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Longitudinal Associations between Emotion Regulation and Depression in Preadolescent Girls: Moderation by the Caregiving Environment

Xin Feng[1], **Kate Keenan**[2], **Alison E. Hipwell**[1], **Angela K. Henneberger**[1], **Michal S. Rischall**[1], **Jen Butch**[2], **Claire Coyne**[2], **Debbie Boeldt**[2], **Amanda K. Hinze**[1], and **Dara E. Babinski**[1]

1 *University of Pittsburgh*

2 *University of Chicago*

Abstract

Identifying childhood precursors for depression has been challenging and yet important for understanding the rapid increase in the rate of depression among adolescent girls. This study examined the prospective relations of preadolescent girls' emotion regulation and parenting style with depressive symptoms. Participants were 225 children and their biological mothers recruited from a larger longitudinal community study. Girls' observed positive and negative emotion during a conflict resolution task with mothers, their ability to regulate sadness and anger, and their perception of parental acceptance and psychological control were assessed at age 9. Depressive symptoms were assessed by self-report at ages 9 and 10. The results indicated interactions between child emotion characteristics and parenting in predicting later depression. Specifically, low levels of positive emotion expression predicted higher levels of depressive symptoms in the context of moderate to high parental psychological control. Low levels of sadness regulation were predictive of high levels of depressive symptoms in the context of low to moderate parental acceptance. Findings from this study support the hypothesis that the prospective association between vulnerabilities in emotion regulation and depression are moderated by the caregiving environment.

Keywords

depression; emotion regulation; emotion expression; parenting; preadolescent girls

It has been consistently reported that the rate of depression increases rapidly among girls during adolescence (see review by Keenan & Hipwell, 2005), resulting in a prevalence rate of depressive disorders that is twice as high in adult females compared to adult males (Lewinsohn, Clark, Seeley, & Rhode, 1994; Nolen-Hoeksema, 1994). Children and adolescents who experience depression are likely to encounter severe, recurrent depression later in life (Costello, Angold, & Keeler, 1999; Kovacs, Gatsonis, Paulauskas, & Richards, 1989; Pine, Cohen, Gurley, Brook, & Ma, 1998; see Weissman, Wolk, Wickramaratne, Goldstein, Adams, et al., 1999 for exception). Kovacs and colleagues (Kovacs, Obrosky, & Sherrill, 2003) have shown that childhood onset depression is likely to recur in adolescence in 40% to 60% of clinically-referred cases. Early-onset depression also has serious consequences for psychosocial functioning (Lewinsohn, Rohde, Seeley, Klein, & Gotlib, 2003). Data on preadolescent depression is limited. However, evidence suggests that during late childhood/preadolescence

Correspondence concerning this article should be addressed to Xin Feng, Department of Human Development and Family Science, The Ohio State University, 171B Campbell Hall, 1787 Neil Aveue, Columbus, OH 43210-1220. Email: E-mail: xfeng@ehe.osu.edu.

depressive symptoms are moderately stable (e.g., Cole, Peeke, Martin, Truglio, & Seroczynski, 1998; Nolen-Hoeksema, Girgus, & Seligman, 1992) and predictive of depressive disorders (Keenan, Hipwell, Feng, Babinski, Hinze et al., in press). Thus, identifying preadolescent precursors that predict emerging depressive symptoms in girls is of great importance in understanding the phenomenology of depression in females, as well as for timely prevention and intervention.

Dysregulated emotion has been hypothesized to precede the onset of psychological disorders such as depressive disorders (Chaplin, Cole, & Zahn-waxler, 2005; Cole et al., 2003). The importance of studying emotion regulation lies in the functional continuities between emotion regulation and psychopathology (Malatesta & Wilson, 1988). Patterns of emotional responding that children develop during everyday social interactions can become consolidated and organized into rigid patterns, which in turn may lead to specific psychopathology (Zahn-Waxler, Klimes-Dougan, & Slattery, 2000). The core aspects of depression involve depressed mood (or irritable mood in children and adolescents) and loss of interest or pleasure (American Psychiatric Association, 1994). Problems in up-regulating positive emotion and down-regulating negative emotions have been linked with depression (Cole Michel, & Teti, 1994). While depression is typically episodic and does not onset until adolescence, problematic patterns of emotion regulation can emerge early in childhood and are likely to maintain when one is not depressed (Chaplin et al., 2005; Cole et al., 2003; Kovacs, Sherril, George, Pollock, Tumuluru, et al., 2006). Several developmental models of depression posit that the gender-specific nature of emotion socialization places girls at risk for depression. For example, girls who are socialized to be sensitive to others' emotional distress but who lack the skills for effectively regulating their own distress are likely to be vulnerable to later depression (Keenan & Hipwell, 2005; Zahn-Waxler, Cole, & Barrett, 1991). Therefore, the role of emotion regulation may be particularly salient in the development of depressive symptoms among girls.

Emotion Regulation

From a functionalist perspective, emotion regulation is seen as the processes involved in initiating, maintaining, and modulating emotional arousal in order to accomplish individual goals and facilitate adaptive social functioning (Thompson, 1994). There are diverse approaches to conceptualizing and measuring emotion and emotion regulation. Some researchers view emotion regulation as changes in intensity and valence of emotion that are independent from the activation of emotion (Cole, Martin, & Dennis, 2004). Others, however, have argued that elicitation, expression, and regulation of emotion are interdependent components of emotion that interact through all phases of the emotional experience from its generation to termination (Campos, Frankel, & Camras, 2004). The present study adopts this latter approach. Specifically, the expression and regulation of emotional arousal are conceptualized as integral parts of the emotion regulation process. There is considerable agreement in the emotion regulation literature that the regulatory behavior is goal directed and context specific (Cole et al., 2004; Gross, 1998). In the present study, we examined girls' emotion regulation in different situations, including emotion expression in structured parent-child interaction and skills for regulating negative emotions in everyday life.

Positive and negative emotion expression

Children's expressed emotion in the face of an interpersonal conflict may serve as an important index of the capacity to regulate emotions, as they need to make efforts to manage negative emotion and maintain constructive engagement within stressful interpersonal exchanges. Previous research has provided evidence for a relation between dysregulated emotion expression and internalizing problems (Shipman et al., 2003). Specifically, findings suggest that compared with nondisordered peers, preadolescents with internalizing problems are more

likely to express sadness (Eisenberg, Cumberland, Spinrad, Fabes, Shepard, et al., 2001) and tend to report higher incidence of dysregulated negative emotion expression such as uncontrollable sobbing and slamming doors (Zeman, Shipman, & Suveg, 2002).

Research on the modulation of emotion expression and psychopathology has often focused on dysregulated negative emotion. Expressing and maintaining positive emotion, however, may be equally important to children's developmental outcomes. Positive emotion has been associated with a set of behaviors including social engagement and reward seeking, which are critical to interpersonal goals and affiliative needs (Forbes & Dahl, 2005). One fundamental characteristic of depressive disorders, anhedonia, is related to the reduced positive affect or diminished capacity to experience enjoyment. In their tripartite theory, Clark and Watson (1991) hypothesized that both the lack of positive emotion and a general sensitivity to experience negative emotion are related to depression, with positive emotion being uniquely associated with depression and negative affect being common to both depressive and anxiety disorders. Low levels of self-reported happiness in children and adolescents have been found to be associated with depressive symptoms (Blumberg & Izard, 1985). Similarly, studies of temperament and personality have indicated that dispositional positive emotionality the propensity to experience a positive mood state protects children from developing depression (Anthony, Lonigan, Hooe, & Phillips, 2002; Chorpita, 2002; Compas, Connor-Smith, & Jaser, 2004).

Skills for regulating negative emotions

Problems in regulating emotions, particularly negative emotions, have been associated with depressive symptoms during childhood (Cole et al., 2003; Silk, Shaw, Forbes, Lane, & Kovacs, 2006). Emerging evidence also suggests that dysregulated emotion in at-risk or depressed individuals may be associated with deficits in strategies in response to negative emotional experience, such as limited repertoire of regulatory strategies or less effective strategies. Garber and colleagues compared emotion regulation strategies reported by depressed and nondepressed school-aged children and found that children and adolescents with depressive disorders reported using fewer problem-focused and active distraction strategies, and more avoidant, passive, and aggressive strategies, than nondepressed peers (Garber, Braafladt, & Weiss, 1991, 1995). It is also expected that depressed individuals should display longer duration of negative emotion (Tomarken & Keener, 1998) and be less able to recover from emotional upset (Kovacs & Devlin, 1998).

In studies of emotion regulation, different types of negative emotion (e.g., sadness, anger) are often combined. However, the same regulatory strategies may not have a systematic effect on the regulation of different negative emotions. Sadness and anger are related to different motivational systems. Sadness is regarded as withdrawal-oriented emotion which is associated with relinquishing goals or eliciting support from others, whereas anger is related to the approach system which supports asserting one's goal and overcoming obstacles (Davidson, 1988). The effectiveness of regulatory strategies may depend on the specific nature of the emotional experience. In the present study, we examined the regulation of sadness and anger separately.

Problems in regulating distress and dysphoria are key characteristics of depressed children (Kovacs et al., 2006). Subjective feelings of sadness have been linked with depressive symptoms in childhood and adolescence (Chaplin et al., 2005; Kasch, Rottenberg, Arnow, & Gotlib, 2002). In fact, the gender difference in depression has been attributed to the greater tendency for females to experience or express sadness (Hankin & Abramson, 2001; Nolen-Hoeksema, 1994). From a developmental perspective, although sadness is a central emotion bias linked to depression, the tendency to experience anger or irritability may also precede the

depressive experience (Zahn-Waxler et al., 2000). The ways in which an individual manages and discharges angry feelings are expected to have consequences in the development of depression. In a study of fourth and fifth graders, Zeman and colleagues (Zeman et al., 2002) found that children's ability to constructively regulate anger was reversely associated with internalizing symptoms. Similarly, in a large sample of children (aged 6–10). Goodwin (2006) found that children who were unable to disengage from their angry feelings had an increased likelihood of depression.

Parenting, Emotion Regulation and Depression

Parenting styles reflect parental attitudes and behaviors toward children that contribute to the emotional climate of the family (Darling & Steinberg, 1993), the socialization of children's emotions, and children's developmental outcomes (Parke & Buriel, 1998). Thus, parenting could potentially have an impact on the development of psychopathology through at least two mechanisms: direct contributions and the moderation of the relation between emotion dysregulation and depression.

Two broad dimensions of parenting style, acceptance/rejection and psychological control, have been widely studied in relation to children's social and emotional functioning. Many studies have found parental psychological control to be associated with internalizing problems in general (e.g., Conger, Conger & Scaramella, 1997), or depression in particular (e.g., Barber & Olsen, 1997; Garber, Robinson, & Valentiner, 1997). A few studies have tested specific relations between negative parenting behaviors and depressive symptoms in girls longitudinally. In a large community based study, girls whose mothers were low in warmth and support demonstrated an increase in depressive symptoms over a 4-year period from late childhood to adolescence (Ge, Lorenz, Conger, Elder, & Simons, 1994). Similarly, Hipwell and colleagues (Hipwell, Keenan, Kasza, Loeber, Stouthamer-Loeber, et al., 2008) reported that low parental warmth predicted increases in depressive symptoms over a 6-year period from ages 7 to 12.

Considerable research has suggested that early signs of dysregulated emotion precede the development of psychopathology, although much remains unknown about how problems in emotion regulation early in childhood might lead to psychopathology. The transactional model posits that environmental stresses interact with an individual's regulatory style to determine outcomes such as adjustment or psychopathology (Chaplin et al., 2005; Cummings, Davies, & Campbell, 2000). Dysfunctional parenting can serve as a major stressor during childhood (Goodman & Gotlib, 1999), which may interact with children's vulnerability for dysregulated emotion and intensify the risk for depression. In contrast, positive parenting behavior may support the emotional development and reduce the risk for depression for children with difficulty in emotion regulation. Few studies have explored such a hypothesis. Lengua and colleagues (Lengua, Wolchik, Sandler, & West, 2000) examined the interactive effect of positive emotionality and parenting on depressive symptoms in preadolescents whose parents were divorcing and found parental rejection to moderate the relation between positive emotionality and depressive symptoms. Specifically, parental rejection was associated with higher levels of depressive symptoms for children low in positive emotionality, whereas for children with moderate to high levels of positive emotionality parental rejection was not associated with depression.

Depression, parenting, and race

Studies of childhood and adolescent depression have found similar overall patterns of racial/ethnic difference, with minority adolescents having higher symptom levels than European Americans (e.g., Leech, Larkby, Day, & Day, 2006; Keenan et al., in press; Rushton, Forcier,

& Schectman, 2002), although some studies produced inconsistent findings (e.g., Fleming & Offord, 1990). In many studies, race and socioeconomic status (SES) are often confounded. As an indicator of SES, poverty has been associated with heightened risk for depression (Sen, 2004). Further, a recent study suggested that race moderates the effect of parenting on child internalizing problems. Specifically, low levels of mother-child openness were associated with internalizing problems only for European American but not African American children (Vendlinski, Silk, Shaw, & Lane, 2006). Examining the moderating effect of race may reveal whether the pattern of relations between parenting and depression varies across racial background.

The Present Study

In the present study, the joint contribution (both additive and interactive) of child emotion regulation and parenting to emerging depressive symptoms in preadolescent girls was examined. Measures of emotion regulation included observations of girls' expression of positive and negative emotions during a problem-solving task and maternal report of sadness and anger regulation. Preadolescence is the developmental period of interest because children at this age are expected to have developed basic emotion regulation skills (Saarni, 1993), but fully expressed depressive disorders are rare. Thus, the preadolescent period provides a window of opportunity for understanding precursors of depression. We hypothesized that low observed positive emotion, high observed negative emotion, and inability to constructively regulate sadness and anger would each be prospectively associated with the emergence of depressive symptoms. We expected parental psychological control to be positively associated with depressive symptoms, and parental acceptance to be negatively associated with depressive symptoms. With regard to race and poverty, we expected African American girls and girls in poverty reporting higher levels of depressive symptoms. In addition, we tested the moderating effect of parenting on the association between girls' emotion regulation and later depressive symptoms, as well as the three-way interactions of race by parenting by emotion regulation. We hypothesized that parental acceptance would reduce the risk of developing depressive symptoms whereas parental psychological control would increase the vulnerability for depression among girls who demonstrated low positive emotion and/or high negative emotion and low levels of sadness and anger regulation. The test for three-way interactions was exploratory in nature.

Method

Participants

Participants were girls and their biological mothers recruited from a larger longitudinal community-based study, the Pittsburgh Girls Study (PGS). The PGS used a stratified, random household sample (with over-sampling of households in low-income neighborhoods) of 2,451 girls who were between the ages of 5 and 8 years at the beginning of the study. Neighborhoods in which at least 25% of the families were living at or below the poverty level were fully enumerated (i.e., all homes were contacted to determine if the household contained an eligible girl), and a random selection of 50% of the households in non-risk neighborhoods were enumerated during 1998 and 1999. The participation rate for the eligible sample was 87%.

Participants in the present study were recruited from the youngest girls in the PGS. We elected to over-sample girls who were already above average on depression scores as measured by girls or maternal report. The over-sampling was designed to increase the base rate of depressive symptoms and disorders. All eight-year old girls who scored in the upper quartile by their own report on the Short Moods and Feelings Questionnaire (SMFQ; Angold et al., 1995) or by maternal report on the depression subscale of the Child Symptom Inventory (CSI; Gadow & Sprafkin, 1994) (n = 135) and a random selection of the remainder (n = 136) were targeted for

recruitment and contacted. There were significantly more African American than European American girls in the screen high group. One hundred thirty-six girls selected from the remainder were matched to the screen high group on race. Eight of the targeted families were not eligible at the time of recruitment because the biological mother had died, the family had moved out of Allegheny County, or the family was no longer participating in the main study and could not be contacted. Of the 263 families eligible to participate, 232 (88.2%) agreed to participate and completed the laboratory assessment at wave 1, 25 (9.5%) families refused to participate, and 6 (2.3%) agreed but could not be scheduled for an assessment. At wave 2, 227 (97.8%) completed the assessment, 4 (1.7%) declined to participate, and 1 (0.4%) could not be scheduled.

Thirty percent of the girls were European American and 69.2% were African American/Multi-racial (only 4.8% of the sample was multi-racial and all girls who were identified as multi-racial included African American as one of the multiple races), and 0.8% (n = 2) were Asian. For the purpose of the present study, the 2 Asian girls were not included in the analyses. The final sample consisted of 225 girls and their mothers who completed assessments at both ages 9 and 10. Mothers' mean age was 34.73 (*SD* = 7.00) at the beginning of the study. Half of the mothers (50.2%) were single parents, and 17.3% had received less than 12 years of education. Forty-five percent of families were supported by some form of public assistance (e.g., food stamps, Medicaid, or monies from public aid). More families in the African American/Multi-racial group (52.6%) than European families (27.9%) received public assistance, $\chi^2(1, N = 225) = 11.60$, $p = .001$. Girls were on average 9.10 years old (*SD* =.48) at Wave 1 and 10.03 years old (*SD* =.41) at Wave 2.

Procedures and Measures

At ages 9 and 10, the girls and their mothers completed a 2-hour laboratory assessment during which they were interviewed, administered questionnaires, and were observed in joint and/or individual activities. Written informed parental consent and child assent were obtained. The University of Pittsburgh IRB approved all study procedures.

Positive and negative emotion—At age 9, the girl and her mother participated in a conflict resolution task during which each generated a topic of conflict and then discussed each conflict with a goal of finding a solution. The entire problem-solving task lasted for 6 minutes; in the first half, the dyad discussed the girl's topic of conflict and in the second half, the mother's topic. Emotion expression observed during a conflict resolution may be seen as an outcome of a regulatory process in a situation where the regulation of both positive and negative emotions is likely to be involved in order to reach a goal of solving the problem.

Digital recordings of the problem solving task were coded by a team of trained raters who were unaware of the girls' responses on any questionnaires or clinical interviews. Positive emotion was coded using the Iowa Family Interaction Rating System (Melby & Conger, 2001). Positive emotion reflected the degree to which the girl appeared happy and optimistic, and demonstrated positive behavior toward self or others. The coding of positive emotion was based on 1) the nonverbal cues, including body posture (e.g., hugging, clapping hands); 2) emotion expression, such as smiling, laughing, or giggling; and 3) the content of statements of the verbal interaction and the tone of voice (e.g., high pitched, excited or up-beat voice). Negative emotion was coded using a coding system developed by Melnick and Hinshaw (2000), based on 1) facial and postural display of negative emotions including frustration, anger, distress, or whiny mood (e.g., grunts, makes a gesture of disappointment); and 2) negative verbal comments towards self or others (e.g., statement acknowledging frustration, yelling, name-calling). Both p*ositive emotion* and *negative emotion* were coded globally on 9-point scales (with a score of 9 indicating the highest level of the emotion coded). Twenty-five percent of the video recordings

were double-coded, and the inter-rater reliability, intraclass correlation (ICC), was.83 for positive emotion and.89 for negative emotion.

Sadness and anger regulation—At age 9, girls' sadness and anger regulation were assessed using maternal report on the Children's Sadness Management Scales (CSMS; Zeman, Shipman & Penza-Clyve, 2001) and Children's Anger Management Scales (CAMS; Zeman et al., 2001), respectively. CSMS and CAMS were initially designed for child-report, with satisfactory internal consistency, test-retest reliability, and construct validity established (Zeman et al., 2001; Penza-Clyve & Zeman, 2002). In the present study, we elected to use maternal report to avoid single informant bias, which may inflate correlation with the dependent variable. Parents have been reported as reliable informants of their children's emotional functioning in previous studies (e.g., Shields & Cicchetti, 1998, 2001). For the purpose of this study, the *emotion regulation coping* subscales of CSMS and CAMS were used. The emotion regulation coping subscale of CSMS measures the extent to which the child can constructively manage the feeling of sadness, that is, the capacity to modulate the intensity and duration of sadness in a way that enhances optimal functioning for the individual in a given context (e.g., "She can stop herself from losing control over her sad feelings"). The sadness regulation measure consists of five items rated on a 3-point scale (1 = hardly ever; 3 = often). The internal consistency (alpha) for the emotion regulation coping subscale of CSMS using maternal report was.64. The CAMS has the same response format and includes four items similar to the CSMS (e.g., "She tries to calmly deal with what is making her feel mad."). The emotion regulation coping subscale of CAMS, which assesses the child's ability to manage the experience of anger in a constructive manner, was used for the present study. The alpha for this subscale using maternal report was.71. The final scale scores were generated by averaging all items included in the subscales.

Parental acceptance and parental psychological control—Parenting style was assessed using the Children's Report on the Parent Behavior Inventory (CRPBI; Schaefer, 1965), which was administered to the girls at age 9. Scores on two broad band factors were included: *parental acceptance* and *parental psychological control.* The parental acceptance subscale measures the degree to which the parent accepts or rejects the child (e.g., "gives me a lot of care and attention"). The parental psychological control subscale assesses the degree of intrusiveness and possessiveness in parental behavior (e.g., "is always telling me how I should behave"). Each subscale consists of 10 items rated on 3-point scales (1 = not like the parent; 3 = a lot like the parent). The alphas for parental acceptance and psychological control were.84 and.81, respectively. The scale scores for the two parenting factors were the means of all items.

Depressive symptoms—At ages 9 and 10, girls were administered the Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present/Lifetime Version (K-SADS-PL; Kaufman, Birmaher, Brent, Rao, Flynn, et al., 1997), a semi-structured interview designed to generate DSM-IV symptoms for major depressive disorder. The nine symptoms of major depressive disorder were coded on a 3-point scale based on the girls' self-report as "not present," "subthreshold," or "threshold," with the threshold level receiving the highest rating. A total score of *depressive symptoms* was generated by summing the scores on nine symptoms. For calculating inter-rater reliability, approximately 20% of K-SADS interviews were coded by a second coder at each age point; ICCs for symptom counts were. 92 and.96, for ages 9 and 10 respectively. Diagnoses of major or minor depressive disorders were generated from the K-SADS according to DSM-IV criteria (American Psychiatric Association, 1994), and 11.6% of the girls (n = 26) at age 9 and 8.4% (n = 19) at age 10 met criteria for major or minor depression.

Results

Descriptive statistics and zero-order correlations of the study variables are presented in Table 1. Girls' depressive symptoms at the two time points were moderately correlated (r =.48). At age 10, depressive symptoms were correlated with all child emotion variables with the exception of negative emotion expression; at age 9, however, depressive symptoms were not related to observed positive and negative emotion expression. Parental psychological control and parental acceptance were correlated with depressive symptoms at both ages. Race was modestly associated with depressive symptoms (at both ages), observed positive emotion, and parental psychological control. Among the child predictor variables, girls' observed positive and negative emotion were modestly negatively correlated (r = −.23) and the regulation of sadness and anger were moderately positively correlated (r =.37), demonstrating sufficient distinction among these emotion regulation variables.

Predicting Girls' Depressive Symptoms at Age 10

Hierarchical multiple regression analyses were carried out to predict girls' reports of depression symptoms at age 10. The variables parental acceptance and depressive symptoms (at both ages) were skewed in distribution. As preliminary analyses with transformed versus untransformed variables revealed no differences in results, the untransformed variables were used in the final analysis for the ease of interpretation of results. All continuous variables included in the analyses were centered, to minimize the possibility of multicollinearity. The predictor variables were entered in five blocks: (1) depressive symptoms at age 9, race, and poverty; (2) emotion regulation variables; (3) parenting; (4) two-way interactions between emotion regulation and parenting variables; and (5) three-way interactions among race, emotion regulation, and parenting. Preliminary analysis indicated that the three-way interactions did not contribute to the explanation of the age 10 depressive symptoms, ΔR^2=.03, $F(7, 197) = 1.29$, *ns*, and thus were removed from the final analysis. In addition, negative emotion expression and its interactions with parenting variables were not associated with depressive symptoms at age 10 (β = −.10 to.09, *ns*), and were removed from the final analysis for the purposes of parsimony. The results of the final regression analysis are summarized in Table 2.

Depressive symptoms at age 9, race, and poverty were first entered in the regression analysis to account for the variability in the depressive symptoms at baseline and differences between race and poverty groups. Age 9 scores of depressive symptoms were strongly predictive of scores one year later. Race was also associated with later depressive symptoms such that African American and Multi-racial girls reported higher depressive symptoms. Together the three variables accounted for 26.1% of the variance in age 10 depression scores (Table 2).

Child predictors, including observed positive and negative emotion expression and regulation of sadness and anger were entered into the analysis as a second block, which explained approximately 7% additional variance in age 10 depressive symptoms. Specifically, lower levels of positive emotion expression and lower levels of sadness regulation were associated with higher scores of depressive symptoms; there was also a marginal negative association (p =.07) between anger regulation and later depressive symptoms (Table 2). In the third step, the perceived parental acceptance and psychological control were entered and the parenting variables did not add significantly to the child variable model, ΔR^2 =.005, $F(2, 211)$ =.80, *ns*.

In the last step of the analysis, the moderating effects of parenting on the relationship between girls' emotion regulation and later depressive symptoms were tested. Two-way interactions between emotion regulation variables (i.e., observed positive emotion, sadness regulation, and anger regulation) and parenting variables (i.e. parental acceptance and psychological control) were tested in separate models in preliminary analyses and only the significant interactions were entered in this final step. The two interactions, positive emotion X parental psychological

control and sadness regulation X parental acceptance, contributed significantly to the explanation of the dependent variable in addition to the main effects of all predictors and covariates, ΔR^2 =.05, $F(2, 209) = 8.34$, p <.001. With the interactions in the model, the main effects of race, positive emotion, and sadness regulation remained, while the association between anger regulation and age 10 depressive symptoms became statistically significant (β = −.14, p <.05). The main effects were qualified by two significant interactions: a negative interaction between observed positive emotion and parental psychological control and a positive interaction between sadness regulation and parental acceptance (Table 2).

To further probe the moderation effects of parenting variables, significant interactions were plotted by computing predicted values of age 10 depressive symptoms at high (+1*SD*), average, and low (−1*SD*) values for the moderator (parenting) and child emotion regulation variables (Figures 1–2). This allowed us to examine whether emotion regulation was differentially related to the manifestation of depression in different parenting contexts. Slopes in the figures were examined to determine whether they were significantly different from zero, followed by procedures outlined by Aiken and West (1991).

As shown in Figure 1, the interaction between girls' observed positive emotion and parental psychological control was such that positive emotion expression during the problem-solving task was negatively associated with subsequent depressive symptoms in the contexts of high (β = −.28, p <.001) and average (β = −.12, p <.05) levels of parental psychological control, whereas when parental psychological control was low, positive emotion expression was not associated with later depressive symptoms (β =.04, *ns*). Note that the regression lines representing different levels of parental control cross within the range of positive emotion (crossing point = 5.98; range = 1–9). It appears that parental psychological control exerts opposite effects at different ends of the positive emotion spectrum. To further elucidate this interaction effect, we tested the differences in depressive symptoms between girls with high (*+1SD* and above) and low (*−1SD* and below) parental psychological control, for those who were below and above the crossing point in positive emotion expression separately. Among girls who exhibited low to moderate levels of positive emotion (below the crossing point), those with mothers high in psychological control reported higher levels of depressive symptoms than those with mothers low in psychological control, $t(59) = 2.49$, p <.05, d =.65; among girls with high expressed positive emotion (above the crossing point), there was no difference in depressive symptoms for those reporting high versus low parental psychological control.

The results depicted in Figure 2 demonstrate that sadness regulation was negatively associated with depressive symptoms among girls who perceived their mothers as low in acceptance (β = −.34, p <.001) or average in acceptance (β = −.15, p <.05); when girls perceived their mothers as high in acceptance sadness regulation and depression were not associated (β =.04, *ns*). The regression lines cross above the mean, at 2.39 (range = 1–3). Further tests revealed that levels of depressive symptoms differed across high versus low levels of parental acceptance only among girls with low to moderate sadness regulation (below the crossing point). More specifically, girls who perceived their mothers as high in acceptance reported lower levels of depressive symptoms in the following year, $t(39) = 2.27$, p <.05, d =.70, compared with those who perceived their mothers as low in acceptance. In contrast, among girls with high levels of sadness regulation the level of parental acceptance was not associated with depressive symptoms.

Discussion

In the present study the links between emotion regulation, parenting, and depressive symptoms in preadolescent girls were examined prospectively. Consistent with the hypothesized relation

between emotion regulation and the emergence of depression, our findings suggest that difficulties in emotion regulation precede later depressive symptoms, and that parenting factors moderate the relations between vulnerability in emotion regulation and later depressive symptoms.

With regard to emotion expression, we found that the lack of positive emotion expression was a risk factor for preadolescent depression and that high levels of positive emotion protected girls from developing depressive symptoms. Our findings support the hypotheses that reduced positive affect is a core feature of depression (Clark & Watson, 1991) and that the difficulty in up-regulation of positive emotion is associated with depression (Cole et al., 1994). Difficulty in generating and maintaining positive emotion can be observed early in childhood and prior to the onset of depression. The behavioral model of depression posits that reduced experience of happiness results in a reduction in active behaviors and motivation to seek out social interactions, which in turn contributes to the onset and maintenance of depressed mood (Lewinsohn, Hoberman, Teri, & Hautzinger, 1985).

The results of this study also lend support to the hypothesis that deficits in emotion regulation place girls at risk for depression (Cole et al., 1994; Keenan & Hipwell, 2005). Specifically, we found that difficulties in regulating sadness were predictive of later depressive symptoms in girls; there was also a trend for a negative prospective association between anger regulation and future depression. We did not find high levels of negative emotion expression to be associated with depression, as suggested by other studies (e.g., Eisenberg et al., 2000; Zenman et al., 2002). However, an association between expression of negative emotion and depression has not always been found (e.g., Chaplin, 2004; Rottenberg, Gross, Willhelm, Najmi, & Gotlib, 2002). It is possible that the expression of negative emotion in and of itself is not a risk factor, but rather the inability to regulate negative emotion once it is elicited may convey a risk for depression (Zemen et al., 2002).

In contrast to our prediction, we did not find associations between parenting and depression above and beyond the effects of child emotion regulation and previous depressive symptoms. It may be that part of the association between parenting and age 10 depression was accounted for by age 9 depression, as parenting variables were correlated with depression at both times. Importantly, we provided evidence that the parenting context can moderate the prospective association between emotion regulation and depression symptoms in preadolescent girls. Parental psychological control, for example, appears to exacerbate the risk for depression associated with low positive emotion. Further, as discussed earlier, positive emotion is associated with reward seeking and motivation for social interaction. For girls without an adequate reserve of positive emotion, their chances for receiving rewards from parent-child interaction are likely to be further reduced if their parents are exerting high levels of psychological control. Additionally, the models of emotion regulation the children develop based on family experiences shape their perception and experience in interpersonal relationships in the broader social context (Thompson & Meyer, 2007). Consequently, girls with low levels of positive emotion and negative experience of the parent-child relationship may be less able to engage in positive, rewarding social interactions outside of the family, which may further exacerbate their vulnerability for depression.

Additionally, parental acceptance moderated the association between sadness regulation and later depressive symptoms. Difficulties in regulating sadness increased the risk for later depression, particularly in the context of low parental acceptance. Our finding is consistent with previous research suggesting that children who have difficulties regulating sad experience may be at risk for later depression in aversive caregiving environments (Chaplin et al., 2005; Cummings, et al., 2000). Conversely, high levels of parental acceptance may serve as a protective factor for depression. Parenting behaviors that are generally positive (i.e., warm,

responsive, and accepting) are likely to protect children with vulnerabilities in emotion regulation from developing depression, as positive parenting behaviors may model adaptive regulatory strategies and provide a family emotional climate that helps reduce children's level of stress, which in turn reduces the risk for future depression. Results from studies of young children indicated that maternal positivity towards children during parent-child interaction was prospectively associated with children's use of active strategies in regulating negative emotions (Feng, Shaw, Kovacs, Lane, O'Rouke et al., 2008) and the increase in positive emotion expression over time (Feng, Shaw, Skuban, & Lane, 2007). At a broader level, our findings on the moderating effects of parenting are consistent with a transactional perspective, suggesting that multiple parent *and* child characteristics and the interplay between them are needed in understanding children's developmental outcomes (e.g., Sameroff & Mackenzie, 2003).

Consistent with previous studies (e.g., Leech et al., 2006 e.g., Leech et al., 2005; Sen, 2004), African American/Multi-racial girls reported higher numbers of depressive symptoms than European American girls. However, we did not find support for the moderating effect of race on the relations between parenting and depression suggested by previous research (e.g., Vendlinski et al., 2006). Our discrepant results may be due to methodological differences, such as measurement of parenting (e.g., child report versus parent report, broad band factors of parenting style versus specific parent-child interactive behaviors) and research design (e.g., longitudinal versus cross-sectional). In addition, there are potentially a large number of parenting variables that may be associated with a variety of problems in adjustment or psychopathology, and research has just begun to address these questions. Clearly, more replication studies are needed in examining the relationship between parenting and psychopathology in the larger socio-cultural context.

The notable strengths of this study are the longitudinal design, the use of multiple methods (i.e., observation, questionnaires, and clinical interviews) and multi-informants (i.e., child and mother), and the examination of child risk factors for depression within the caregiving environment. There are also severallimitations of the present study, which may suggest directions for future work. First, girls' regulation of sadness and anger was assessed using maternal report on the extent to which they were able to constructively manage negative emotions, which provided a general profile of the girls' coping with negative emotional experiences in everyday life. We chose to use maternal report in order to provide an assessment from a different informant (than the laboratory observation) and to avoid the inflated correlation with the dependent variable due to the shared method variance. However, the extent to which mothers can reliably report on their daughters' internal emotional states may be limited, which may potentially threaten the validity of the results. Note that the sadness regulation scale also had a relatively low alpha (.64). Additionally, our emotion regulation measures only represent a narrow slice of the multifaceted construct of emotion regulation. Other aspects of emotion regulation, such as the specific strategies children utilize in response to emotional stimuli, may also have consequences in the development of psychopathology. For instance, previous studies have identified the avoidant, passive, and aggressive strategies (in contrast to the problem-focused and active distraction strategies) as being associated with depression (e.g. Garber et al, 1991, 1995; Silk et al., 2003). A related issue is that the regulation of sadness and anger were measured in such a way that higher scores represent better ability to regulate. However, the relation between emotion regulation and depression, or psychopathology in general, may not be linear. Both positive and negative emotion can be under- or over-regulated and the under-regulation versus over-regulation of an emotion may have qualitatively different consequences. The over regulation of anger, for example, may be particularly important in understanding depression in girls. Block, Gjerde, and Block (1990) found that among 7-year-olds intropunitive and oversocialized traits were predictive of adolescent depression in girls while undercontrolled traits predicted depression in boys. This limitation in measurement may be attributable to the null finding in relation to anger regulation in the present study.

Second, in the present study we examined two broad factors of parenting style as measures of caregiving context. Future studies should also focus on parents' behavior in interactions with their children, particularly behaviors that are relevant to the socialization of emotion, which may mediate the relations between general parenting style and depression in children. Third, in the present study we focused on parenting style and race as factors in the caregiving context. There are, however, other risk factors within the family that may contribute to the emergence of depression. These factors include but are not limited to maternal depression (Goodman & Gotlib, 1999), family conflict and/or marital discord (Sheeber, Hops, Alpert, Davis & Andrews, 1997), and stressful life events (Ge et al., 1994). Future studies should address the potential effects of a variety of environmental factors simultaneously, as well as possible interactions among them. Fourth, race was associated with positive emotion expression and parental psychological control, such that African American girls displayed lower levels of positive emotion and perceived their mothers as more psychologically controlling, compared with European American girls. Although we statistically adjusted for these differences in the analysis, the racial difference in emotion expression and parental control warrants further investigation, such as whether this pattern is also present in the mothers' expressed emotion during the parent-child interaction, the possible cultural differences in the display rules for positive/negative emotion, and whether the mechanisms by which parental psychological control lead to depression differ between racial groups. Fifth, the present study was oversampled for risk for depression, African American race, and poverty, and thus did not allow us to generalize to the population in terms of base rates of depression; however, the developmental processes could be relevant to the larger population. The oversampling allowed us to have a sufficient base rate of symptoms and the power to test effects of race and poverty. Lastly, girls' depressive symptoms decreased slightly between ages 9 and 10, which was inconsistent with the expected direction of developmental change, but consistent with the small attenuations in symptom levels typically observed on re-assessment (Piacentini, Roper, Jensen, Lucas, Fisher, et al., 1999). It is possible that this measurement artifact could attenuate the associations between depressive symptoms and the developmental precursors examined in the present study. The decrease in symptom endorsement rates at the second assessment, usually referred to as test-retest attenuation, has been documented by other studies using clinical interviews (e.g., Edelbrock, Costello, Dulcan, Kalas, & Conover, 1985; Piacentini et al., 1999). Two of the mechanisms can potentially explain the test-retest attenuation in the study: a) the participant's threshold for endorsing the symptoms increases due to the educational effect associated with the first assessment; and b) the informant learns that not endorsing the symptoms decreases the length of the interview (Piacentini et al., 1999).

In summary, our findings provide preliminary support for the hypothesis that difficulties in up-regulating positive emotion and down-regulating sadness precede the emergence of depressive symptoms during the preadolescent period. Our findings suggest that helping girls develop effective skills regulating negative emotional experience during childhood may prevent the initial onset of depression. The timing of the intervention may be crucial. If difficulties in emotion regulation evolve into more entrenched patterns, risk for depression is likely to increase as girls encounter greater developmental demands on emotional functioning during adolescence. We have also provided evidence that the processes by which vulnerability in emotion regulation leads to depression may be dependent upon the caregiving environment. These results raise the possibility that modification of the caregiving environment may reduce the risk for depression, especially for girls who evidence individual vulnerability in the form of emotion regulation.

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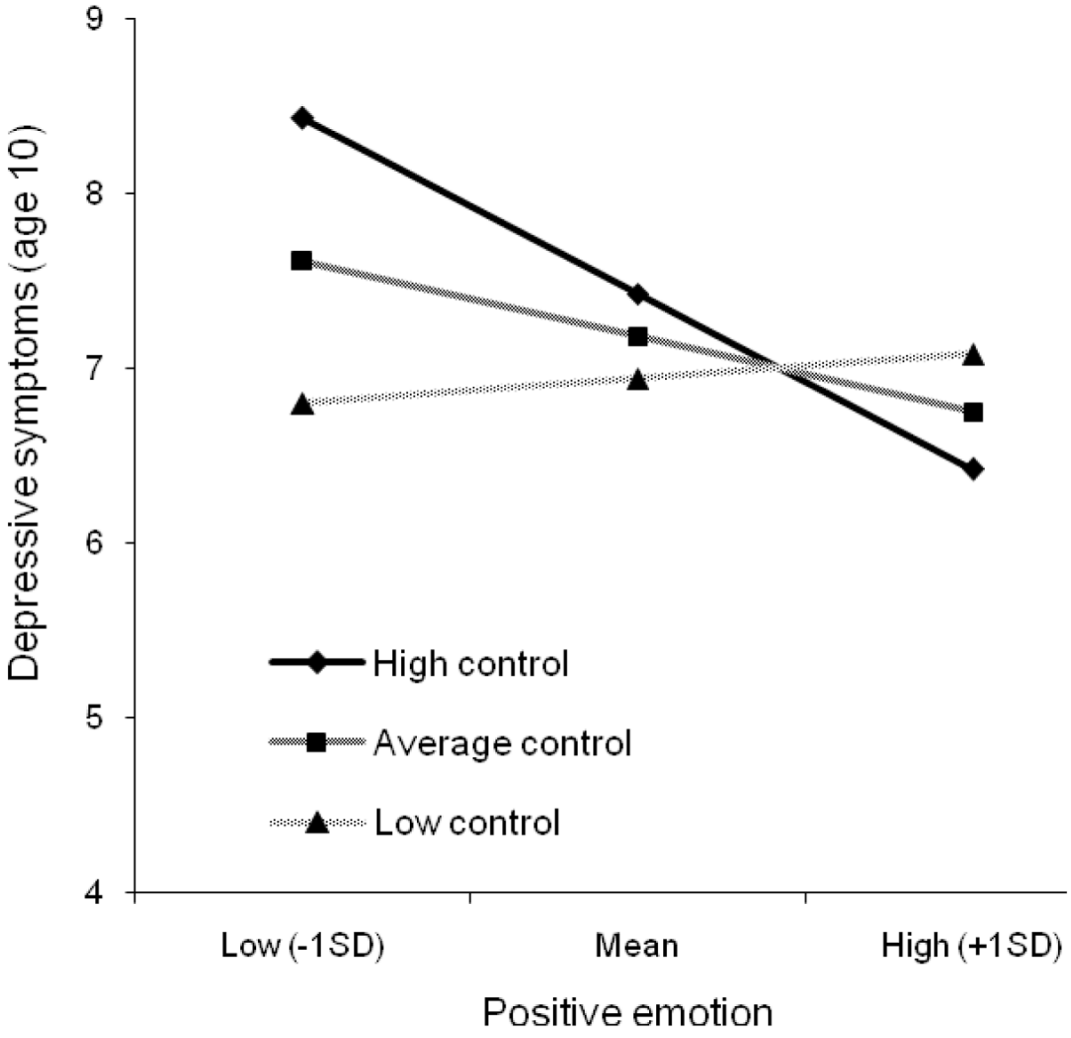

Figure 1.
Interaction between child positive mood and parental psychological control

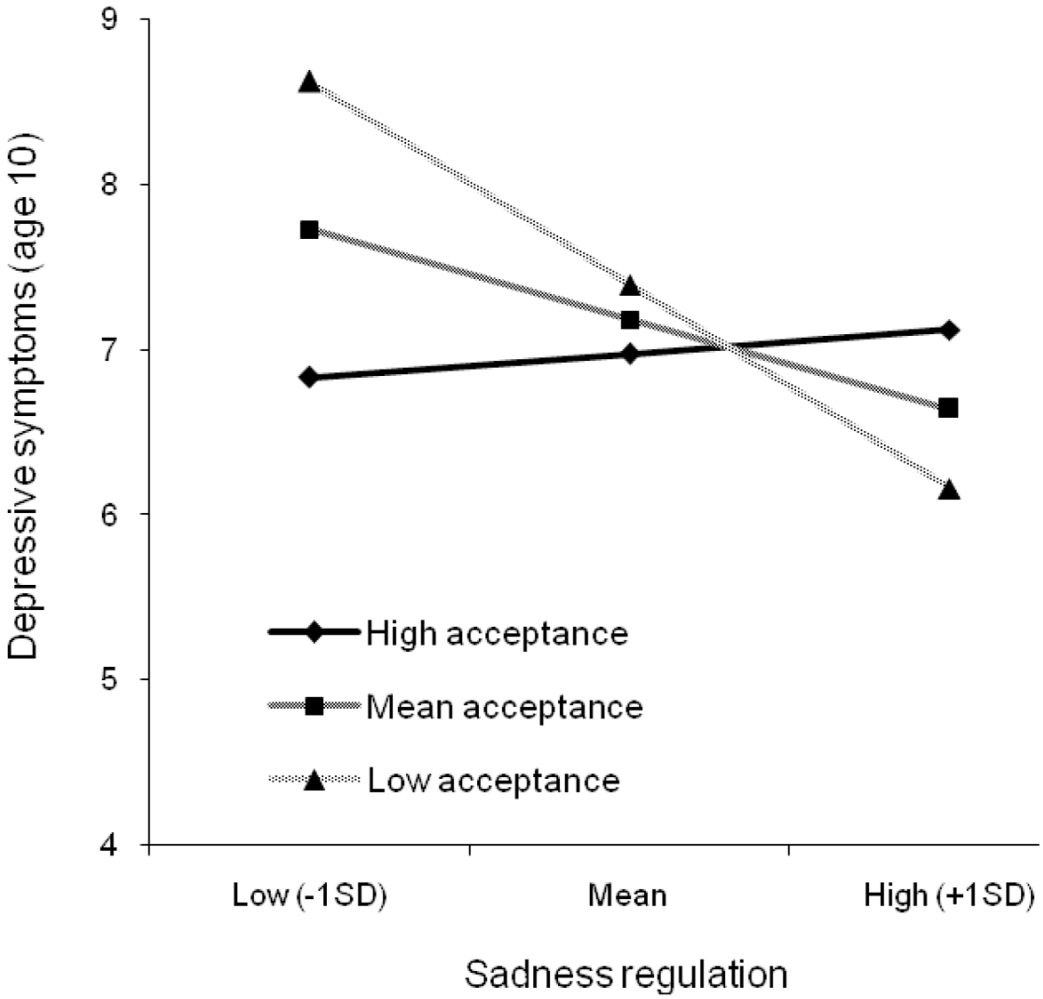

Figure 2.
Interaction between sadness regulation and parental acceptance

Table 1

Means (M), Standard Deviations (SD) and Bivariate Correlations of Variables in the Study

			Correlation								
	M	***SD***	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1. Race	--	--									
2. Poverty	--	--	.23***								
3. Depressive symptoms (age 9)	14.40	3.85	.15*	.09							
4. Positive emotion	5.56	1.65	−.16*	−.10	−.12						
5. Negative emotion	2.97	1.92	−.09	−.06	−.01	−.23***					
6. Sadness regulation	2.09	.41	−.07	−.05	−.16*	.16*	−.08				
7. Anger regulation	2.00	.45	.01	−.10	−.18**	.03	−.14*	.37***			
8. Parental acceptance	2.62	.40	.06	−.03	−.22***	.08	−.18**	.05	.08		
9. Parental control	1.91	.47	.36***	.28***	.36***	−.14*	−.07	−.21**	−.13	.19**	
10. Depressive symptoms age 10)	13.14	3.57	.22***	.14*	.48***	−.24***	−.01	−.27***	−.25***	−.17*	.27***

Note. Race and poverty are dichotomous variables: race (0 = European American, 30.2%; 1 = African American and mixed race, 69.8%); poverty (0 = not receiving public assistance, 54.9%; 1= receiving public assistance, 45.1%). Parental control = Parental psychological control.

* $p < .05$.

** $p < .01$.

*** $p < .001$

Table 2

Results of Hierarchical Regression Analysis on Preadolescent Depressive Symptoms

	B	SE B	β	t	ΔR^2	ΔF(df)
Step 1					.26	25.45(3, 216)***
Depressive symptoms (age 9)	.43	.06	.47	7.86***		
Race	1.07	.48	.14	2.26*		
Poverty	.29	.44	.04	.66		
Step 2					.07	7.03(3, 213)**
Depressive symptoms (age 9)	.38	.05	.41	7.00***		
Race	.97	.46	.12	2.10*		
Poverty	.10	.42	.01	.23		
Positive emotion	−.30	.13	−.14	−2.41*		
Sadness regulation	−1.23	.55	−.14	−2.25*		
Anger regulation	−.90	.49	−.11	−1.84		
Step 3					.01	.80(2, 211)
Depressive symptoms (age 9)	.35	.06	.38	5.82***		
Race	.92	.48	.12	1.92		
Poverty	−.00	.44	.00	−.00		
Positive emotion	−.29	.13	−.13	−2.27*		
Sadness regulation	−1.17	.55	−.13	−2.12*		
Anger regulation	−.88	.49	−.11	−1.80		
Parental acceptance	−.66	.56	−.07	−1.18		
Parental control	.43	.54	.06	.80		
Step 4					.06	3.74(6, 205)**
Depressive symptoms (age 9)	.35	.06	.38	6.03***		
Race	1.22	.47	.16	2.58*		
Poverty	−.20	.43	−.03	−.48		
Positive emotion	−.26	.12	−.12	−2.12*		
Sadness regulation	−1.33	.53	−.15	−2.48*		

	B	SE B	β	t	ΔR^2	ΔF(df)
Anger regulation	−1.10	.48	−.14	−2.31*		
Parental acceptance	−.52	.54	−.06	−.96		
Parental control	.51	.53	.07	.96		
Positive mood X Parental control	−.74	.25	−.17	−2.93**		
Sadness regulation X Parental acceptance	4.20	1.28	.18	3.06**		

Note. Parental control = Parental psychological control. The variable race has two levels (0 = European American; 1 = African American/Mixed race); poverty also has two levels (0 = not receiving public assistance; 1 = receiving public assistance).

† p <.1.

* p <.05.

** p <.01.

*** p <.001.