

Emotion regulation in preschoolers: the roles of behavioral inhibition, maternal affective behavior, and maternal depression

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Background: This study examined preschoolers' emotion regulation (ER) strategies and the association with temperament, maternal interactive style, and maternal history of childhood-onset depression (COD). **Methods:** Participants were 62 children and their mothers, 37 of whom had mothers with COD. Children's ER was assessed using a disappointment paradigm; temperament assessment also was laboratory-based. **Results:** Maternal COD was inversely related to offspring's active ER and positive mood. Among children of COD mothers, behavioral inhibition was associated with passive regulation and sadness, and maternal positivity toward these children was associated with child active ER and positive mood. **Conclusion:** Behavioral inhibition may place children of COD mothers at risk for developing maladaptive ways of regulating negative emotion, whereas mothers' positivity may serve as a protective factor for them. **Keywords:** Emotion regulation, behavioral inhibition, parent-child interaction, maternal depression. **Abbreviations:** COD: childhood-onset depression; ER: emotion regulation.

One of the key developmental tasks in early childhood is the attainment of emotion regulation (Grolnick, McMenamy, & Kurowski, 2006; Kopp, 1989). Beginning in the preschool years, children gradually develop the ability to attune their emotion to best support situational demands (Kopp, 1989). In this context, emotion regulation (ER) has often been defined as the ability to initiate, maintain, and modulate emotional arousal in order to accomplish individual goals and facilitate the adaptation to the social environment (Thompson, 1994). ER has been related to a wide variety of domains of functioning, including social competence, peer acceptance (e.g., Calkins, Gill, Johnson, & Smith, 1999; Eisenberg, Fabes, Guthrie, & Reiser, 2002), as well as academic competence (e.g., Grolnick, Kurowski, & Gurland, 1999). On the other hand, problems in ER are often related to behavioral problems and psychopathology (Cole, Teti, & Zahn-Waxler, 2003; Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002). In particular, problems in regulating negative emotions in early childhood have been found to be associated with both internalizing and externalizing problems at school age and beyond (e.g., Buckner, Mezzacappa, & Beardslee, 2003; Silk, Shaw, Forbes, Lane, & Kovacs, 2006). Given the significance of ER, particularly the regulation of negative emotions, it is important to understand how children develop a repertoire of strategies for regulating emotion and factors that are associated with the development of ER.

Through infancy and the preschool years, the development of ER is considered as moving along a

continuum, from passive, other-reliant strategies to increasingly active and autonomous strategies (Grolnick et al., 2006). Individual differences in ER also arise during these formative years. Calkins (1994) has specified two critical domains in the process of acquiring ER skills: internal elements, including biological reactivity and behavioral traits, and external elements including parental caregiving styles and the training they provide. Temperament, representing innate individual differences in emotional, behavioral, and biological reactivity to changes in environment (Rothbart & Bates, 1998), has been hypothesized to directly shape the display and development of ER strategies (Calkins, 2003; Fox, Henderson, Marshall, Nichols, & Ghera, 2005). There is also considerable evidence that external support from caregivers is crucial in the development of ER skills during early childhood (Kopp, 1989). Calkins (1994) further postulated that the process of developing ER skills is a function of the interaction of these internal and external factors. Caregiving styles have been shown to be affected by child temperament and certain parental characteristics (Belsky, 1984). One parental attribute that has been consistently found to be associated with caregiving style is depression (Downey & Coyne, 1990). In the present study, we examined how child temperament, maternal interactive style, and maternal history of depression jointly contribute to the emerging patterns of ER in early childhood.

Behavioral inhibition and ER

As a temperament construct, behavioral inhibition represents an individual's behavioral, emotional,

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and physiological reactivity to novel and challenging situations (Kagan, Reznick, & Snidman, 1988). Behaviorally inhibited children are thought to be predisposed to be highly reactive to unfamiliar stimuli as infants and unusually fearful, shy, and withdrawn in the preschool and school-age years (Kagan et al., 1988). Because of their propensity for high reactivity in stressful situations, inhibited children are expected to become over-aroused easily and in response, use a narrow range of ER strategies. Over time, inhibited children would be expected to have limited opportunities to acquire and develop a large repertoire of effective ER strategies (Calkins, 2003; Fox et al., 2005). Research has linked inhibited temperament to the passive types of ER strategies that children employ in stressful situations. For example, inhibited infants and toddlers were found to engage in more self-soothing and proximity seeking with their mothers in response to a stranger or unfamiliar objects; in contrast, uninhibited children tended to engage in more active strategies such as self-distraction (Mangelsdorf, Shapiro, & Marzolf, 1995; Parritz, 1996).

Parenting and child ER

Research on normative development has demonstrated that parents' socialization practices play an important role in children's ER (Saarni, 1993; Zeman & Shipman, 1998). Several dimensions of parenting—especially those associated with positive emotions and emotional support—have been linked to the development of children's ER skills. First, parents' warmth and positive expressivity have been hypothesized to serve as models of constructive ways of self-regulation, evoke children's positive emotion, and enhance their active attempts to regulate emotion (Eisenberg et al., 2005). Denham, Mitchell-Copeland, Strandberg, Auerbach, and Blair (1997) found that children whose parents were more affectively positive tended to display more positive emotion with peers and be more socially competent at preschool. Parental involvement has also been found to support children's initial attempts to use active ER strategies (Grolnick et al., 1996, 2006). Furthermore, parental support for autonomy is thought to relate to children's capacity for effective self-regulation. For example, it has been found that toddlers whose mothers were more supportive of autonomy were more likely to engage in active distraction and constructive ER strategies and were less likely to display distress in a frustrating situation than those whose mothers interacted in a controlling manner (Calkins, 1997; Grolnick et al., 2006).

Maternal depression and child ER

Children with a parental history of depression tend to be at risk for a host of problem behaviors, including internalizing and externalizing problems

(Garber, Braafladt, & Weiss, 1995; Silk, Shaw, Forbes, et al., 2006; Zahn-Waxler, Iannotti, Cummings & Denham, 1990). Underlying these problems in offspring of depressed parents are likely difficulties in regulating emotions (Kovacs & Devlin, 1998). Depressed parents have often been found to be low in positive affect and responsiveness in parent-child interactions (Downey & Coyne, 1990). Children of mothers with a history of childhood-onset depression (COD) may be particularly prone to have problems regulating emotion and developing optimal strategies to cope with unpleasant emotions. Mothers with a history of COD may lack the skills to provide proper ER modeling and training for their offspring, because of their own impaired ER and social relationship skill development in childhood (Kovacs & Goldston, 1991; Silk, Shaw, Forbes, et al., 2006). Using the same overall sample as the present study, our group has previously reported that, compared to control mothers, COD mothers showed less positive emotion to their young offspring's positive expressions and were less likely to respond contingently to children's expression of distress even after accounting for concurrent maternal depressive symptoms (Shaw et al., 2006). We also have reported that during a frustrating situation, children (particularly daughters) of COD mothers are more likely to wait passively and less likely to engage in active distraction than offspring of nondepressed mothers (Silk, Shaw, Skuban, et al., 2006).

The present study

The present study used observational methods to examine whether individual differences in child inhibition, maternal positivity and support, and maternal history of COD would be related to children's ER skills in early childhood. We examined children's ER strategies (including expression of emotion) in response to a disappointment experience. As ER involves modulating one's emotional arousal, we consider emotional expression an integral part of the ER process. The previous use of disappointment-like tasks has been found to reliably elicit negative affect and spontaneous ER attempts among preschool-aged children in normative and high risk samples (Cole, Zahn-Waxler et al., 1994; Forbes, Fox, Cohn, Galles, & Kovacs, 2006). The first goal of this study was to investigate the extent to which individual differences in child inhibition and maternal positivity and support were related to children's expression of emotion and regulatory strategies. Based on previous findings, we expected that behavioral inhibition would be positively related to child distress and the use of passive regulatory strategies, and that maternal positivity would be positively associated with children's positive mood and active regulation. The second goal was to investigate whether a maternal history of COD would be associated with negative-affect laden and passive

ER styles among offspring. We anticipated that children of COD mothers would be more likely to display sadness and utilize passive strategies, compared to children of nondepressed mothers. Lastly, we examined whether maternal COD moderates the relations of behavioral inhibition and maternal positivity with child ER. We hypothesized that children who were either high on behavioral inhibition or low in maternal positivity would be more likely to show sadness and a greater percentage of passive versus active strategies if they also had mothers with a history of COD.

Method

Recruitment and diagnoses

To qualify for the present study, mothers and offspring had to be enrolled in a Program Project (PP) focusing on risk factors for childhood-onset mood disorder, and had to have completed at least two appointments of the Parent-Child Interaction component, one at age 2 or 3 and the other at age 4. All psychiatric diagnoses were derived through administration of standardized, semi-structured psychiatric interviews by trained clinicians and reviewed by independent diagnosticians. The Psychiatric Evaluation Core of the Program Project, staffed by highly experienced and trained professional-level clinical evaluators, and independent best-estimate psychiatrists, was responsible for all psychiatric assessments and verified cases' lifetime diagnostic status. Best-estimate consensus diagnostic procedures generally followed the steps outlined by Maziade et al. (1992). All psychiatric assessments involved the use of semi-structured clinical interviews. Diagnoses were derived according to rules specified in the various versions of the DSM (DSM-III, DSM-IV; American Psychiatric Association, 1980, 1994). These psychiat-

ric assessments were completed at enrollment into the study and at yearly follow-up interviews.

In the current sample, 10 COD mothers had been previously enrolled in a longitudinal naturalistic follow-up of COD (Kovacs, Obrosky, Gatsonis, & Richards, 1997) and the remaining 23 were recruited from the community. The NCOD families were recruited via one of three ways: other research studies ($n = 7$), the general community ($n = 8$), or through a special community program for women and their children ($n = 9$).

Participants

Sixty-two children and their mothers participated, including 37 children of mothers with a history of COD and 25 with no history of psychiatric disorder (NCOD). Children were 4 years old when ER strategies were assessed ($M = 3.99$, $SD = .17$). All COD mothers met DSM criteria (DSM-III, DSM-IV; American Psychiatric Association, 1980, 1994) for major depressive and/or dysthymic disorder by age 15, or bipolar spectrum disorder by age 17. The COD group consisted of 33 mothers, four of whom had two children enrolled, and the NCOD group consisted of 24 mothers, in which one enrolled two children. Current diagnosis was available for 32 of the 33 COD mothers: within a year of the present study ($M = 6.9$ months, $SD = 5.9$), 11 (33%) COD mothers experienced a major depressive episode. Rates of clinical diagnosis were supported by self report of depressive symptoms collected on the same day as the present study: 11 (33%) of COD mothers reported a depressive symptom at or above moderate-severe level on the Beck Depression Inventory (i.e., score ≥ 19). Efforts were made to ensure the groups were similar on sociodemographic characteristics. As shown in Table 1, children's age and gender distribution were not different between the two groups. COD and NCOD mothers were also similar in age, education, ethnicity, and marital status; however, COD mothers had higher self-reported depressive symptoms than NCOD mothers.

Table 1 Descriptive statistics and group differences on demographic characteristics for COD and NCOD groups

	COD	NCOD	t/χ^2
Child age	3.99 (.18)	3.97 (.16)	.49
Maternal age	28.14 (3.50)	29.31 (5.08)	-1.00
Maternal BDI score	13.00 (9.96)	3.39 (3.80)	5.22***
Child gender (% female)	59.5	40.0	.13
Maternal education			
<12th grade (%)	8.1	.0	6.02
High school grad. (%)	43.2	28.0	
Some college (%)	35.1	64.0	
College grad. (%)	13.5	8.0	
Maternal ethnicity			
African-American (%)	21.6	32.0	2.03
Euro-American (%)	73.0	68.0	
Marital status			
Married	32.4	68.0	8.17
Living with someone	13.5	8.0	
Single	40.5	16.0	
Divorced or separated	10.8	8.0	
Widowed	2.7	.0	

Note. COD = childhood-onset depression (in mother). NCOD = control.

* $p < .05$; ** $p < .01$; *** $p < .01$.

Procedures and measures

Children and their mothers completed two 2.5-hour laboratory visits at least one year apart, which were videotaped. Data used for the present study were derived from a subset of tasks from these visits. Behavioral observations of children and mothers in different tasks were coded by separate teams of coders who were not aware of the mothers' diagnostic status. Maternal depressive symptoms were obtained through self-report. Following approval of study procedures by the University of Pittsburgh's Institutional Review Board, before data were collected and laboratory tasks were administered, trained research assistants reviewed all study components and obtained written consent from all participants.

Child ER. At age 4 children participated in a procedure designed to tap ER in the face of disappointment (Cole, Zahn-Waxler, & Smith, 1994). Before the beginning of a cognitive task, an experimenter asked the child to rank-order eight small prizes and told the child that he/she would receive the preferred prize upon completion of the task. A second experimenter administered the cognitive task and then presented the child with his/her least preferred prize (which was a broken toy). The second experimenter stayed for 60 seconds and then left. The child was left alone for another 60 seconds before the first experimenter came in to give the child his/her preferred prize. To confirm that the disappointment paradigm elicited mild negative affect, we compared children's observed negative emotion during the disappointment task to their negative emotion during other tasks that were designed to be neutral in affect and that were administered at the same assessment as the disappointment task (e.g., playing with Sand-n-Ball). Results indicated a higher level of negative affect during the disappointment task than that during the neutral tasks, $F(1, 61) = 12.87, p = .001$ (mean ratios of negative emotion were .14 and .05, $SDs = .19$ and $.09$, respectively).

Children's affect and behavior in response to the disappointment were coded in 10-second intervals, using a coding system adapted from Cole et al. (1994). The presence or absence of different affect and strategies within each 10-second interval was recorded. Based on the facial and vocal cues, three types of affective expression were coded: *joy*, *sadness*, and *anger*. Behavioral coding focused on three regulatory strategies: (1) *active self-regulation* – child's active engaging in the playing/exploring of the broken item (e.g., trying to repair it) or attempting to change the situation (e.g., asking questions about the gift); (2) *passive tolerance* – sitting quietly or staring at the item without engaging in any overt activity; and (3) *disruptive behavior* – behavior that is typically regarded as inappropriately aggressive and disruptive. A subset of tapes (10%) was coded by two coders and kappas were .88, .96, and .91, for joy, sadness, and anger, respectively and .74, .72, and .96 for active self-regulation, passive tolerance, and disruptive behavior, respectively.

To reduce the number of variables, all six codes were factor analyzed. A principal component analysis revealed two factors explaining 63.9% of the total variance. The first factor consisted of active self-regu-

lation and joy (loaded positively), and passive tolerance and sadness (loaded negatively). For the ease of interpretation, the first factor was split into two components: *active regulation and joy* and *passive regulation and sadness*. Although these two components correlated highly, $r = -.77, p < .001$, they were analyzed in separate models to examine the possibility that they might be differentially associated with child and maternal factors. Another factor derived from the principal component analysis, *anger and disruption*, consisted of displayed anger and disruptive behavior.

Behavioral inhibition. At age 2 or 3, children's reactions to unfamiliar stimuli were coded to provide an index of behavioral inhibition. The age-2 visit consisted of two novel situations: an unfamiliar room/environment (*free-play*) and the *Strange Situation*. The free play task involved the child playing with toys alone in an unfamiliar setting for 10 minutes, while the mother working on questionnaires with an experimenter. The Strange Situation is a standardized procedure involving exposure of the child to increasingly stressful 3-minute episodes involving the child, mother, and a stranger (Ainsworth, Blehar, Waters, & Wall, 1978). The age-3 visit consisted of the same free-play task, a *stranger* task where an experimenter (the stranger) engaged the child in play for two minutes, and a *novel toy task* (4–5 minutes). In the novel toy task a remote controlled Komodo Dragon was manipulated to approach the child while making different movements and noises. The child was also placed in front of an eight-foot-long tunnel and allowed to play with it for two minutes.

Children's level of inhibition was coded globally on a 4-point scale (1 = shows no inhibition; 4 = shows much inhibition). The rating was based on all incidents of the following: 1) the lack of approach to toys (e.g., child does not touch or play with the toys, or walks around the toys); 2) anxious, wary expression or behavior (e.g., child is timid or fearful); and 3) wary, hesitant response to the stranger (e.g., child retreats from the stranger, freezes, avoids eye contact). The coding scheme was adapted from Kochanska (1991). The inter-rater reliability was .88 based on 10% of cases coded by two raters. Because part of the procedures for assessing inhibition were different at ages 2 and 3, children who were assessed at different ages were compared; no differences in levels of inhibition were found, $t(60) = 1.17, ns$.

Maternal positivity. At age 4, children and their mothers participated in a 25-minute mother-child interaction, which consisted of a series of 4–5 tasks designed to elicit positive and negative affect in children; all mothers were instructed to follow the same sequence (Shaw et al, 2006). Each task involved a toy (e.g., wiggle ball) with which the child and mother played together. Maternal and child affective behaviors were coded in two ways, based on the occurrence of a behavior in 10-second intervals and using a global rating scale. For this study, a factor of *maternal positivity* was generated based on one interval code and four global codes that reflect mothers' warmth, supportiveness, and involvement with their children. The interval code of *maternal positive affect* reflects mothers' positive gesture (e.g., smiling, laughing, kissing, hugging)

Table 2 Descriptive statistics and group differences on child and maternal study variables

	COD (<i>n</i> = 37)		NCOD (<i>n</i> = 25)		<i>t</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Behavioral inhibition	1.95	1.03	2.16	1.07	-.79
Maternal positivity	2.93	.44	3.17	.50	-1.96*
Maternal BDI Score	13.00	9.96	3.39	3.80	5.22***
Active regulation and joy	.32	.16	.40	.16	-1.94†
Passive regulation and sadness	.28	.18	.21	.17	1.47

Note. COD = childhood-onset depression (in mother); NCOD = control; BDI = Beck Depression Inventory.

†*p* < .1; **p* < .05; ****p* < .001.

and verbal comments indicating approval (e.g., 'good job'), affirmation of, or affection toward the child; the number of intervals in which mothers displayed positive affect towards children was recorded. Four global codes were included, all rated on a 4-point scale with higher scores indicating greater frequency/intensity of the maternal behavior being rated: 1) *maternal positivity toward child*, which is similar in definition to the interval code but allows the coder to rate both the frequency and intensity of mothers' display of positive affect; 2) *maternal quality as a teacher*, the extent to which mothers explain the tasks, provide feedback and suggestions, make the tasks interesting, and give children the freedom to try on their own; 3) *maternal sociability*, indicating mothers' warmth and friendliness toward children; and 4) *maternal involvement with child*, the degree to which mothers are attentive to children, maintaining eye contact and conversation. Cronbach's alpha for this 'maternal positivity' index was .73. Interrater reliability was calculated based on 15% of tapes coded by at least two coders. Reliability was .63 (kappa) for the interval code, and .72, .62, and .70 (intraclass correlations) for maternal positivity, quality as a teacher, and sociability, respectively. For maternal involvement, because all but one mothers received ratings of 3 or 4, a kappa was calculated (.60).¹

Beck Depression Inventory (BDI). The BDI (Beck, Steer, & Garbin, 1988) was administered to mothers at the age-4 visit. The BDI is a well-established 21-item measure assessing current depressive symptomatology, yielding total scores with a potential range from 0 to 63.

Results

Means and standard deviations of study variables and differences between COD and NCOD groups on study variables are presented in Table 2. COD mothers reported more depressive symptoms and were observed to be less positive when interacting with offspring compared to NCOD mothers. There was also a trend for children of COD mothers to show lower levels of active regulation and joy (*p* = .06). Both anger and disruption occurred infrequently –

about 40% of children ever showed (and only about 16% showed more than one incident of) anger or disruption. Preliminary analysis revealed no significant associations with any of the predictors.²

As described earlier, five of the mothers in the sample had two children participate in the study. Although laboratory visits for siblings were on different days, measures of siblings may be correlated. To account for the potential nonindependence due to the inclusion of siblings, associations between child and maternal attributes (i.e., child inhibition, maternal positivity, and maternal depression) and children's ER variables were tested using mixed-effect (regression) models with family membership treated as a random effect. Two mixed-effect models were tested, one for each ER factor. The main effects of behavioral inhibition, maternal positivity, and maternal COD status, as well as the interaction effects of maternal COD × behavioral inhibition and maternal COD × maternal positivity were estimated as fixed effects. Mothers' BDI scores were entered as a covariate, as COD mothers had higher BDI scores than NCOD mothers. In the model estimation, all continuous independent variables were centered. As some studies have reported gender effects on child ER (e.g., Forbes et al., 2006), we also tested child gender in preliminary analyses. Neither gender nor COD by gender interaction was associated with ER variables; thus, gender was not included in the final analyses.

The model for the ER factor reflecting active regulation and joy revealed a main effect of maternal COD status; maternal COD was predictive of child active regulation and joy such that children with COD mothers engaged in less active regulation and displayed less positive affect during the

¹Among 50 tapes coded for reliability (17 tapes coded by 5 coders), only one mother had a rating of '2' by one coder and none had a rating of '1'. In calculating the kappa, the score of '2' was considered a disagreement.

²The distribution of the variable anger and disruption was substantially deviated from normal due to its low occurrence, and thus it was analyzed using a generalized linear model, which is an extension of traditional linear models to non-normal data. Maternal COD status and BDI scores, child behavioral inhibition, maternal positivity, as well as COD by behavioral inhibition and COD by maternal positivity interactions, were entered as predictors. Results indicated that none of the independent variables, nor the interactions were predictive of children's display of anger and disruption in the disappointment task, (χ^2 s = .09–1.32, *ns*).

Table 3 Random effects regression analyses for child ER factors

	Active regulation and joy			Passive regulation and sadness		
	<i>B</i>	<i>SE B</i>	<i>t</i>	<i>B</i>	<i>SE B</i>	<i>t</i>
Behavioral inhibition	-.00	.03	-.08	-.00	.04	-.07
Maternal positivity	-.06	.07	-.85	.07	.07	.90
MCOD	-.10	.05	-1.99*	.07	.06	1.17
Maternal BDI score	.00	.00	.58	.00	.00	.24
MCOD × Behavioral inhibition	-.09	.04	-2.13*	.10	.05	2.24*
MCOD × Maternal positivity	.18	.09	1.95 [†]	-.14	.10	-1.42

Note. MCOB = Maternal childhood-onset depression diagnostic status; BDI = Beck Depression Inventory.

[†] $p < .1$; * $p < .05$.

disappointment task, compared to children in the NCOD group. This main effect was qualified by an interaction between maternal COD and behavioral inhibition, as well as a marginal interaction ($p = .06$) between maternal COD and maternal positivity. Mothers' BDI scores were not associated with active regulation and joy (Table 3). The interactions (including the marginally significant COD by maternal positivity effect) were probed further and the associations of positive regulation and joy with maternal positivity and child inhibition were estimated by diagnostic group (COD vs. NCOD). As shown in Figure 1a, behavioral inhibition was negatively associated with active regulation and joy only for children in the COD group ($B = -.09$, $SE = .03$, $t = -3.44$, $p < .01$). The interaction between maternal COD and maternal positivity is plotted in Figure 1b. For children in the COD group, maternal positivity was positively associated with active regulation and joy ($B = .12$, $SE = .06$, $t = 1.97$, $p = .05$), while this relationship was not significant for the NCOD group (Table 3).

The model for the ER factor reflecting passive regulation and sadness indicated only an interaction effect between maternal COD status and child behavioral inhibition (Table 3). None of the predictor variables (including the covariate) was associated directly with children's passive regulation and sadness. To further specify the interaction effect, the association between behavioral inhibition and ER was estimated separately for the two maternal diagnostic groups. As shown in Figure 2, among children of COD mothers, behavioral inhibition was positively associated with passive regulation and sadness ($B = .10$, $SE = .03$, $t = 3.42$, $p < .01$), whereas this relationship was nonsignificant for children of NCOD mothers (Table 3).

Discussion

This study examined children's ER strategies in the context of a laboratory-based disappointment experience. We attempted to address several questions about predictors and moderators of ER in early childhood. As expected, we found that maternal history of COD moderates the associations between

children's inhibition and ER and between maternal interactive style and children's ER. Specifically, among children of COD mothers, behavioral inhibition at age 2 or 3 was predictive of high levels of passive regulation and sadness and low levels of active regulation and positive mood at age 4; maternal positivity was positively associated with

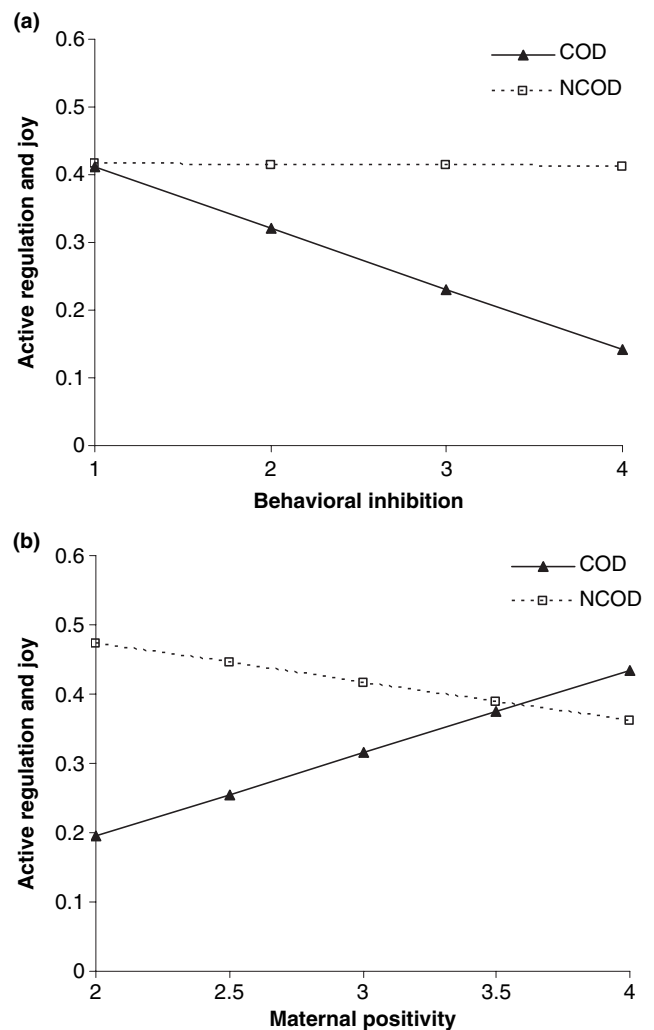


Figure 1 Children's active regulation and joy as predicted by (a) maternal COD × child behavioral inhibition, and (b) maternal COD × maternal positivity. COD = childhood-onset depression (in mother); NCOD = control

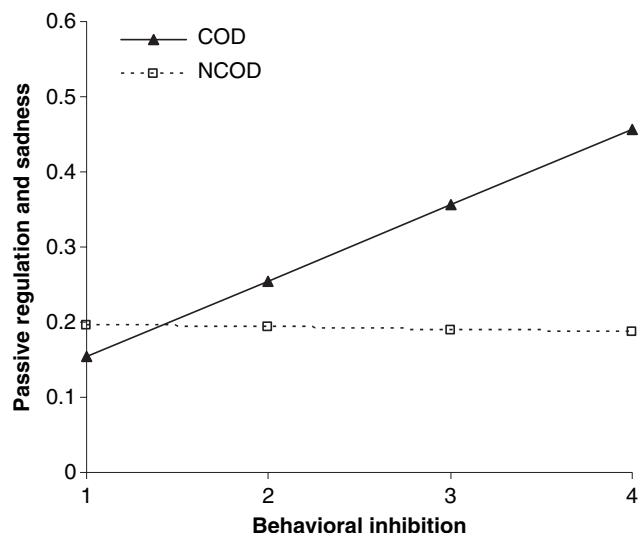


Figure 2 Children's passive regulation and sadness as predicted by maternal COD \times child behavioral inhibition. COD = childhood-onset depression (in mother); NCOD = control

child active regulation and positive mood. Results also revealed that children of COD mothers were less likely than children of nondepressed mothers to display active regulation and positive mood.

During the early childhood years, passive styles of ER become less effective for down-regulating negative emotion, compared to active strategies (Grolnick et al., 2006). Growing evidence suggests that passive styles of regulation, such as self-soothing and passive waiting, are positively correlated with subsequent distress beyond infancy (Diener, Mangelsdorf, McHale, & Frosch, 2002; Calkins et al., 1999). On the other hand, strategies such as active distraction, have been associated with the reduction of distress in challenging situations (Calkins et al., 1999; Grolnick et al., 1996).

Our findings support the proposition that the development of ER skills reflect both internal and external factors and their interactions (Calkins, 1994). Our results also are consistent with previous studies suggesting an association between behavioral inhibition and passive ER strategies in infancy and toddlerhood (e.g., Mangelsdorf et al., 1995; Parritz, 1996), and although this association was not strong (i.e., it became nonsignificant when other variables were added to the model), the results extend it to an older sample of children. Furthermore, early behavioral inhibition was associated with later passive regulation and sadness among children of COD mothers (but not among children of NCOD mothers), and maternal positivity was directly associated with child active regulation and positive mood only for at-risk offspring. These findings suggest that there may be different pathways to maladaptive ER depending on the child's at-risk status. The findings also seem to suggest that children of COD mothers may be more sensitive or responsive to

positive maternal mood, or that multiple parental risk factors have to be present to increase children's vulnerability for problems in ER.

At a broader level, the non-linear relationships evident between child inhibition and ER, as well as between caregiving style and ER, are consistent with a transactional perspective (e.g., Sameroff & Mackenzie, 2003), suggesting that multiple parent *and* child characteristics and their interplay are needed in understanding children's developmental outcomes. The results indicated that temperamental vulnerability or the lack of positive parent-child interaction alone may not necessarily lead to problems in ER; however, child risk status appears to increase for parents that have a history of COD and may have difficulties regulating their own emotion. Interestingly, maternal COD status was associated with offspring's active regulation and positive mood but not with passive regulation and sadness, although the two ER factors were highly correlated. Our finding that children of COD mothers showed less positive mood and active regulation than children of nondepressed mothers is consistent with our earlier report (using the same sample but different tasks at different ages) suggesting a *negative* association between maternal history of COD and offspring's expression of positive affect in mother-child interaction (Shaw et al., 2006) and active self-distraction in a delay situation (Silk, Shaw, Skuban, et al., 2006).

Reduced positive affect has been regarded as a core feature of depression (Clark & Watson, 1991; Forbes & Dahl, 2005). The present study extends this line of research by demonstrating that maternal COD status can be linked to offspring's reduced active regulation and positive mood, underscoring early signs of ER difficulties among children at familial risk for depression (e.g., Downey & Coyne, 1990). The results further suggest that maternal history of COD may connote a greater challenge for children's developing ER skills than mother's current level of depressive symptoms, given the null finding on the relations between mother BDI scores and child ER. Taken together with our earlier report (e.g. Silk, Shaw, Skuban, et al., 2006) that link the lack of active regulatory strategies (e.g., self-distraction, positive reward anticipation) with increased risk for internalizing problems in children, our results suggest that depression-risk may be transmitted through parental behaviors that influence the development of ER in children, which then impacts on children's subsequent psychological adjustment.

Parents can shape children's development in ER in many ways, through modeling and reinforcing of children's behavior, and by creating the emotional climate for social interaction at home (Eisenberg, Cumberland, & Spinrad, 1998). Depressed parents may provide social models for passive, withdrawn behavior and a lack of positive affectivity to their children (Downey & Coyne, 1990; Goodman &

Gotlib, 1999). Previous research using the same cohort as the present study has found that mothers' observed positive emotion when children were 2–3 years of age was associated with subsequent increases in offspring's positive affective expression 1–2 years later (Feng, Shaw, Skuban, & Lane, in press). Depressed parents may also influence the development of ER by their immediate responses to children's expression of emotions (Denham, Bassett, & Wyatt, 2007; Eisenberg, Fabes, & Murphy, 1996), a notion that has also been supported by previous work with this cohort. Shaw et al. (2006) found that COD mothers were less responsive to children's distress, and Feng et al. (in press) found that mothers' responsiveness to children's positive affect was associated with subsequent decreases in offspring's negative affective expression.

Additionally, parents may also influence offspring's ER through genetic transmission. Research has suggested strong genetic contribution to depression in the offspring of parents with early-onset depression (Kovacs et al., 1997; Weissman, Warner, Wickramaratne, & Prusoff, 1988). Children of COD mothers may inherit directly the vulnerabilities to depression (Goodman & Gotlib, 1999), which may also lead to increased risk for developing problems in ER. It is also plausible that children of depressed mothers inherit certain temperament/personality traits, such as inhibited temperament and low positive affectivity (Goodman & Gotlib, 1999), which in turn may predispose these children to risk for dysregulated emotion in stressful circumstances.

Limitations

Several limitations of the present study suggest directions of future work. First, maternal positivity and child ER were assessed at the same time, and thus the directionality of the associations cannot be inferred. Longitudinal studies are needed to further investigate the process in which children develop stylistic strategies for regulating emotion over time and how these strategies might be related to child and familial factors. Second, children's ER was assessed in a laboratory setting for a brief time period. Although the disappointment task has been shown to be ecologically valid and consistently elicit negative emotions (Cole et al., 1994; Forbes et al., 2006), children's ER needs to be assessed in multiple situations because the context may support or inhibit the use of some strategies (e.g., more socially desirable ones) over others. Future studies also should attempt to assess children's ER across multiple relationship contexts and using multiple methods (e.g., interviews, vignettes) to improve the generalizability of findings and examine convergent validity. Third, the sample was relatively small, which limited the number of predictors we were able to test. Because of the limited power, we included only one child and one parenting factor, while in

reality there could be other variables that are potentially influential for children's ER, including child approach reactivity (Dennis, 2006), aspects of maternal depression (Silk, Shaw, Skuban, et al., 2006), and maternal responsiveness to child distress (Shaw et al., 2006). Studies with larger samples could address the potential effects of a variety of factors simultaneously, and possible interactions among them.

Conclusion and clinical implications

The present study contributes to and extends current research on ER and socialization by having examined a sample of young offspring at risk for depression by virtue of their mothers having had mood disorders. Using a multi-method design, we found that compared with children of nondepressed mothers, children of COD mothers were more likely to exhibit passive versus active styles of regulation in a disappointment task particularly if they had an inhibited temperament or if their mothers expressed low levels of positivity when interacting with them. One notable strength of this study is that key child measures and maternal behavior were assessed in different tasks and/or times, and thus methodologically minimized the possible confounding among these variables.

Findings of this study, if corroborated by other studies, could have implications for prevention and intervention that target the enhancement of positive affect and active self-regulation skills for children of depressed parents. Our results suggest that the negative influence of maternal COD on the development of ER in offspring may persist even when mothers are not currently depressed. As COD mothers may lack adequate skills to provide proper ER modeling and training for their offspring (Kovacs & Goldston, 1991; Silk, Shaw, Forbes, et al., 2006), parenting interventions that focus on enhancing maternal positive interaction with offspring may help reduce offspring's risk for developing problems in ER in early childhood, particularly for those who are temperamentally predisposed to be inhibited and withdrawn.

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