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Maternal Emotion Regulation Strategies, Internalizing Problems and Infant Negative Affect

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Abstract

Recent work has identified links between mothers' self-regulation and emotion regulation (ER) and children's social-emotional outcomes. However, associations between maternal ER strategies (e.g., reappraisal, suppression), known to influence internalizing problems in adults, and children's negative affect (NA) have not been considered. In the current study, the direct and indirect relationships, through maternal internalizing problems, between maternal use of ER strategies and infant NA are examined. The potential effects of infant NA on maternal internalizing difficulties are also considered. Ninety-nine mothers and their infants participated across three time points during the first year postpartum. Higher maternal suppression was indirectly related to higher infant NA, through maternal internalizing problems; lower maternal reappraisal also was indirectly related to higher infant NA through maternal internalizing problems. Infant NA at four months postpartum was related to mothers' internalizing problems 6 months postpartum. The implications of these findings for future research and intervention are discussed.

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¹Post-hoc analyses were conducted to determine whether the pattern of relationships differed among the subcomponents of infant negative affect (i.e., fear, distress to limitations, and sadness) and maternal emotion regulation strategies. Indirect relations were either significant ($p < .05$) or trending ($p < .10$), with the exception of predicting fear from reappraisal through maternal internalizing problems. Given findings were still in the anticipated direction, it appeared that the main findings regarding indirect relationships between maternal emotion regulation strategies and infant negative affect through maternal internalizing problems were robustly captured when negative affect was measured broadly.

²The bootstrap confidence interval for the Reappraisal and Suppression regression models was obtained using options available in EQS 6.3. It is important to note, however, that such output is only provided at the 90% confidence interval, and for the unstandardized values. For the Reappraisal model, the unstandardized value for the indirect effect was $-.07$, with a 90% CI of $-.01$ to $-.16$. For the Suppression model, the unstandardized value for the indirect effect was $.11$, with a 90% CI of $.10$ to $.13$.

In regards to the indirect effect of 4 month infant negative affect on 8 month infant negative affect through maternal internalizing difficulties, in the Reappraisal model, the unstandardized value for the indirect effect was $.08$, with a 90% CI of $.02$ to $.15$. For the Suppression model, the unstandardized value for the indirect effect is $.11$, with a 90% CI of $.04$ to $.20$.

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Keywords

Emotion Regulation; Internalizing Problems; Bi-Directional Relations; Infants; Negative Affect; Temperament

Temperament, defined as biologically based individual differences in reactivity (i.e., dispositional emotional response characteristics) and regulation (i.e., modulation of emotional responses), is shaped over time by heredity, maturation, and experience (Derryberry & Rothbart, 1988; Rothbart, Posner & Kieras, 2006). Negative affect, one of the two higher-order dimensions of reactivity (Rothbart, 1988; Rothbart, Ahadi, & Evans, 2000), is an early-emerging aspect of temperament that is malleable during the first years of life. In addition, from infancy into adulthood, factor analytic studies have noted the consistent presence of three finer-grained subcomponents of the broad negative affect factor: anger/frustration/distress to limitations, fear, and sadness (Capaldi & Rothbart, 1992; Evans & Rothbart, 2007; Putnam, Ellis & Rothbart, 2001; Rothbart, Ahadi, Hershey & Fisher, 2003).

Negative affect increases across the first years of life, reaching a relative mean level of stability around the age of two years (Lemery, Goldsmith, Klinnert, & Mrazek, 1999; Putnam, Ellis, & Rothbart, 2001). For instance, Leve and colleagues (2013) noted increases in children's negative affect between 9 and 27 months of age. The subcomponents of negative affect show similar patterns of growth. Gartstein and colleagues (2010) found increasing trajectories of infant fearfulness over the first year of life in two separate studies using complementary methods of measuring fear. Frustration also increases during infancy (Putnam, Gartstein, & Rothbart, 2006) and then levels off by the pre-school period (Rothbart et al., 2003). The increasing stability, both in terms of rank-order and mean-level stability, of infant negative affect and its fine-grained components suggests that negative affect may be more susceptible to the influence of contextual factors earlier, rather than later, in childhood (Bridgett et al., 2009; Crawford, Schrock & Woodruff-Borden, 2011; van den Akker, Dekovic, Prinzie & Asscher, 2010).

Previous work has identified a number of contextual factors that influence the development of children's negative affect during infancy and early childhood. One such factor is interparental relationship quality. Specifically, higher interparental conflict has been consistently related to subsequent increases in children's distress (for a review, see Cummings & Davies, 2002). Interparental conflict is also related to more hostile parenting behaviors (Krishnakumar & Buehler, 2000), which may increase expressions of negative affect in children. Another contextual factor that has been implicated in the development of children's negative affect is parenting. Specifically, less supportive parenting and overly-restrictive parenting behaviors are linked to heightened levels of children's negative affect (Paulussen-Hoogeboom, Stams, Hermanns, & Peetsma, 2007). Another contextual factor that has received considerable attention in the literature is maternal internalizing problems. For example, Austin, Hadzi-Pavlovic, Leader, Saint, and Parker (2005) linked maternal internalizing problems to higher parental report of child negative affect. Similarly, both Feldman and colleagues (2009) as well as Pauli-Pott and colleagues (2004) linked higher

maternal internalizing difficulties to elevated infant negative affect as rated by independent observers.

Maternal internalizing problems have also been related to more specific negative affect subcomponents in children. Specifically, infant fear has been related to maternal internalizing problems both when assessed by maternal report (Gartstein et al., 2010; Sugawara, Kitamura, Toda, & Shima, 1999) and laboratory observation (Gartstein et al., 2010). Maternal report of infant frustration has also been linked with maternal internalizing difficulties (Sugawara, Kitamura, Toda, & Shima, 1999). Beyond relations with infant negative affect, maternal internalizing difficulties appear to act as a risk factor for the emergence and maintenance of children's psychopathology, including anxiety disorders (e.g., Beidel & Turner, 1997) and conduct problems (e.g., Chronis et al., 2007).

Although there is evidence to support a link between maternal internalizing problems and negative affect during both infancy and childhood, there is limited research examining maternal characteristics that may predict both maternal internalizing problems and infant negative affect. Maternal self-regulatory capacity, broadly defined, has been linked to a range of children's temperament-related outcomes. For example, maternal executive functioning appears linked to children's executive functioning (Cuevas et al., 2014) and maternal self-reported effortful control has been related to maternal report of infant orienting/regulation and toddler effortful control (Bridgett et al., 2011). Poorer self-regulatory processes also are related to less optimal parenting practices, which, in turn are often associated with adverse child outcomes (see Bridgett, Burt, Edwards, & Deater-Deckard, 2015, for a related review). Specifically, cognitively based regulatory processes, such as working memory, attention, cognitive flexibility, and/or inhibition, are linked to parenting behaviors such as intrusiveness (Cuevas et al., 2014), lower sensitivity (Chico et al., 2014; Gonzales, Jenkins, Steiner, & Fleming, 2012), and harsh parenting (Deater-Deckard, Wang, Chen, & Bell, 2012). Associations between general emotion dysregulation and parenting behaviors have also been demonstrated, including poor discipline implementation (Kim, Pears, Capaldi, & Owen, 2009), low emotional availability (Kim, Teti, & Cole, 2012), and harsh punishment (Zalewski et al., 2014).

Although maternal self-regulatory processes have been related to factors that influence children's negative affect (e.g., temperament characteristics and parenting behaviors), little is known about how maternal use of emotion regulation strategies (i.e., processes employed to influence the experience and expression of emotions; Gross, 1998) may be linked to infant negative affect. Emotion regulation is a candidate maternal characteristic to consider given that emotional dysregulation is a risk factor for developing internalizing problems, such as anxiety and depression (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Martin & Dahlen, 2005; Salters-Pedneault, Roemer, Tull, Rucker, & Mennin, 2006). Thus, it is possible that maternal emotion regulation is directly related to the development of infant negative affect. Alternately, maternal emotion regulation may be related to infant negative affect indirectly through maternal internalizing difficulties, given the well-established literature noting the relationship between emotion regulation and subsequent internalizing problems.

Emotion Regulation and Internalizing Problems

Emotion regulation has been described as the intentional and unintentional processes by which an individual influences their experience and expression of emotion (Gross, 1988; Gross, 2002). This process model of emotion regulation distinguishes emotion regulation strategies by their time of implementation, either before (antecedent-focused) or after (response-focused) the emotion is experienced (Gross, 2002). One antecedent-focused emotion regulation strategy, reappraisal, is defined as the positive cognitive reframing of a situation before or shortly after the emotion response has been activated, in order to modulate the intensity of the emotional experience (Gross, 2002). One response-focused emotion regulation strategy, suppression, entails a post-hoc process by which an individual modifies a behavioral response to an evoked emotion (Gross & John, 2003). Given the timing of these emotion regulation strategies, reappraisal is believed to affect both the experience and expression of emotion whereas suppression affects only emotional expression (Gross, 2002; Gross & John, 2003).

Previous research has demonstrated that the habitual use of either reappraisal or suppression predicts unique outcomes (Goldin, McRae, Ramel & Gross, 2008; Gross & John, 2003; Ehrling, Tuschen-Caffier, Schnülle, Fischer, & Gross, 2010). The use of reappraisal is associated with greater experience and expression of positive emotion and decreased experience and expression of negative emotion (Goldin et al., 2008; Gross, 2002). Suppression decreases the expression of positive and negative emotions and decreases the experience of positive emotion, yet does not affect the experience of negative emotion (Gross & John, 2003; Gross, 2002). Importantly, differential use of these emotion regulation strategies is related to risk for internalizing difficulties (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Specifically, infrequent use of reappraisal is linked to increased depressive and anxiety symptoms (Garnefski & Kraaij, 2006; Martin & Dahlen, 2005; Moore, Zoellner, & Mollenholt, 2008; Salters-Pedneault et al., 2006) whereas increased use of reappraisal corresponds to decreased negative affect (Dillon & Pizzagalli, 2013; Goldin et al., 2008). In addition, frequent use of suppression is linked to increased depressive and anxiety symptoms (Haga, Kraft, & Corby, 2009; Kashdan & Steger, 2006) and is a common regulatory strategy used by individuals with a history of depression (Ehrling et al., 2010). In sum, whereas prior research has established reappraisal as a more adaptive emotion regulation strategy, suppression appears to operate as a risk factor for internalizing problems.

In addition to having a potentially direct relation with infant negative affect, maternal emotion regulation strategy use may also have an indirect relation with infant negative affect via the infant's experience of less optimal parenting practices, often considered as stemming from maternal internalizing difficulties (see Bridgett, Burt, Edwards, & Deater-Deckard, 2015 or Rutherford, Wallace, Laurent, & Mayes, 2015 for reviews). Maternal internalizing difficulties are linked to less optimal parenting behaviors, such as lack of positive engagement with children and heightened negative parenting behaviors (Lovejoy, Graczyk, O'Hare, & Neuman, 2000), which are known to predict adverse child socio-emotional outcomes. Recognizing that such internalizing problems may stem from emotion regulation strategy use and also predict adverse child outcomes, we considered the potential for

maternal emotion regulation strategies to be indirectly linked with subsequent infant negative affect through maternal internalizing problems.

Child Effects

To this point, we have considered the impact of contextual factors on children's temperament development. However, it is also important to consider potential child effects, recognizing that children have an important role in shaping their environment (Scarr & McCartney, 1983). Although work in this area has not been entirely consistent, some prior work has demonstrated that children's temperament characteristics, such as negative affect, can influence parenting and maternal internalizing difficulties. Heightened infant negative affect has been observed to predict less sensitivity in maternal parenting behaviors (Mills-Koonce et al., 2007). Additionally, increased infant difficulty, often considered as increased infant negative affect, has been observed to differentiate between groups of depressed and non-depressed mothers (Hopkins, Campbell, & Marcus, 1987) and predict subsequent increases in postpartum depression (Cutrona & Troutman, 1986). Such findings are consistent with recent research noting that infant negative affect is related to higher parenting stress (Oddi, Murdock, Vadnais, Bridgett, & Gartstein, 2013). Collectively, these findings suggest that early infant negative affect influences maternal internalizing concerns.

However, limited research has examined whether earlier infant negative affect might influence subsequent infant negative affect through maternal internalizing concerns. Such a possibility, reminiscent of such effects observed in other areas of family science (e.g., coercive family processes; Patterson, 2002), may exist in light of evidence linking children's negative affect to maternal internalizing difficulties, and evidence linking maternal internalizing difficulties to children's negative affect. Thus, an additional aim of the current study was to consider the possibility of child effects on maternal internalizing difficulties, and also to explore the possibility that earlier infant negative affect may indirectly affect later negative affect via its influence on maternal internalizing difficulties.

The Current Study

Although some contributors to infant negative affect, such as maternal internalizing problems, have been considered in the existing literature, direct and/or indirect links between maternal emotion regulation strategies and infant negative affect have not been thoroughly examined. This question is important given recent research demonstrating links between maternal self-regulation, including emotion regulation, and children's outcomes (Bridgett et al., 2011; Bridgett et al., 2015; Cole, Teti & Zahn-Waxler, 2003; Cuevas et al., 2014; Deater-Deckard, Sewell, Petrill, & Thompson, 2010; Deater-Deckard, Wang, Chen & Bell, 2012; Ramsden & Hubbard, 2002; Rutherford et al., 2015).

Previous work has demonstrated links between emotion regulation strategy use (i.e., higher use of suppression and lower use of reappraisal) and increased internalizing difficulties (Ehring et al., 2010; Haga, Kraft & Corby, 2009; Kashdan & Steger, 2006) as well as links between maternal internalizing problems and children's negative affect (e.g., Austin et al., 2005; Pauli-Pott et al., 2004). Taken together, it may be that maternal emotion regulation

strategy use is indirectly linked to infants' negative affect through maternal internalizing problems, although this possibility has not been considered in existing work. In addition, limited work has examined whether infant negative affect is indirectly linked to subsequent negative affect through maternal internalizing problems.

To address these gaps in the literature, the current study examined the direct and indirect relationships between maternal emotion regulation strategies and infant negative affect through maternal internalizing problems. It was expected that mothers' lower use of reappraisal and higher use of suppression would be related to subsequently higher maternal internalizing problems as well as elevated infant negative affect. Consistent with existing work, we also hypothesized that greater maternal internalizing problems would be directly related to higher infant negative affect. Given links between emotion regulation strategies and internalizing problems in adults, and between mothers' internalizing problems and children's negative affect, we anticipated that both greater maternal use of suppression as well as lower maternal use of reappraisal would be indirectly related to increased infant negative affect through maternal internalizing problems. Based on previous work relating children's temperament characteristics to parenting and maternal factors, we anticipated that earlier infant negative affect would be related to mothers' subsequent internalizing difficulties and, in turn, may be indirectly related to later infant negative affect through maternal internalizing difficulties.

Method

Participants and Procedure

Participants—One-hundred mothers and their infants from a rural community in the mid-western U.S. participated in the current investigation. Caregivers were recruited by birth announcements placed by families in local publications, through flyers posted throughout the community, and through a OB/GYN practice. Eligibility for participation was restricted to infants who were delivered at full-term with no serious delivery complications, no infant developmental concerns at the time of enrollment, and maternal age of at least 17 years. Although 100 families were initially recruited into the study, the current investigation only included 99 families, as one infant developed a serious neurological disorder that compromised normal development.

Participants had a range of demographic backgrounds. The majority of mothers identified their ethnic background as Caucasian/European American (70.4%), followed by 12.2% Hispanic/Latina, 11.2% African American/Black, 2% Native American, and 4.1% —other. The mean age of mothers was 27.78 years ($SD = 6.40$, range = 17–42 years), with 9.2% of the sample classified as teen mothers (ages 17–19 years). Mothers had completed an average of 14.63 years of education ($SD = 2.81$, range = 9–20 years), with 31.3% reporting they had not completed high school. Approximately 20% of families (22.8%) were at or below the poverty threshold, defined as an income-to-needs ratio of less than or equal to one. The majority of mothers identified as being married or in a relationship (88.7%) with the minority identifying as single (11.3%). Of the ninety-nine infants, 55 were girls and 44 were boys.

Procedure—Mothers completed a packet of questionnaires approximately two weeks before their infant reached four months of age. Additionally, mothers attended a laboratory visit within a two week time frame around infants' four month —birthday (+/- 1 week) and participated in a structured clinical interview (SCID-IV: First, Spitzer, Gibbon & Williams; 1996) that assessed the presence or absence of past and/or current depressive episodes. When infants were six and eight months old, mothers again completed a packet of questionnaires. Mothers were compensated \$50.00 for participating in the initial four-month visit and \$30.00 for each additional time point.

Measures

Maternal emotion regulation—At four-months postpartum, mothers completed the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003). The ERQ consists of 10 items assessing individual differences in the use of two emotion regulation strategies. These items, rated on scale from 1 (Strongly Disagree) to 7 (Strongly Agree), yield two factors: reappraisal (e.g., *I control my emotions by changing the way I think about the situation I'm in*) and suppression (e.g., *I control my emotions by not expressing them*). The reappraisal factor consists of six items intended to assess how often individuals regulate emotions by modifying the meaning of emotional events. The suppression factor consists of four items intended to assess how often individuals regulate emotions by attempting to control or limit their emotional expression. In the current study, the internal consistency was good for both the reappraisal ($\alpha = 0.76$) and suppression ($\alpha = 0.75$) subscales.

Maternal internalizing problems—At six months postpartum, mothers completed the Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988) and the Beck Depression Inventory-II (BDI-II; Beck, Steer, & Carbin, 1988). The BAI is a 21-item questionnaire that asks participants to indicate how much they have been bothered by common symptoms of anxiety (e.g., numbness or tingling, feeling hot) during the past week. Each item is rated on a 4-point Likert scale ranging from 0 to 3, with higher scores indicating higher levels of anxiety ($\alpha = 0.90$). The BDI-II is a 21-item questionnaire asking participants to endorse statements, consistent with symptoms of depression, on a 4-point Likert scale ranging from 0 to 3 ($\alpha = 0.91$). Higher scores are indicative of more frequent/intense symptoms of depression. In the current sample, the association between the BAI and BDI-II scores was strong ($r = .50, p < .01$). Thus, an index of maternal internalizing problems was created by averaging the standardized totals of the BAI and BDI-II.

Infant negative affect—At both four and eight months postpartum, mothers completed the Infant Behavior Questionnaire-Revised (Gartstein & Rothbart, 2003). The IBQ-R is a comprehensive parent-report measure of infant temperament with good reliability and validity (see Gartstein, Bridgett, & Low, 2012 for an overview). For the purposes of the current investigation, the broad negative affect factor was used (four-month $\alpha = 0.85$, eight-month $\alpha = 0.91$). Mothers were asked to indicate on a 7-point, Likert-type scale how frequently the infant engaged in the behaviors, consistent with various aspects of temperament, during the last week, ranging from 1 (Never) to 7 (Always). The 46 items covering negative affect were averaged to comprise the broad negative affect factor, and can also be parsed into three subcomponent scales: sadness (14 items; e.g., *When you were busy*

with another activity, and your baby was not able to get your attention, how often did s/he become sad?), fear (16 items; e.g., *When an unfamiliar adult came to your home or apartment, how often did your baby cry when the visitor attempted to pick him/her up?*), and distress to limitations/frustration (16 items; e.g., *When the baby wanted something, how often did s/he become upset when s/he could not get what s/he wanted?*). These subcomponent scales were all related in the expected direction at four and eight months (fear and distress to limitations/frustration $r = .24$ and $r = .21$, $ps < .10$, respectively, fear and sadness $r = .26$ and $r = .29$, $ps < .05$, respectively, and sadness and distress to limitations/frustration $r = .59$ and $r = .80$, $ps < .01$, respectively).

Cumulative risk—The presence of multiple individual risk factors, or cumulative risk, confers greater risk for children's problematic developmental outcomes compared to individual risk factors (Appleyard, Egeland, Dulmen & Alan Sroufe, 2005; Deater-Deckard, Dodge, Bates, & Pettit, 1998). Thus, in the current study, a cumulative risk index was used as a covariate. The cumulative risk index consisted of multiple risk factors derived from participant demographic information and results from the semi-structured clinical interview with mothers (SCID-IV; First et al., 1996). These included a past or current maternal major depressive episode, maternal education less than high school, teen motherhood (17–19 years), single parenthood, and household income at or below the poverty threshold (i.e. income-to-needs ratio equal to or less than one). For each risk factor present, the participant received one point, resulting in a zero to five scale indicating level of risk (i.e., 0 = no risk factors present, 5 = all risk factors present). These maternal and socio-demographic risk factors were selected for use in the cumulative risk index given prior work noting them as indicators of risk for negative developmental outcomes (Goodman et al., 2011; Jaffee, Caspi, Moffitt, Belsky, & Silva, 2001; Jackson, Brooks-Gunn, Huang & Glassman, 2000; Brody & Flor, 1998).

Analytic Approach

Prior to analyses, all variables were examined for normality. Following recommendations made by Tabachnick and Fidell (2007), variables exhibiting significant skew such that $z = +/ -2.58$ based on a z -test calculated by dividing skew by the standard error of skew were transformed using either a logarithmic or square-root transformation (See Table 1 for variable means and standard deviations). Univariate and multivariate outliers were screened—two cases in each of the main analyses were eliminated due to being significant multivariate outliers. Primary regression analyses were then conducted with EQS 6.3 (Bentler, 2006). A total of four analyses, including cumulative risk and infant gender as covariates, were performed predicting 8-month infant negative affect: one model with reappraisal and a separate model with suppression, both without the influence of maternal internalizing difficulties, and subsequently, a final model with reappraisal and a final model with suppression, with both of these models including maternal internalizing difficulties. To obtain information on indirect relationships, the EQS 6.3 effect decomposition feature was used.

It is important to note that although traditional approaches to testing indirect associations require that the initial relationship between the IV and the DV be significant in order for a

mediated relationship to be present, contemporary approaches suggest that this initial relationship is not necessary for indirect associations (Hayes, 2009; Rucker, Preacher, Tormala, & Petty, 2011; Shrout & Bolger, 2002; Zhao, Lynch, & Chen, 2010). The use of EQS 6.3 software also permitted the use of full information maximum likelihood estimation to model missing data, resulting in analyses using the entire sample (see Missing Data section, below, for additional information).

Results

Missing Data and Preliminary Analyses

As is common in longitudinal research, there were some data missing at the final time point (22.2%). To determine if systematic patterns of missing data were present, Little's MCAR test (Little, 1988) was conducted. The test produced a non-significant result, $\chi^2(18) = 26.71, p = .09$, indicating that the data appeared to be missing completely at random. Since modern methods of accounting for missing data are less biased than traditional approaches (e.g., listwise deletion), missing values were estimated using full information maximum likelihood estimation, one of the preferred methods for handling missing data (Graham, 2009).

Next, the potential influences of covariates were examined. First, the possibility of gender differences in infant negative affect at four and eight months was examined. Although no significant gender differences were observed at 4 months, $t(93) = 1.45, p = .15$, significant differences were observed at 8 months, $t(75) = 1.96, p = .05$, with girls rated higher in negative affect than boys. Thus, gender was included as a covariate in analyses. A marginally significant association between cumulative risk and maternal reappraisal was also present, $r(93) = -0.19, p = .06$, warranting the inclusion of cumulative risk as a covariate in tests of direct and indirect associations.

Zero-Order Associations and Direct Relationships

A number of notable zero-order associations were observed (see Table 1). Maternal reappraisal was inversely related to infant negative affect at 8 months but not at 4 months; maternal suppression was not significantly related to infant negative affect at 4 months or 8 months. Maternal internalizing symptoms were inversely associated with maternal reappraisal and positively associated with maternal suppression. Higher maternal internalizing symptoms were also significantly associated with higher infant negative affect at 8 months and associated with higher infant negative affect at 4 months at the trend level.

Reappraisal—Controlling for cumulative risk and infant gender, and accounting for infant negative affect at 4 months, maternal reappraisal had a significant direct relationship with 8-month infant negative affect, $b^* = -0.22, z = -2.58, p = .009$. Maternal reappraisal was not concurrently related to infant negative affect at 4 months, $b^* = -0.04, z = -0.42, p = .67$. Cumulative risk also was related to higher infant negative affect at 8 months, $b^* = 0.23, z = 2.80, p = .005$. Infant gender was not related to infant negative affect at 8 months, $b^* = -0.11, z = -1.38, p = .167$. Infant negative at 4 months of age was significantly related to 8-month infant negative affect, $b^* = 0.59, z = -8.10, p < .001$.

Suppression—Accounting for covariates, maternal suppression did not have a significant direct relationship with 8 month infant negative affect, $b^* = 0.02$, $z = 0.26$, $p = .79$. Maternal suppression also was not concurrently related to infant negative affect at 4 months, $b^* = 0.07$, $z = 0.62$, $p = .54$. Consistent with the prior regression model, cumulative risk was significantly related to higher infant negative affect at 8 months, $b^* = 0.24$, $z = 2.88$, $p = .004$. Likewise, infant gender was not related to infant negative affect at 8 months, $b^* = -0.12$, $z = -1.40$, $p = .16$, and 4-month infant negative affect continued to be significantly related to 8-month infant negative affect, $b^* = 0.60$, $z = -8.16$, $p < .001$.

Tests of Indirect Relationships

Reappraisal—With maternal internalizing problems in the model (Figure 1), maternal reappraisal at 4 months was no longer significantly related to infant negative affect at 8 months, $b^* = -0.08$, $z = -1.12$, $p = .26$. However, higher maternal reappraisal was significantly related lower maternal internalizing difficulties, $b^* = -0.23$, $z = -2.24$, $p = .025$, and higher maternal internalizing difficulties was significantly related to 8-month infant negative affect, $b^* = 0.32$, $z = 4.07$, $p < .001$. Importantly, the indirect relation between maternal reappraisal and 8-month infant negative affect was significant, $b^* = -0.08$, $z = -1.963$, $p = .0496$.

Although 4-month infant negative affect remained unrelated to maternal reappraisal, $b^* = -0.08$, $z = -0.79$, $p = .43$, a significant direct relation with 8 month infant negative affect remained, $b^* = 0.53$, $z = 6.98$, $p < .001$. Four month infant negative affect also was related to maternal internalizing difficulties, $b^* = 0.25$, $z = 2.34$, $p = .019$. Notably, the indirect relation between 4- and 8-month infant negative affect through maternal internalizing difficulties was significant, $b^* = 0.08$, $z = 2.03$, $p = .04$. Finally, cumulative risk remained related 8 month infant negative affect, $b^* = 0.30$, $z = 3.88$, $p < .001$, but was not significantly related to maternal internalizing difficulties, $b^* = -0.18$, $z = -1.72$, $p = .085$. Infant gender also was related to 8 month infant negative affect, $b^* = -0.17$, $z = -2.26$, $p = .024$.

Suppression—With maternal internalizing problems in the model (Figure 2), as before, maternal suppression at 4 months was not significantly related to infant negative affect at 8 months, $b^* = -0.08$, $z = -1.06$, $p = .29$. However, higher maternal suppression was significantly related more maternal internalizing difficulties, $b^* = 0.24$, $z = 2.28$, $p = .022$, and higher maternal internalizing difficulties was significantly related to 8-month infant negative affect, $b^* = 0.41$, $z = 4.95$, $p < .001$. The indirect relation between maternal suppression and infant negative affect at 8 months of age was significant, $b^* = 0.10$, $z = 2.07$, $p = .038$.

Although 4-month infant negative affect remained unrelated to maternal suppression, $b^* = 0.06$, $z = 0.61$, $p = .54$, a significant direct relation with 8-month infant negative affect remained, $b^* = 0.48$, $z = 6.15$, $p < .001$. Four month infant negative affect also remained related to maternal internalizing difficulties, $b^* = 0.29$, $z = 2.77$, $p = .006$. Notably, the indirect relation between 4- and 8-month infant negative affect through maternal internalizing difficulties remained significant, $b^* = 0.11$, $z = 2.42$, $p = .016$. Finally, cumulative risk remained unrelated to maternal internalizing difficulties, $b^* = -0.17$, $z =$

$-1.79, p = .073$, but remained related to 8-month infant negative affect, $b^* = 0.34, z = 4.45, p < .001$. As before, infant gender was related to 8-month infant negative affect, $b^* = -0.16, z = -2.12, p = .034$.

Discussion

Previous work has identified a variety of maternal factors that influence infant negative affect, including maternal internalizing difficulties (e.g., Austin et al., 2005; Gartstein et al., 2010; Sugawara et al., 1999). However, up to this point, the role of maternal use of specific emotion regulation strategies in the development of infant negative affect has not been considered. In the current study, we examined (a) links between the specific maternal emotion regulation strategies of reappraisal and suppression and subsequent maternal internalizing symptoms in the first year postpartum, (b) associations between maternal emotion regulation strategies and infant negative affect, and (c) whether the hypothesized links between maternal emotion regulation strategies and infant negative affect occurred through maternal internalizing problems. We also considered potential child effects by examining whether infant negative affect at four months was related to subsequent maternal internalizing difficulties, and if earlier infant negative affect was indirectly associated with subsequent infant negative affect through maternal internalizing problems.

Accounting for cumulative risk and infant gender, findings generally supported our hypotheses. Lower maternal use of reappraisal, but not greater use of suppression, was directly related to higher infant negative affect four months of age. Lower maternal use of reappraisal and greater use of suppression were related to higher maternal internalizing problems. Likewise, more maternal internalizing difficulties at six months postpartum were related to higher infant negative affect at eight months postpartum. Importantly, and consistent with key expectations, tests of indirect relationships indicated that increased levels of maternal suppression and lower levels of maternal reappraisal were indirectly related to higher infant negative affect through heightened maternal internalizing problems. These findings are important given that prior work has been largely restricted to the examination of executive functions, such as working memory (e.g., Deater-Deckard et al., 2010), or to broader indices of self-regulation, such as effortful control (e.g., Bridgett et al., 2011), that may not capture the unique strategies caregivers may implement to regulate emotions.

Our key finding that maternal emotion regulation strategies were indirectly linked with infant negative affect through maternal internalizing problems has several important implications. Notably, mothers with poorer emotion regulation may be more prone to experiencing internalizing problems during the first year postpartum, a time when infants may be particularly vulnerable to the effects of mothers' dysregulated emotions (e.g., Cogill, Caplan, Alexandra, Robson, & Kumar, 1986). At such a young age, infants are heavily dependent on their caregiver for structuring and mediating their interactions with their immediate environment. When mothers are expressing internalizing symptoms (e.g., withdrawal, flattened affect, hyper-vigilance), they may be poorly equipped to provide the external emotion regulation their infants need, and infants may not develop effective regulatory mechanisms that can be used to successfully cope with negative emotions. As a

consequence, infant's expressions of negative affect could become more pronounced, a possibility supported by the findings in the current investigation.

In addition to the indirect links between maternal emotion regulation strategy use and infant negative affect via maternal internalizing concerns observed in the current study, emotion socialization, parenting, and effects originating from the broader rearing context (e.g., home environment) are all potential means by which maternal emotion regulation may impact infant negative affect. For example, poor maternal emotion regulation may be related greater internalizing difficulties, as demonstrated in the current study, which are then related to the use of more negative parenting practices and, in turn, elevated infant negative affect. Such a possibility is consistent with prior work and theory (see Bridgett et al., 2015 or Rutherford et al., 2015 for recent theoretical work). Specifically, maternal internalizing problems have been linked to parenting behaviors, with parental anxiety predicting more criticism/rejection (Whaley, Pinto, & Sigman, 1999; Warren, Mufson, & Weissman, 1995), insensitivity (Nicol-Harper et al., 2007), and intrusiveness (Stifter, Coulehan, & Fish, 1993). Mothers experiencing depression are also more likely to exhibit similar negative parenting behaviors (Downey & Coyne, 1990; Lovejoy, Graczyk, O'Hare, & Neuman, 2000; Middleton, Scott, & Renk, 2009; Webster-Stratton & Hammond, 1988). As a consequence, infants and children are more likely to display heightened negative affect (Hirshfeld-Becker, Mico, Simoes, & Henin, 2008), internalizing disorders (Lim, Wood, & Miller, 2008), externalizing disorders (Foster, Garber, & Durlak, 2008; Middleton, Scott, & Renk, 2009), and problem behaviors in later childhood (Carter, Garrity-Rokous, Chazan-Cohen, Little, & Briggs-Gowan, 2001). Taken with our findings, it may be that maternal internalizing problems, a potential consequence of problematic maternal emotion regulation strategies, influence young children's negative affect and behavior through parenting behavior. Further research with a focus on assessing these potential mechanisms is needed to examine such complex, multiple mediated effects.

An additional interpretation of our findings is related to maternal perception of infant temperament characteristics. That is, mothers who are less adept at applying emotion regulation strategies (i.e., use greater suppression and lower reappraisal) and who have more internalizing problems may experience their infants' developmentally appropriate expressions of negative affect as more aversive, or may be more sensitive to infant distress cues, thereby affecting their perception of their infants' negative affect (e.g., Donovan, Leavitt, & Walsh, 1998; Forman et al., 2003; Gartstein, Bridgett, Dishion, & Kaufman, 2009). Alternately, mothers who use less reappraisal/more suppression to manage their emotions and experience higher internalizing problems may interpret their infants' affective expressions to be indicative of underlying, stable temperament traits (i.e., negative affectivity), rather than normative, state-dependent reactions. To examine this important possibility, future studies may wish to include both maternal report and independent observer ratings, which would allow for direct examination of the effects of emotion regulation strategy use and internalizing problems on interpretation of, and response to, infant negative affect.

In terms of child effects, we found that higher infant negative affect at four months postpartum was associated with greater maternal internalizing problems six months

postpartum. This finding is consistent with previous work indicating that difficult infant temperament, such as excessive crying or unpredictability, may be related to subsequent maternal internalizing difficulties (Cutrona & Troutman, 1986; Hopkins, et al., 1987; Mayberry & Affonso, 1993). As an extension of this work, it is possible that parents who must attend to more negative infant and child behaviors are more likely to express symptoms of internalizing disorders (e.g., withdrawal, fatigue). Alternately, infant negative affect may contribute to greater parental stress, a possibility that has also been supported by previous work (e.g., Oddi et al., 2013), which then increases vulnerability to experiencing internalizing problems.

We also observed a significant indirect link between four month infant negative affect and eight month infant negative affect through maternal internalizing problems while controlling for suppression and reappraisal. These findings are consistent with prior work reporting associations between early infant negative affect and subsequent maternal stress and internalizing concerns (Cutrona & Troutman, 1986; Hopkins, Campbell, & Marcus, 1987; Mills-Koonce et al., 2007; Oddi et al., 2013), which, in turn, are related to subsequent infant negative affect, consistent with transactional models (e.g., coercive family processes [Patterson, 2002] or negative emotional reciprocity within parent-child relations [Moed et al., in press]) that are frequently invoked in family science. Future work should continue to examine such transactional relations between infant negative affect and maternal internalizing problems in order to explore how such interplay may be affecting children's outcomes, such as temperament and psychopathology.

An additional notable finding concerns the lack of a concurrent relationship between maternal emotion regulation and infant negative affect at four months postpartum. Though a significant direct relationship between maternal use of reappraisal at four months and infant negative affect at eight months was observed, infant negative affect at four months was not concurrently related to either maternal reappraisal or suppression. These findings suggest several possibilities. It may be that the effects of maternal emotion regulation on infant negative affect, occurring either directly or indirectly through internalizing problems, accumulate over the first year of life, resulting in the pattern of associations observed in the current investigation. Alternately, given our findings that earlier infant negative affect and maternal emotion regulation strategies were related to maternal internalizing problems six months postpartum, it may be that mothers' emotion regulation strategies are less susceptible to influence by younger children. These possibilities should be examined in future investigations.

In addition, and consistent with previous work relating reappraisal and suppression to internalizing problems in other populations (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Ehring et al., 2010; Haga, Kraft & Corby, 2009; Kashdan & Steger, 2006), our findings further support the notion that suppression and reappraisal are related to internalizing problems. Moreover, our findings extend this work to include mothers in the first year postpartum, making a modest contribution to this area. Given our findings, future efforts could identify ways to limit the extent to which maternal emotion dysregulation serves as a risk factor for developing infant negative affect, potentially through identifying mothers with high emotional dysregulation and providing appropriate interventions.

Based on the current findings, it is possible that interventions intended to increase adaptive emotion regulation would be of benefit for both mothers' experience of distress and infants' negative affect. This may be true especially for mothers who demonstrate problematic use of emotion regulation strategies (i.e., less reappraisal, more suppression) early in the postpartum period. In addition, because elevated negative affect is related to later child behavioral problems (Caspi, Henry, McGee, Moffitt, & Silva, 1995; Crawford, Schrock, & Woodruff-Borden, 2011; Eisenberg et al., 2003; Kim, Walden, Harris, Karrass, & Catron, 2007; Stright, Gallagher, & Kelley, 2008), infants of mothers who receive such early intervention and/or prevention measures may be at lower risk of future behavioral difficulties. These applied implications of the current study are promising avenues for future research.

Limitations and Future Directions

While this study identified novel indirect links between maternal emotion regulation strategies and infant negative affect through maternal internalizing problems and exhibited several notable strengths (e.g., longitudinal approach), there are several limitations, as well as several possibilities for future work that should be considered. First, and consistent with prior work, it is possible that maternal emotion regulation and/or internalizing problems impact the development of infant negative affect via maternal parenting behaviors, possibilities that were not tested in the current study. For example, it has been noted that both maternal self-regulation, broadly defined, and maternal psychopathology are subsequently related to poorer parenting (Bridgett et al., 2011; Bridgett, et al., 2015; Deater-Deckard et al., 2010; Nicol-Harper et al., 2007). In turn, poorer parenting may be related to adverse infant and child outcomes such as infant negative affect (Ispa et al., 2004), compromised cognitive and social development (Stams, Juffer, & van IJzendoorn, 2002), and increased risk for psychopathology (van IJzendoorn et al., 2006). Future studies would do well to consider the potentially complex relations between maternal emotion regulation strategies, internalizing problems, and parenting practices, and how the interplay between these factors may be related to young children's negative affect.

Next, it is possible that our ability to detect potentially small but important effects was limited by our relatively small sample size—future work should consider employing larger samples to examine similar questions. Another limitation related to our study sample is that all children were raised by their biological parents. As such, it is impossible to account for potential genetically influenced relations, including passive gene-environment correlations (Scarr & McCartney, 1983). As previously mentioned, the same genetic factors that put children at risk for the development of high negative affect may place parents at greater risk for experiencing internalizing problems, thereby compromising their ability to provide their child with optimal care. Genetically sensitive designs are needed to examine these potential effects.

In addition, the current study relied exclusively on maternal report to measure emotion regulation, internalizing problems, and infant negative affect. Although the validity of maternal reports of infant temperament has been supported (e.g., Seifer, Sameroff, Barrett, Krafchuk, 1994; Rothbart, 1986) and parent reports have notable strengths (see Gartstein,

Bridgett, & Low, 2012, for discussion), we cannot rule out the possibility of method effects stemming from our single source of information. Nevertheless, our use of a longitudinal approach helps to mitigate this possibility to some degree (see Podsakoff, MacKenzie, & Podsakoff, 2012 for discussion).

Another concern associated with the use of maternal report for the measurement of infant temperament, as previously discussed, is the potential bias introduced by maternal characteristics, including emotion regulation and internalizing problems. Evidence on this topic is mixed, with some studies suggesting depressed mothers are less accurate raters than non-depressed mothers (Briggs-Gowan, Carter, & Schwab-Stone, 1996; Fergusson, Lynskey, & Horwood, 1999) whereas another study found depressed mothers to be more accurate raters than non-depressed mothers (Hayden, Durbin, Klein, & Olino, 2010). While the possibility of bias in the current investigation cannot be completely ruled out, we attempted to minimize such a possibility by including the presence of a current or past depressive episode, assessed using a diagnostic interview, in the cumulative risk index.

It also should be noted that maternal self-report of emotion regulation may be different in a setting that induces strong affect as opposed to the general context in which it was assessed in the current investigation. In future studies examining the links between maternal emotion regulation and infant temperament, it will be important to assess maternal emotion regulation strategy use during difficult parenting tasks and/or when children are expressing negative affect, as this is the context in which children are likely to be affected by their parents' emotion regulation strategy use. Finally, this study examined the relations between maternal emotion regulation, maternal internalizing problems, and infant negative affect within a fairly short, restricted time frame (i.e., four to eight months postpartum). We did not test whether the relations identified in the current study persist outside of, or are specific to, this time period. Considering that children undergo rapid changes early in life and many mothers experience notable distress during the first year postpartum, it is possible that the links observed in the current study are time-specific. Future work may benefit from exploring these relationships across early childhood.

Despite these limitations, this study demonstrates initial evidence supporting the importance of considering maternal use of specific emotion regulation strategies as a potential influence on infant negative affect. Our findings add to the growing body of literature indicating that aspects of parental self-regulation are related to important child outcomes and influence the context in which children are being raised (Bridgett et al., 2013; Bridgett et al., 2015; Cuevas et al., 2014; Deater-Deckard et al., 2012). Future studies should continue to examine the roles of maternal emotion regulation and internalizing problems in the developmental trajectory of negative affect in order to better understand the complex influence of these factors on children. This additional empirical information can be applied to the development of novel interventions, or the modification of existing interventions, that aim to limit the degree to which maternal characteristics, such as maternal emotion regulation strategy use, confer risk for heightened infant negative affect.

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Highlights

- Mother's greater use of reappraisal was associated with less infant negative affect (NA).
- Maternal suppression affected infant NA indirectly via maternal internalizing problems.
- Maternal internalizing difficulties also mediated the link between maternal reappraisal and infant NA.
- Earlier child NA was related to subsequent maternal internalizing difficulties
- Findings demonstrate the role of maternal emotion regulation strategies on the emergence of early child NA.

Figure 1.

Indirect link between maternal reappraisal at 4 months postpartum and infant negative affect at 6 months postpartum through maternal internalizing problems at 6 months postpartum, controlling for infant negative affect at 4 months postpartum.

1. Direct relationship between maternal reappraisal at 4 months and infant negative affect at 8 months with maternal internalizing problems at 6 months in the model is above the line; the indirect link is below the line.
2. Direct relationship between infant negative affect at 4 months and infant negative affect at 8 months, with maternal internalizing problems at 6 months in the model is above the line; the indirect link, through maternal internalizing problems, is below the line.

Note: * $p < .05$

Figure 2.

Indirect link between maternal suppression at 4 months postpartum and infant negative affect at 6 months postpartum through maternal internalizing problems at 6 months postpartum, controlling for infant negative affect at 4 months postpartum.

1. Direct relationship between maternal suppression at 4 months and infant negative affect at 8 months with maternal internalizing at 6 months in the model is above the line; the indirect link is below the line.
2. Direct relationship between infant negative affect at 4 months and infant negative affect at 8 months with maternal internalizing at 6 months in the model is above the line; the indirect link, through maternal internalizing problems, is below the line.

Note: * $p < .05$

Table 1

Descriptive Statistics and Zero-Order Correlations among Study Variables

Variable	1	2	3	4	5	6	7
1. Infant Sex	-						
2. Cumulative Risk	.03	-					
3. Infant NA 4 Months	-.15	.07	-				
4. Maternal Reappraisal	.05	-.20 ^a	-.06	-			
5. Maternal Suppression	-.10	.10	.00	-.01	-		
6. Maternal Internalizing Problems	.03	-.11	.26 [*]	-.22 ^a	.21 ^a	-	
7. Infant NA 8 Months	-.19 ^a	.20 ^a	.66 ^{**}	-.23 [*]	-.09	.39 ^{**}	-
Mean (SD)	<i>a</i>	0.78 (0.83)	2.95 (0.64)	5.28 (0.91)	2.98 (1.26)	-0.02 (0.87)	3.43 (0.77)
Skew (Standard Error)	-	0.66 (0.24) ^b	0.11 (0.25)	-0.25 (0.25)	0.56 (0.25)	0.50 (0.27)	0.09 (0.27)
Range	-	0.00–3.00	1.61–4.30	3.50–7.00	1.00–7.00	-1.18–2.09	1.61–5.00

Note:

^a $p < .10$,^{*} $p < .05$,^{**} $p < .01$.

NA = Negative Affect. Maternal Internalizing Problems was computed by aggregating standardized component scores.

^a 55 girls (56%) and 44 boys (44%).^b Cumulative risk was square-root transformed to reduce non-normality; post-transformation skew (standard error) = 0.42 (0.24).