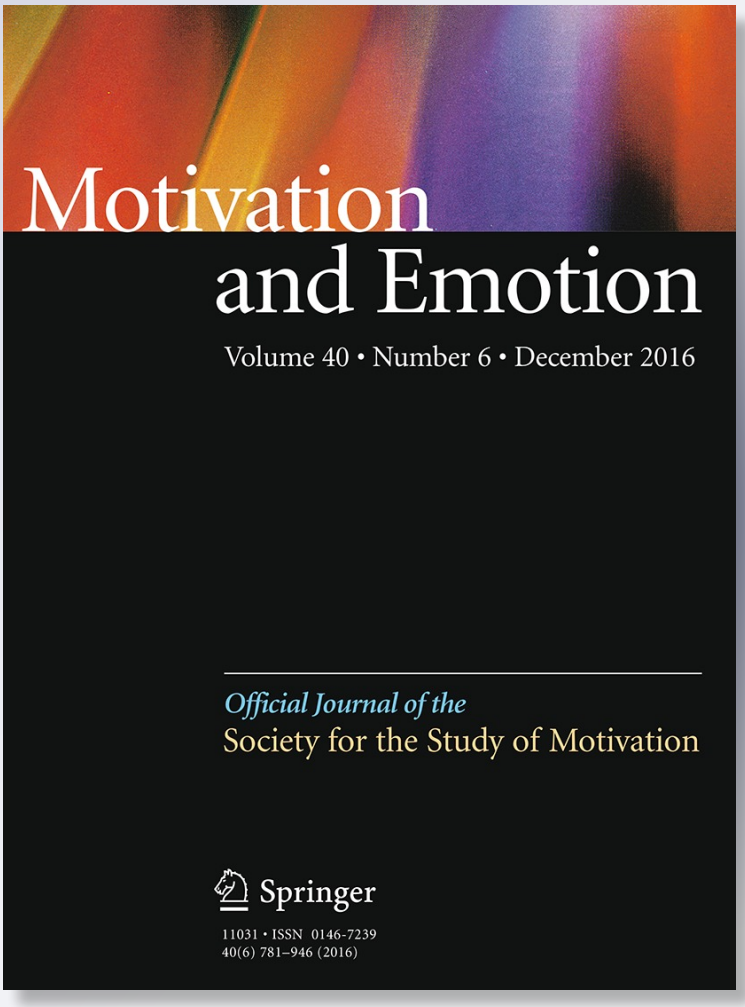

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ORIGINAL PAPER

Anger in response to challenge: children's emotion socialization predicts approach versus avoidance

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Abstract Negative emotion is typically associated with avoidance behavior; however, recent advances in the adult literature show that unlike some emotions (sadness, shame), anger predicts both approach and avoidance. Here we propose that socialization to suppress anger will play a role in whether children who express anger respond to a performance challenge with approach or avoidance. Children ($N = 79$; $M_{age} = 11.4$ years) reported perceptions of parental use of positive conditional regard (PCR) to socialize anger suppression and worked on four unsolvable puzzles. We measured change in verbalized puzzle-solving strategies during failure, and coded emotion expression on the final puzzle. We examined whether negative emotion type (shame/sadness vs. anger) and PCR for anger predicted change in strategy use, and whether the association between level of PCR for anger and approach-avoidance (change in strategy use) depended on type of negative emotion expressed. Neither emotion expression nor level of PCR anger predicted strategy use; however, type of negative emotion moderated the association between PCR anger and change in strategy use, controlling for NCR anger. For children who displayed anger, low PCR was associated with increased strategy use, and high PCR was associated with decreased strategy use. We discuss the role of emotion socialization in shaping approach and avoidance motivation.

Keywords Anger · Emotion suppression · Positive conditional regard · Task engagement · Children

When individuals encounter challenges or setbacks on tasks, some of them experience negative emotion and their performance suffers. Indeed, generalized negative emotion has been linked to poorer performance in both children and adults (e.g., Elliott and Dweck 1988; Gillet et al. 2013; Meinhardt and Pekrun 2003). When specific negative emotions—sadness, shame, and anger—are examined, however, associations with task engagement or performance are more complicated in that they also depend on efforts to regulate emotion expression; in the case of children, this may depend on how they are socialized for emotion expression.

Experiencing sadness reliably activates the "avoid" or "withdraw" motivational system, across age (e.g., Dyson et al. 2012; Rothbart and Bates 2006). For example, when their goals are blocked, infants who respond with sadness have heightened cortisol responses and withdraw from goal pursuit (Lewis and Ramsay 2005; Lewis et al. 1992). Similarly, kindergarteners who display higher teacher-and parent-reported sadness show lower levels of math achievement because they are less likely to actively engage in learning activities (Valiente et al. 2010), and adults experiencing avoidance-motivating emotions of anxiety and sadness tend to perform more poorly on physical and cognitive tasks (Perbandt 2007; Rathschlag and Memmert 2013).

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A similar pattern obtains with children who experience shame. Young children displaying signs of shame in response to difficult tasks tend to stop working toward mastery (Barrett et al. 1993; Kelley et al. 2000; Lewis and Ramsay 2005). However, unlike a tendency to experience sadness, which may be temperamental, research shows that shame in response to failure is socialized; shame is more likely when parents have made negative evaluations of children's actions or outcomes, controlled their behavior in order to force certain outcomes, or were frequently emotionally negative in achievement situations (Alessandri and Lewis 1993; Barrett 1995; Kelley et al. 2000; Lewis and Sullivan 2005; Mills 2003; Mills et al. 2007). Children exposed to such parent input feel shame when confronting challenges, pin their self-worth on performance, and in turn, fail to persist or perform (Burhans and Dweck 1995; Heyman et al. 1992). College students' retrospective reports of a particular controlling parenting practice—the provision of more approval and acceptance only when they meet their parents' academic performance expectations, termed positive conditional regard—predict heightened shame as well as self-devaluation, unstable self-esteem, and avoidance of academic challenge (Assor and Tal 2012).

Children and adults who experience higher levels of anger/frustration have also been shown to perform more poorly on achievement tasks (Gentzler et al. 2013; Jaworska et al. 2012; Pekrun et al. 2009) and in school (Valiente et al. 2010). However, unlike sadness and shame, anger can also be approach-motivating: Infants who express anger in response to goal-blockage (Lewis et al. 1992) and children who express anger in response to a toy-removal task (He et al. 2012) are more likely to persist in pursuing goals later on; similarly, anger can enhance adults' physical and cognitive performance (Perbandt 2007; Rathschlag and Memmert 2013). Further, as we explain below, research with adults shows that anger's opposing motivational properties (toward avoidance or approach) depend on individual differences in sensitivity toward cues of threat or cues of reward, respectively (Carver and Harmon-Jones 2009; Cooper et al. 2008), and on the duration of perceived loss of control over task outcomes (Greenaway et al. 2015; Roth and Kubal 1975).

In the present study, we argue that when children experience sadness or shame or are socialized to suppress emotion, they will withdraw from an achievement challenge. However, when they experience anger/frustration, their tendencies to withdraw from or engage with an achievement challenge may depend on how they were socialized for anger expression. Those who were socialized not to express anger, like adults who perceive loss or failure as threatening, may be more susceptible to performance disruption than those for whom anger expression was not discouraged. Children who are socialized to suppress their anger, particularly through parents' use of conditional regard, may perform poorly because they experience internal conflict; that is, in order to merit their parents' approval, they must surrender autonomy over emotion expression (Ryan and Deci 2000). Because achievement challenges are a common experience for children of school age, it is important to understand how their emotional responses and socialization histories can shape responses to setbacks. Children who respond to challenge with withdrawal or avoidance are at risk for academic failure, whereas those who "rise to the challenge" and persist are not (Elliot et al. 1999; Pekrun et al. 2009) because regulation of negative emotion is critical to successful learning (e.g., Davis and Levine 2013; Graziano et al. 2007).

Negative emotion and approach/avoidance motivation

To conceptualize the motivational properties of emotion, researchers have invoked two psychophysiological systems with opposing tendencies; briefly, the Behavioral Inhibition System (BIS) is responsive to cues of threat or punishment and the Behavioral Approach System (BAS) is sensitive to reward cues (e.g., Elliot and Covington 2001; Gray 1990; Kiff et al. 2011). In early work, negative emotions were identified with the operation of BIS, and positive emotions, with BAS (Gray 1994; Watson et al. 1999), but more recent research shows that one negative emotion, anger, is associated with both BIS and BAS (e.g.,Carver and Harmon-Jones 2009; Cooper et al. 2008; Rothbart and Bates 2006). Associations of anger with these two systems are revealed in differential action responses, with individuals high in BIS responding to anger with aggression against the self (e.g., self-denigration (Cooper et al. 2008) or inhibition of protest (Tibubos et al. 2014), and those high in BAS responding with direct or indirect aggression against a perpetrator (Cooper et al. 2008). Adults' responses to anger also depend on duration of perceived loss of control; when loss of control is time-limited, participants typically respond with enhanced effort, due to feelings of approach motivation, but when loss of control persists, participants respond with helplessness, due to low approach affect (Greenaway et al. 2015; Roth and Kubal 1975).

These processes mirror those associated with achievement goal constructs. Children and adolescents who enter achievement situations with a sensitivity to threat cues—wishing to avoid showing incompetence (i.e., a "performance-avoid" goal)—and then encounter a challenge, tend to experience negative emotions, including anxiety, shame, anger, loss of interest, or hopelessness (Daniels et al. 2009;

Grant and Dweck 2003; Pekrun et al. 2006, 2009, 2014; Smiley et al. 2016) and reduce their task engagement (Elliott and Dweck 1988; Elliot et al. 1999; Grant and Dweck 2003; Smiley et al. 2016). Indeed, Pekrun et al. (2009) showed that specific negative emotions—anger, anxiety, hopelessness, and shame—mediated negative associations between performance-avoid goals and poor exam performance. On the other hand, Pekrun et al. (2009) also showed that anger mediated a *positive* relation between achievement goal and performance when students held mastery goals for growth or improvement. That is, anxiety, hopelessness, and shame are uniquely associated with sensitivity to threat and with withdrawal tendencies, but anger can be associated with either avoidance motivation and performance decrements or approach motivation and performance enhancement (Daniels et al. 2009; Pekrun et al. 2009).

Socialization of emotion expression and approach/avoidance motivation

Appropriate expression of emotion is an important aspect of emotion regulation (Saarni and Crowley 1990; Thompson 1994). Healthy expression of negative emotion is socialized in families in which it is acceptable to express negative emotion, specific coping strategies are taught, or the causes and consequences of negative emotion are openly discussed (e.g., Cole et al. 2010; Eisenberg et al. 1998; Fabes et al. 2001; Jaffe et al. 2010; Morris et al. 2011; Morris et al. 2007). In comparison, in families where expression of negative emotion is viewed as unacceptable or parents socialize their children to suppress negative emotion, children learn to use emotion suppression strategies (Bariola et al. 2012; Berlin and Cassidy 2003; Eisenberg et al. 1998; Fabes et al. 2001; Gunzenhauser et al. 2014). However, suppression of emotion is not a successful long-term strategy: children socialized to hide negative emotion tend to show it less frequently but at higher intensity (Eisenberg et al. 1998; Fabes et al. 2001; Snyder et al. 2003). Likewise, adults who attempt to suppress overt emotion expression still experience its subjective and physiological correlates (e.g., Gross and Levenson 1993, 1997).

One specific tactic that parents use to regulate children's emotion expression is known as conditional regard (CR), a practice that involves either withdrawing affection and attention when a child fails to suppress negative emotion (negative CR) or providing added affection and attention when a child successfully suppresses negative emotion (positive CR) (Assor et al. 2004; Roth and Assor 2010; Roth et al. 2009). Positive CR (PCR), in particular, is associated with suppressive emotion regulation. Thus, parent-reported use of PCR to suppress sadness is associated with young children's lower awareness of sadness in the self and others and with less empathic responding (Roth and Assor 2010); adolescent-reported use of PCR to suppress anger is associated with feelings of compulsion to hold anger in and with dysregulated anger that interferes with life tasks (Roth et al. 2009). Extensive research with adults, but not yet with children, shows that active attempts to suppress negative emotions are not only emotionally dysregulating, but also impede task performance (Bonanno et al. 2004; Gross 2002; Richards and Gross 2000; Roth et al. 2014). In the present study, we extend research on negative effects of suppressed anger to performance by school-aged children.

The present study

In the present study, we explored change in school-aged children's engagement during an impossible puzzle task, in relation to their expression of discrete negative emotions (i.e., sadness, shame, anger), perceptions of parent use of PCR for anger suppression, and the interaction of these two factors. To our knowledge, this is the first study of the use of CR in the emotion domain in relation to observed task engagement (cf. Roth et al. 2009) and the first to assess the interactive effect of observed negative emotion and socialization of emotion expression using CR on task performance.

We presented children with four unsolvable puzzles and measured change in their verbalization of puzzle-solving strategies across the series, strategies that they were taught and practiced before the start of the task. Similar talk-aloud procedures have been used in prior research as a means of non-intrusively measuring ongoing cognitive processes (Berhenke et al. 2011; Diener and Dweck 1978; Nolen-Hoeksema et al. 1995; Smiley and Dweck 1994; Smiley et al. 2010). On the last puzzle in the series, we coded facial expression of emotion. Prior to the puzzle task, we assessed perceptions of parent use of PCR and NCR to suppress expression of anger.

We tested the following three hypotheses. First, based on research with adults (e.g., Rathschlag and Memmert 2013) and children (Barrett et al. 1993; Kelley et al. 2000; Lewis et al. 1992; Valiente et al. 2010), we predicted that children who experienced avoidance-based emotions (i.e., sadness, shame) after failure would show greater task withdrawal (i.e., reduction in strategy production across the puzzle series) compared to children who experienced what has been considered an approach-based emotion (i.e., anger) (Hypothesis 1).

Second, based on previous research with adults documenting negative effects of suppressive emotion regulation

on performance (Bonanno et al. 2004; Gross 2002; Richards and Gross 2000; Roth et al. 2014), on prior research with children showing an association between parental PCR in the emotion domain and suppressive negative emotion regulation (Roth and Assor 2010), and on work with children and adolescents showing associations between negative emotion and performance disruption (e.g., Barrett et al. 1993; Pekrun et al. 2009; Valiente et al. 2010), we expected that children who perceived that parents used higher levels of PCR to suppress their expression of anger would show larger decreases in verbalization of strategies over the course of the unsolvable puzzle series, compared to those children who perceived that their parents used lower levels of PCR for anger (Hypothesis 2).

Third, compared to children who showed avoidance-based emotions (shame, sadness) after failure, whose task engagement would not depend on socialization to suppress anger, we expected that task engagement of children who showed anger after failure would depend on the extent to which they perceived their parents to have used PCR to suppress anger expression. Specifically, children who displayed anger and perceived that anger expression was not acceptable—like adults who perceive threat cues (Carver and Harmon-Jones 2009; Cooper et al. 2008), suppress their anger (e.g., Gross 2002; Richards and Gross 2000), or experience extended loss of control (Greenaway et al. 2015)—would be more likely to show a decline in engagement than children whose anger expression was not discouraged by the use of PCR (Hypothesis 3). As in past research on effects of PCR and NCR (e.g., Assor and Tal 2012; Roth et al. 2009), to isolate the effect of PCR for anger, we controlled children's perceptions of their parents' use of NCR for anger in evaluating Hypotheses 2 and 3.

Method

Participants

Participants were part of a study that included 123 (64 girls, 59 boys) 9- to 14-year-old children, $M = 11.50$ years, $SD = 1.43$ years, from ethnically and socio-economically diverse backgrounds. Parents (113 mothers, 10 fathers) reported on their own education level, annual household income, marital status and ethnicity. Education level was measured using a 5-category scale ranging from high school to completed graduate degree; the modal level reported was "some college." Most parents reported an annual household income of less than $40,000 (48 %) or $41,000-$60,000 (20 %). Most parents were married (55 %) or single (38 %). Forty percent of parents identified as Hispanic, 28 % as White (Non-Hispanic), and 22 % as African-American. Participants were recruited from the community through internet advertisements, flyers, and word of mouth.

The full sample of participants was included in the factor analysis of the conditional regard scales. Of this sample, 105 participants had valid video data for facial expression coding and 82 of those children displayed a negative emotion after the fourth unsolvable puzzle (discussed below). Three of these participants were missing strategy use data, which resulted in a final sample of 79 participants (43 girls, 36 boys) for testing study hypotheses. This sample (n = 79) did not differ from the participants with missing data (n = 26) in child age, $t(103) = .71$, *ns*; parent education level, $t(101) = -.57$, *ns*; annual household income, $t(99) = -1.23$, *ns*; marital status for the two largest subsamples (married vs. single), $\chi^2(1) = .45$, *ns*; or ethnicity for the three largest subsamples (white vs. Hispanic, $\chi^2(1) = .01$, *ns*, white vs. African-American, $\chi^2(1) = .88$, *ns*, and Hispanic vs. African-American, $\chi^2(1) = .81$, *ns*).

Procedure and materials

The protocol for this study was approved by the Institutional Review Board. Upon arriving at the laboratory, children and parents completed assent and consent forms, respectively. Parent–child dyads were compensated $50 for their participation.

Child puzzle task

We adapted a puzzle-solving task used with younger children in Smiley et al. (2010) by increasing the difficulty level of the puzzles, and programming it for presentation on a 20.5-inch computer. Children were asked to complete a series of 9-piece geometric puzzles, modeled after the Block Design task in the Wechsler Intelligence Scale for Children-III (WISC-III; Wechsler 1991). Nine puzzles were used, including one demonstration puzzle, two practice puzzles, and six experimental puzzles for the child to complete on his/her own. Instead of 3-dimensional cubes, children were presented with two-dimensional "tiles" that were either all red, or all white, or half white and half red, split on a diagonal. For each puzzle, the display on the computer screen included a reduced-size image of the completed puzzle in the upper left corner of the screen (designs resembled a seahorse, chimney, chevron, hourglass), an empty square "frame" outlined in black in the center of the screen, and a random array of nine tiles to the right of the frame. Tiles could be dragged from the array into the frame using the mouse; tiles snapped into place when dragged to one of the nine (unmarked) locations in the frame. The child's goal was to move the pieces on the screen to their correct positions in the empty frame in order

to create a design that matched the image of the completed puzzle.

Prior to working on the puzzle series, children learned six puzzle-solving strategies—"corners" (fill the corners first); "rows" (fill a row); "up and down" (fill a column); "match" (match a piece to the target picture before placing); "sort" (separate solid color pieces from diagonal pieces); and "solids" (placing the solid pieces first)—which they could use to solve the puzzles (Smiley et al. 2010). Strategies were taught as follows: First, seated in an adjacent room equipped with an audio connection to the testing room, the experimenter named and then demonstrated each strategy by using a remotely controlled mouse to move tiles into the puzzle frame on the children's computer display. Children were then prompted to use each strategy on the demonstration puzzle themselves. If they made any mistakes or forgot any of the strategies, the experimenter demonstrated those strategies again. Next, while completing two practice puzzles, children were instructed to say aloud the strategies they were using (e.g., "corners"; "match"). During the practice puzzles, 82 % of children produced three to six different strategies, indicating that most children had internalized several strategy types prior to working on the experimental puzzle sequence. To facilitate learning, the demonstration and practice puzzles showed dotted grid lines that marked the spaces for the nine tiles in the frame; however, the frames for the experimental puzzles did not have grid lines.

The experimental protocol presented six puzzles in the following order: one solvable puzzle, four unsolvable puzzles, and a second solvable puzzle. For the solvable puzzles, all nine of the necessary tiles were provided but for the unsolvable puzzles, eight correct tiles and one incorrect tile were included, making them impossible to solve. Solvable puzzles were untimed, but unsolvable puzzles were on the screen for a fixed period of time (70 s). At the end of the 70-s period, a cartoon "frown face" (a brownish-yellow face with two dots for eyes and a downturned mouth) popped up on the right side of the screen to indicate that the puzzle had not been solved. For the solvable puzzles, a cartoon "smiley face" (a bright yellow face with two dots for eyes and an upturned mouth) popped up to indicate successful completion. There was a short break between the first two and last two unsolvable puzzles, during which the experimenter reminded the child to use and verbalize the puzzle-solving strategies.

Measures

Parent conditional regard in the anger domain

We administered the Parent Conditional Regard scale, developed by Roth et al. (2009) to assess adolescents' perceptions of their parents' use of positive and negative conditional regard for expression of anger. Because the measure had not yet been used with a younger age group, we evaluated its factor structure as part of this study.

The NCR anger subscale consisted of 5 items (e.g., "When I express anger my mother makes me feel worthless") and the PCR anger subscale consisted of 3 items (e.g., "When I'm angry, but do not express it, I feel that my mom expresses more love for me"). Items were rated on 6-point Likert scales ranging from 1 ("Not true at all") to 6 ("Very true"). Perceptions of mothers' and fathers' use of NCR and PCR for expression of anger have been assessed with adolescent samples; Cronbach's alphas ranged from .75 to .86. In our sample, Cronbach's alpha for NCR anger was .79 and for PCR anger, .81. Mean scores for NCR and PCR anger were used in analyses.

Strategy use

Children's verbal naming of strategies while attempting to solve puzzles, our measure of task engagement, was captured in video recordings of the experimental session. The total number of strategies named during each puzzle was tallied for each participant. To assess reliability, two coders separately tallied verbalized strategies during the unsolvable puzzles for 18 cases (17 %); *ICC* was 1.00. Mean numbers of strategies named during unsolvable puzzles 1 and 2 (early response to failure) and during unsolvable puzzles 3 and 4 (later response to failure) were calculated for subsequent analyses.

Facial expression

Children's facial expressions following failure on the fourth unsolvable puzzle, when emotion expression was expected to be at its peak, were coded using a modified version of the AFFEX coding system for infants (Izard and Dougherty 1980). In AFFEX, the face is divided into 3 regions: (1) forehead/eyebrows, (2) eyes/nose/cheeks, and (3) mouth/chin, with specific cues such as "lips rolled in" and "downward gaze" associated with each emotion. To accommodate our older sample and the specific task environment, we incorporated additional body, head, and verbal cues to emotional states, including "slumping," "covers face," and "sighs." Other researchers also rely on ancillary cues when coding emotion expression (Hubbard et al. 2004; Tracy et al. 2009; Zalewski et al. 2011). Each participant was assigned one of the following dominant emotions based on observed cues: sadness, shame, embarrassment, anger/frustration, surprise, or amusement. Assessment of emotion expression in the preadolescent period is difficult due to increased masking of emotions (Zalewski et al. 2011; Zeman and Garber 1996). Therefore,

coders worked in pairs. Reliability for 26 cases (25 %) on the four most frequent emotion categories (anger/frustration, sadness, shame, embarrassment) was calculated between two pairs of coders, $K = 0.64$. We resolved coding discrepancies by consensus, and one pair of coders completed the remaining cases.

Results

Factor analysis of conditional regard scale

Because the conditional regard (CR) measure we utilized had not previously been administered to children in middle childhood, we conducted a factor analysis to determine whether children distinguished PCR from NCR. Preliminary tests indicated that the data were suitable for factor analysis, KMO = 0.77, Bartlett's test of sphericity = 321.06, $p < .001$. Examination of the scree plot indicated that a two-factor solution best fit the data, and a principal components analysis extracted two factors, which were rotated using Varimax rotation. The two-factor solution accounted for 63 % of the total variance. The NCR anger items loaded on the first factor (eigenvalue = 3.22, 34 % of total variance explained after rotation) and the PCR anger items loaded on the second factor (eigenvalue = 1.87, 29 % of variance explained after rotation), indicating that children distinguished negative and positive CR for anger suppression (see Table 1 for factor loadings). Given that the two-factor solution accounted for 63 % of the total variance, and a forced one-factor solution accounted for 40 % of the total variance, we concluded that a two-factor solution was the better fit for the data. This solution aligned with previous research with adolescents (Roth et al. 2009).

Preliminary analyses and hypothesis tests

We first examined the distribution of children's ($n = 105$) facial expressions of emotion. A majority of children expressed a negative emotion, as follows: anger/frustration (39 %), shame (22 %), and sadness (17 %). Although prior research shows that expressions of shame and sadness are often difficult to distinguish (Tracy et al. 2009), coders reliably differentiated them. The remaining children expressed amusement (4 %), embarrassment (11 %), surprise (2 %), or no codable facial expression (5 %). In tests of hypotheses, we considered only those children who expressed a negative emotion.

We next examined distributions, gender differences, and emotion group differences for the major study variables. All variables were normally distributed with acceptable skew and kurtosis. Table 2 displays means and standard deviations, by child gender and overall. Child gender was significantly related to PCR for anger, $t(79) = 2.25$, $p = .03$, mean strategy use across unsolvable puzzles 1 and 2, $t(79) = -2.13$, $p = .04$, and mean strategy use across unsolvable puzzles 3 and 4, $t(79) = -2.27$, $p = .03$; boys reported more perceived use of PCR anger by their parents than did girls, and girls had higher mean strategy use across all unsolvable puzzles.

Examination of the CR anger scores by the three negative emotion groups showed that neither NCR anger scores ($M_{anger} = 2.28$; $M_{shame} = 2.64$, $M_{sad} = 2.31$), $F(2, 79) = .63$, *ns*, nor PCR anger scores ($M_{anger} = 3.67$; $M_{shame} = 3.45$, $M_{sad} = 3.15$), $F(2, 78) = .66$, *ns*, were significantly related to the negative emotion expressed. In addition, neither mean strategy use during unsolvable 1 and 2 ($M_{anger} = 2.93$; $M_{shame} = 2.18$, $M_{sad} = 2.44$), $F(2, 77) = 1.44$, *ns*, nor mean scores during unsolvable 3 and 4 ($M_{anger} = 2.65$; $M_{shame} = 1.79$, $M_{sad} = 2.32$), $F(2, 76) = 1.69$, *ns*, were significantly related to emotion expression groups.

Finally, we examined correlations among children's age, perceptions of PCR and NCR anger, and mean verbalized strategy use for unsolvable puzzles 1 and 2 and unsolvable puzzles 3 and 4 (see Table 3). Children's age and perceptions of parents' PCR anger were significantly related, with younger children reporting more PCR than older children. Children's age and mean verbalized strategy use were also significantly related, with older children producing more strategies than younger children across unsolvable puzzles 1 and 2 and puzzles 3 and 4. Given these associations and gender differences, we included age and gender as covariates in subsequent analyses.

We also note that, on average, children's strategy use was relatively stable across the puzzle series; the correlation between the number of different strategies verbalized on the practice puzzles and the first two unsolvable puzzles was $r = .46$, $p < .001$, and between the practice puzzles and the last two unsolvable puzzles was $r = .41$, $p < .001$. And, as shown in Table 3, the mean number of verbalized strategies was, on average, stable from the first two to the last two unsolvable puzzles.

Because the focus of our study was on correlates of avoidance-motivating versus approach-motivating emotions, and in order to increase the numbers of children in the negative emotion expression groups, we formed two groups for subsequent analyses, namely, a shame/sadness group and an anger group. The shame-sadness group ($n = 39$) was hypothesized to include avoidance-motivated participants, whereas the anger group ($n = 40$) was hypothesized to include avoidance- and approach-

Table 1 Factor analysis of child-reported mother use of negative CR and positive CR for anger (n = 115)

NCR			
1	When something makes me angry and I show that, I feel that my mom expresses less appreciation of me for a while	0.54	0.44
2	When I express anger, I feel that my mother doesn't express much love for me	0.87	0.04
3	When I express anger, my mom looks like she can't stand me	0.82	0.04
4	If I show my anger, my mother will express less warmth toward me for a while	0.69	0.12
5	When I express anger, my mother makes me feel worthless	0.71	0.08
PCR			
1	When I'm angry but do not express it, I feel that my mom expresses more love for me	−0.02	0.87
2	When I'm angry but succeed in covering it, I feel that my mom appreciates me much more than usual	0.20	0.77
3	If I'm angry but do not express it, my mother will express more love for me	0.07	0.88

Table 2 Descriptive statistics for major study variables (n = 104)

Variable	Boys		Girls		Combined	
	Mean	SD	Mean	SD	Mean	SD
PCR anger	3.78	1.55	3.05	1.61	3.39	1.62
NCR anger	2.49	1.27	2.26	1.11	2.37	1.19
Mean strategies, unsolvable 1, 2	2.31	1.56	3.09	1.94	2.73	1.81
Mean strategies, unsolvable 3, 4	2.14	1.82	2.91	1.91	2.55	1.90

Table 3 Correlations among study variables (n = 79)

	1	2	3	4	5
1. Age	–				
2. Perceptions of PCR anger	−.31**	–			
3. Perceptions of NCR anger	−.07	.15	–		
4. Mean strategies, unsolvable 1, 2	.44**	−.14	−.15	–	
5. Mean strategies, unsolvable 3, 4	.33**	−.22	−.19	.82***	–

* $p < .05$. ** $p < .01$. *** $p < .001$

Note. PCR/NCR = child report of mother use of positive/negative conditional regard

motivated participants, depending on their socialization histories.

Hypothesis 1: Association between facial expression of emotion and change in strategy use

We conducted a one-way ANCOVA to test the relation between child facial expression of negative emotion and mean number of strategies verbalized during unsolvable puzzles 3 and 4. Child age and gender were entered as covariates, along with mean verbalized strategy use during unsolvable puzzles 1 and 2 in order to examine *change* in strategy verbalization from earlier to later in the series of impossible puzzles. The analysis showed that the two emotion groups (anger vs. shame/sadness) did not differ in change in verbalized strategy use, $F(1, 74) = 0.23$, *ns*.

Hypothesis 2: Associations between PCR and NCR for anger and change in strategy use

A hierarchical regression was conducted to assess the association between child-reported parent use of PCR anger and change in verbalized strategy use. Child age, gender, mean verbalized strategy use during the first two unsolvable puzzles, and child-reported NCR for anger were entered in a first step; change in R^2 was .68, $F(4, 74) = 40.17$, $p < .001$. Mean verbalized strategy use during unsolvable puzzles 1 and 2 was strongly related to mean verbalized strategy use during puzzles 3 and 4, $b = 0.84$, $t = 11.10$, $p < .001$. PCR anger was entered in a second step; change in R^2 was 0.00, $F(1, 73) = 0.78$, *ns*; the effect of PCR anger, $b = -0.07$, $t = -0.88$, was not significant.

A second hierarchical regression was conducted to determine whether child-reported NCR anger predicted change in verbalized strategy use. Child age, gender, mean verbalized strategy use during unsolvable puzzles 1 and 2, and child-reported PCR anger were included in a first step; change in R^2 was .68, $F(4, 74) = 39.52$, $p < .001$. Child-reported NCR anger was entered in a second step; change in R^2 was 0.00, $F(1, 73) = 1.59$, *ns*, with a nonsignificant effect of NCR anger, $b = -0.13$, $t = -1.26$, *ns*.

Hypothesis 3: Association of PCR anger and emotion expression with change in strategy use

To test our CR anger X emotion hypotheses, we carried out two regression analyses, one with PCR anger and one with NCR anger. In these analyses, we controlled child age, gender, perceptions of parent use of NCR or PCR for anger, and mean strategy use during the first two unsolvable puzzles. PCR and NCR anger were the independent variables, the dichotomous emotion expression variable was the moderator, and mean strategy use during unsolvable puzzles 3 and 4 was the outcome. We used the PROCESS regression macro for SPSS, Model 1, to test for moderation (Hayes 2013). This analysis yields a bias-corrected estimate of the 95 % confidence interval for the interaction effect, based on 1000 samples.

In the first regression, after controlling for covariates, the moderation effect (PCR for anger X emotion expression) was significant, $b = 0.30$, $t = 2.00$, $p < .05$, with change in $R^2 = 0.02$, a small effect size (Cohen 1988). For children who expressed anger after the last unsolvable puzzle, the negative association between perception of PCR anger and change in verbalized strategies was significant, $b = -0.22$, $t = -2.06$, $p < .05$, whereas for children who expressed shame/sadness, it was not, $b = 0.08$, $t = 0.69$, *ns*. For children who expressed anger, higher perceived maternal use of PCR anger was related to fewer verbalized strategies after repeated failure, whereas lower perceived maternal use of PCR anger was related to greater strategy use (see Fig. 1). In the second regression, after controlling for covariates, the moderation effect (NCR anger X child emotion) predicting verbalized strategies on unsolvable puzzles 3 and 4 was not significant, $b = 0.31$, $t = 1.44$, *ns*, with change in $R^2 = 0.00$.

Discussion

The goal of the present study was to investigate individual differences in children's engagement during a task involving repeated failure, in relation to their emotional responses to the failure experience and their socialization histories. We hypothesized that the dominant emotion

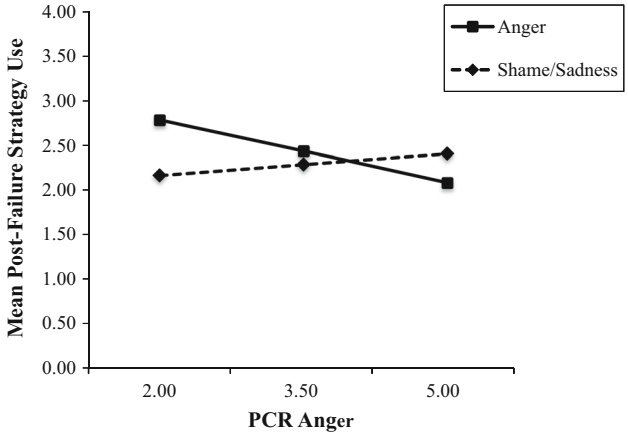

Fig. 1 Mean strategy use on puzzles 3 and 4 by child-reported mother use of positive conditional regard for anger suppression, by child expression of anger or shame/sadness after repeated failure *Note.* Points on the PCR Anger axis are at 1 SD below the Mean, the Mean, and 1 SD above the Mean

children displayed in response to failure and their socialization experience (perceived parental use of PCR for anger suppression) would predict behavioral responses to failure; and that children who showed anger would respond differentially depending on their socialization history (levels of perceived PCR for anger suppression). Because the CR for anger suppression scale had not previously been used with this age group (mean age = 11.5 years), we also conducted a factor analysis of the CR for anger scale. Our analysis of the child-report scales for parent use of CR to suppress anger expression indicated that children in this age range distinguished negative CR from positive CR, consistent with earlier research with adolescents (e.g., Roth et al. 2009). The factor analysis enabled us to move ahead with hypothesis-testing using the CR subscales for anger suppression and it supports the use of this scale in future research with pre-adolescents.

Emotion expression, socialization, and performance during failure

We first assessed the range of facial expressions displayed at the end of the failure trials. Whereas earlier investigations of emotional responses to failure report differences in levels of generalized negative affect for children who differed in their cognitive and behavioral responses to achievement tasks (e.g., Elliott and Dweck 1988; Smiley and Dweck 1994), in the current study, and in line with more recent research (e.g., Gentzler et al. 2013; Roth et al. 2014), we observed a range of discrete negative emotions in facial displays following repeated failure. Consistent with Gentzler et al. (2013), more children expressed anger/frustration than sadness or shame. We also note that a small number of children in our study expressed positive

emotion, including amusement and surprise; because their numbers were small, it was not possible to examine performance correlates of these emotions. Nevertheless, it is important to acknowledge the range of possible emotional responses to failure; presumably children who show positive emotion are more resilient against failure, due to, for example, a growth mindset (Dweck 2006) or emotion socialization that encourages processing of negative emotion (Eisenberg et al. 1998; Jaffe et al. 2010).

With respect to our first two hypotheses, we had expected that compared to anger, typically an approach-motivating emotion, avoidance-motivating emotions (sadness, shame) would be associated with greater decreases in strategy production across the series of impossible puzzles, as would higher levels of perceived parental use of PCR for anger compared to lower levels of perceived parental use of PCR for anger. However, analyses revealed no main effects of either factor. Not finding a difference in use of strategies from earlier to later in the failure series for the anger versus shame/sadness groups could be due to qualitative differences in performance *within* these two groups. Although not statistically different, raw mean scores for children displaying shame were lower than for children displaying sadness on puzzles 1 and 2 and puzzles 3 and 4, suggesting that children who experience shame might have stronger tendencies to withdraw than those who show sadness but this claim requires further study. Further, within the group of children displaying anger/frustration, we *hypothesized* that there would be two subgroups of children whose performance trajectories would differ depending on their socialization around the expression of anger. These possible within-group differences may account for the non-significant result in our test of Hypothesis 1.

Regarding Hypothesis 2, PCR for anger suppression did not predict reduced verbalization of strategies later in the puzzle series, nor did NCR for anger. The null finding with PCR for anger is inconsistent with past research in which parent-reported PCR to suppress expression of sadness was disruptive to young children's emotion processing (Roth and Assor; Roth and Assor 2010), and with research in which parent- and adolescent-reported PCR to suppress anxiety, sadness, or anger was associated with adolescent-reported suppression of emotion (Assor et al. 2004; Israeli-Halevi et al. 2015; Roth and Assor 2012). Not finding a main effect of PCR anger on task engagement may be due to a number of factors. First, our outcome measure, unlike the studies just cited, was not a direct measure of emotion suppression but rather, a hypothesized downstream effect of emotion suppression, namely, compromised performance. Second, past research has shown that academic disengagement or restricted focus in learning situations is associated with parental use of CR in the *academic domain* (Assor et al. 2004; Roth et al. 2009). In other words, past research with parental CR has documented domain-specific effects, whereas we arguably attempted to show a cross-domain effect by using PCR in the emotion domain to predict decrements in problem-solving behavior. Finally, in many studies of the effects of parental CR, parent CR and outcomes are both assessed via self-report (Roth and Assor (2010) is an exception); positive associations found in prior research may therefore derive at least in part from shared method variance. By comparison, we used a behavioral measure of task engagement that might be only indirectly associated with the predictor. That is, as discussed below, identifying a mediating factor between PCR anger and performance decrement after failure—for example, a physiological measure of emotion dysregulation, a cognitive measure of rumination, or a measure of feelings of compulsion/autonomy or loss of control—would be a fruitful area for future research.

Interaction of emotion expression and socialization predicts performance change

Our third hypothesis was that socialization of anger suppression and emotion expression would interact to predict performance change during repeated failure. One of our goals in testing this hypothesis was to extend to a child sample research that had been done with adults on divergent responses to anger (e.g., Carver and Harmon-Jones 2009; Cooper et al. 2008). We speculated that, like adults who experience chronic versus time-limited loss of control (Greenaway et al. 2015; Roth and Kubal 1975), children who are socialized to suppress anger/frustration may experience chronic loss of control and succumb to helplessness, withdrawing effort in a challenging achievement situation, compared to children socialized toward legitimate expression of anger/frustration who may respond to challenge with enhanced effort. As predicted, we saw that when children displayed anger/frustration after failure, those who perceived that they were parented with PCR aimed at suppressing anger showed performance deterioration, whereas those not parented in this way showed performance enhancement.

This finding is striking on several counts. First, it is consistent with findings in the adult literature that anger is both avoidance- and approach-motivating (Cooper et al. 2008) and that anger suppression is negatively associated with performance (e.g., Gross 2002; Gross and Levenson 1997). Further, our finding augments the single report in the developmental literature (Pekrun et al. 2009) that anger mediates associations between *both* performance-avoid goals and mastery goals and task performance. Second, the finding is specific to perceived *positive* conditional regard in the domain of anger expression. That is, as found in prior studies with older participants (e.g., Assor and Tal 2012;

Roth et al. 2009), offering extra attention or affection to children for conforming with expectations is not a benign parenting practice; it is associated with suppressive emotion regulation that can interfere with task engagement. Finally, it is useful to place the observed effect in the context of the average child's performance during our challenging task: In general, children's strategy use was relatively stable across the puzzle series. In contrast, this finding shows that children who display anger and report being parented with PCR to suppress anger exhibit performance deterioration. The finding advances our understanding of the sources of individual differences in children's responses to failure.

One way to interpret the more adaptive response by children who expressed anger but reported low parent use of PCR anger versus the less adaptive response by children who expressed anger and reported high levels of PCR anger is in terms of the self-determination theory-based distinction among regulatory styles (Ryan et al. 2006; Roth and Assor 2012; Roth et al. 2009, 2014). An integrative emotion regulatory style is associated with more adaptive functioning because individuals attempt to recognize and understand emotional experiences as they happen, enabling volitional experience of emotion and motivating goal-directed action. Healthy emotion regulation may "immunize" individuals against negative emotion that may arise with challenges (Gross et al. 2006; Roth et al. 2014). In comparison, a controlling regulatory style is associated with less adaptive responding because individuals tend to ignore or suppress emotions they experience as threatening or uncomfortable. Attempting to suppress emotions may be experienced as non-volitional and place an individual in conflict at the behavioral, emotional, and/or physiological levels, therefore interfering with adaptive responding.

However, in the present study we did not explicitly explore the reasons children socialized to suppress their anger might show performance impairments. Researchers have suggested alternative explanations that involve resource depletion: individuals who attempt to suppress anger may deplete the cognitive resources they can devote to a task (e.g., Bonanno et al. 2004; Gillet et al. 2013; Gross 2002), perhaps due to ruminative thinking (Gentzler et al. 2013), or they may deplete self-regulatory resources needed to manage both internal experience and action (Baumeister 2002; Schmeichel et al. 2003). On the other hand, there is evidence to support the hypothesis that feelings of limited autonomy in emotion expression could explain the difference in performance. When instructed either to suppress emotion or to attend to and try to figure out their emotion, only those instructed to suppress emotion show performance disruption, despite the fact that both groups devoted cognitive resources to managing emotion during a task (Roth et al. 2014). Similarly, adults instructed to express anger when no anger-eliciting stimulus was present showed poorer performance, suggesting that discrepancies between felt and expressed emotion interfere with performance (Perbandt 2007). In other words, if children perceive that their parents use PCR for anger and therefore do not experience autonomy in anger expression, this may disrupt their performance, an explanation that is consistent with self-determination theory.

Strengths and limitations

Our study has several notable strengths. First, to measure performance under challenge, we used a real-life failure task, trained participants on solution strategies, and asked them to announce strategies as they were used. This procedure enabled us to measure engagement throughout a challenging task and assess change in strategy use in an ecologically valid setting. Second, we assessed emotion through facial displays rather than self-report, enabling us to obtain an objective measure of emotional response and to distinguish several discrete emotions rather than broad categories of negative and positive emotion. In contrast, most studies that explore effects of CR on emotion regulation and performance rely exclusively or primarily on self-report data (e.g., Assor et al. 2004; Israeli-Halevi et al. 2015; Roth et al. 2009). Third, we assessed socialization of emotion suppression with both PCR and NCR for anger, making it possible to identify PCR anger as a unique predictor (in interaction with emotion expression) of performance patterns.

The study also has some limitations that temper our interpretations. First, we measured children's task engagement on the puzzle series by tallying the number of strategies they produced verbally. While strategy use is a key indicator of children's task engagement, other measures (e.g., number of disengagement cues expressed during the puzzle series) could provide additional indicators of performance. In addition, there may not be a one-to-one correspondence between children's announcements of strategy use and deployment of those strategies.

Second, we coded children's facial expressions of emotion using an adapted version of the AFFEX coding scheme, which was validated for use with infants' responses to strong elicitors (Izard and Dougherty 1980). In comparison, the failure experience we used was relatively mild and the emotion expressions we coded were more subtle, perhaps because preadolescents mask their emotions (Zalewski et al. 2011). In future research, other measures of emotion (e.g., physiological reactivity) could be used. In addition, a stronger eliciting event, for example, less time allotted per puzzle or social comparative feedback, could be used to evoke stronger negative emotion.

Finally, we measured parent use of PCR and NCR for anger suppression with child self-report and our data were collected at one point in time. Replicating our results with parent-report or observational measures of parent attempts to control child anger would provide supportive evidence. Collecting socialization data prior to emotion and performance data, in a longitudinal design, will be an important avenue for future research, to explore causal relations between socialization and responses to failure.

Conclusion

Our results show that socialization of anger expression is associated with differences in performance for school-aged children who experience anger/frustration during a failure task. Those who are socialized to suppress their anger appear to suffer performance impairments, whereas those whose anger is not suppressed may benefit from the approach-motivating aspects of anger. There is more to learn about why these effects occur, as well as about whether socialization of expression of internalizing emotions like sadness or shame has effects on children's performance under challenge. The results of this research point to the importance of distinguishing among discrete negative emotions and attending to individual differences in regulation of anger when examining motivational properties of emotion experiences.

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Compliance with ethical standards

Ethical approval All procedures involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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

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