Positive and Negative Affect in Children of Depressed vs. Nondepressed Mothers

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Abstract

Children of depressed mothers are at a higher risk of developing depression in their lifetime compared to children of nondepressed mothers. Based on the tripartite model of depression and anxiety, low positive affect is the core symptom of depression. The current study examined the affect pattern of children of depressed and nondepressed mothers in general and in response to stimuli. Participants were 92 children (ages 8 to 10, mean=9.39, *SD*=.83; 55.4% female) and their mothers. Thirty-seven children were offspring of mothers with a history of depression during the child's lifetime (high risk), and 55 were offspring of mothers without a depression history (low risk). The Positive Affect and Negative Affect Schedule was used to measure trait and state positive and negative affect; the Smiley Face Mood Rating was used to measure children's affect after exposure to audio and visual stimuli that were neutral, negative, and positive. Results indicated that maternal depression history predicts low positive affect trait, and high positive parenting predicts high positive affect. Sex difference was found in the reactivity to mood induction stimuli, in a way that girls respond more positive to positive stimulus and more negative to negative stimulus than boys.

Depression is a disabling condition that affects many aspects of life including sleep, appetite, school and work, and social relationships. According to the National Comorbidity Survey Replication Study, 16.2% of adults in the United States met criteria for a diagnosis of a major depressive disorder (MDD) at some point in their life (Kessler & Berglund, 2003). MDD frequently is comorbid with anxiety disorders, dysthymic disorder, or other psychiatric disorders and often starts during adolescence. Because depressive symptoms in adolescence predict depression in adulthood (Birmaher et al., 1996), it is important to understand the risk factors for depression in youth and start early interventions.

Children of depressed parents are at a higher risk of depressive disorders, have an earlier age of onset, and greater impairment than offspring of nondepressed parents (Weissman, Wickramaratne, Nomura, Warner, Pilowsky, & Verdeli, 2006). The mechanisms underlying this intergenerational transmission of depression are not yet fully understood. One risk factor is biased information processing that is shaped by interactions with depressed parents (Taylor & Ingram, 1999). Additionally, children of depressed parents are exposed to stressful environments, which increases their chance of developing psychopathology. Other risk factors include an inherited temperamental emotionality or a disturbed neuroregulatory system (Goodman & Gotlib, 1999). Finally, depressed parents are more likely than nondepressed parents to show unsupportive and inconsistent behaviors toward their children (Goodman & Gotlib, 1999). Thus, a variety of environmental and biological factors have been linked with increased risk of psychopathology in offspring of depressed parents.

Positive and Negative Affect

Watson and Clark (Watson, Clark & Tellegen, 1998) proposed a Tripartite Model of Anxiety and Depression with three components: general distress, anhedonia, and hyperarousal.

The first element, *general distress*, is also known as negative affect (NA) and refers to the unpleasant engagement with the environment, including fear, contempt, and nervousness (Watson et al., 1998). *Anhedonia* refers to a low level of positive affect (PA); that is, the extent to which a person feels enthusiastic and energetic. According to the Tripartite model, low PA (anhedonia) is specifically related to higher risk of depression, whereas high NA (general distress) is a more general risk factor for internalizing disorders such as anxiety and depression (Watson et al., 1998). In an experience sampling study aimed at measuring emotional reactivity, patients with MDD reported more negative events and more persistent negative feelings in their everyday life, which was consistent with the expected low positive affect and high negative affect (Peeter, Nicolson, Berkhof, Delespaul, & deVries, 2003).

Studies with children and adolescents also have found evidence in line with the tripartite model. For example, children with a diagnosis of depression were found to have low PA and high NA, which together predicted an increased rate of future depressive symptoms (Joiner & Lonigan, 2010). Thus, evidence consistent with the tripartite model has been found in both children and adults.

Positive and Negative Affect in Children at Risk for Depression

Might levels of positive and negative affect also be a risk factor for the development of depression? A recent meta-analytic review of maternal depression and child psychopathology indicated a significant association between maternal depression and children's positive and negative affect (Goodman, Rouse, Connell, Broth, Hall, & Heyward, 2011). Thus, levels of PA and NA are possible risk factors for internalizing problems in offspring of depressed parents.

Using observations of parent-child interactions in a laboratory task, Dietz and colleagues (Dietz et al., 2008) found that children of depressed parents showed higher levels of negativity

and lower levels of positivity compared to children of nondepressed parents. One possible explanation for these observed differences in emotional reactivity is that depressed parents and their children have less adequate emotion regulation strategies. Indeed, depressed parents have been found to have fewer and less effective methods for regulating their emotions (Silk, Shaw, Skuban, Oland, & Kovacs, 2006), which likely are transmitted to their children.

Using data from observations of parent-child interactions to assess children's affect, however, has limitations. When parents are in a depressive episode, they and their children may behave differently, particularly in an unfamiliar laboratory setting that can be anxiety-inducing. In addition, children's behaviors may be affected by their parents' displayed affect. In the Dietz et al. (2008) study, depressed parents displayed lower positivity and higher negativity, which in turn might have affected the levels of positive and negative affect expressed by their children.

PA and NA also have been measured indirectly using cognitive information processing tasks. For example, Taylor and Ingram (1999) studied children's self-referent/self-concept under negative mood priming or neutral mood and found that children of depressed and nondepressed parents differed in their cognitive reactivity in self-referent encoding tasks. Children of depressed parents engaged in enhanced negative self-referent information processing during negative mood priming, which made them prone to negative thoughts and affect. In an earlier study, Ingram and colleagues (Ingram, Bernet, & McLaughlin, 1994) found a similar cognitive vulnerability in formerly depressed individuals who were more easily distracted by negative stimuli than never depressed individuals in a sad mood. Thus, this cognitive processing bias may reflect a difficulty in mood regulation associated with levels of PA and NA.

Biological factors such as neural activation in response to emotion-related stimuli and temperamental emotionality also have been found to differ between children of depressed and

nondepressed parents. In a study of children's activation of amygdala and accumbens, children of depressed parents and nondepressed parents were shown happy and sad faces while their neural activation was measured. Children of depressed parents displayed greater amygdala and accumbens activation when they were shown fearful faces and less activation when shown happy faces as compared to children of nondepressed parents (Monk et al., 2008). These results indicated that children of depressed parents have a weaker neural response to pleasurable stimuli (low PA) and stronger response to unpleasurable stimuli (high NA).

Another biological factor is temperamental emotionality. In a large community sample, Olino and colleagues (Olino, Klein, Dyson, Rose, & Durbin, 2010) examined the relation between children's emotionality and parental psychopathology. Higher child NE predicted a greater probability of parental depression when child PE was at a moderate to high level. Higher child PE was related to a lower probability of parental depression when child NE was at a low to moderate level. The association between child temperament and parental psychopathology was found exclusively with respect to parental depression. Thus, children of depressed parents have a different pattern of engaging with the environment and responding to emotion-related stimuli.

Although previous studies have shown a difference in the PA and NA levels in children of depressed versus nondepressed parents, the data have been less consistent with regard to the patterns proposed by the tripartite model. According to the tripartite model, low positive affect is a defining feature of depression, and can be used to predict future depressive symptoms (Joiner & Lonigan, 2010; Watson et al., 1988). Olino and colleagues (2010), however, did not find the expected direct relation between child positive emotion and depression in parents (Olino et al., 2010). Moreover, no significant differences in reported mood intensity were found between

children of depressed and nondepressed parents, after children were exposed to the same mood induction (Taylor & Ingram, 1999).

Positive and negative affect seldom have been measured explicitly in studies comparing children of depressed and nondepressed parents. Children's PA and NA levels have sometimes been implied from their cognitive information processing pattern or measures of temperamental emotionality. In addition, much of the data on PA and NA levels in children have come from studies on emotionality, and the definition of emotionality has been inconsistent across studies. For example, in the study by Olino and colleagues (2010), positive emotionality (PE) and negative emotionality (NE) matched the anhedonia and general distress, respectively, as proposed in the tripartite model of anxiety and depression. Positive affect was only one facet of PE, along with reward sensitivity, sociability, and motivation. In contrast, in the study by Wetter and Hankin (2009), PE was conceptualized as extraversion and NE as neuroticism from the big five personality traits. In still other studies, terms such as negativity and positivity were used without clear operational definitions (Dietz et al., 2008). Thus, comparisons across studies regarding positive and negative affect in children have been difficult due to the different definitions used. These various limitations highlight directions for future studies. PA and NA patterns in children of depressed parents should be investigated with well-defined terms and explicit measures.

Finally, Olino and colleagues (2009) found that children's depressive symptoms were more closely correlated with maternal as compared to paternal depression. A meta-analytic review (Goodman et al., 2011) also reported an association between maternal depression and child PA and NA. Most often, mothers are the major caregivers in families, and they spend more

time than fathers with their children. Therefore, studying the relation between depression in mothers and positive and negative affect in children makes sense as a place to begin.

Previous studies have found some evidence consistent with the tripartite model of anxiety and depression in children of depressed parents. Further investigations are needed to explore the validity of the tripartite model for explaining risk of depression in children of depressed parents. Such research can inform both theories of risk and guide the development of interventions targeting children of depressed parents.

Based on the findings of previous studies, we predict that children of depressed mothers will report higher levels of PA than NA when exposed to positive stimuli, and higher levels of NA than PA when exposed to negative stimuli. Also they will report lower levels of PA when given positive stimuli and higher levels of NA when presented with negative stimuli as compared to children of nondepressed mothers.

Method

Participants

Participants were recruited simultaneously in Atlanta, GA through Emory University and Nashville, TN through Vanderbilt University. Phone screens with mothers were conducted to evaluate their eligibility prior to scheduling appointments. Inclusion criteria for mothers were either a history of a depressive disorder during the child's lifetime (high risk) or no history of depression (low risk), and a child ages 8, 9, or 10 years old. Exclusion criteria were (a) mothers who were currently suicidal, psychotic, or substance abusing or had ever had bipolar I disorder or schizophrenia; (b) children with a pervasive developmental disorder, intellectual disability, autism, psychosis, bipolar disorder, or a current major depressive disorder or dysthymia.

Participants were 92 children (ages 8 to 10, mean=9.39, *SD*=0.83; 55.4% female) and their mothers. Thirty-seven children were offspring of mothers with a history of depression during the child's lifetime (high risk), and 55 were offspring of mothers without a depression history (low risk). 45% (N=52) of the participants were Caucasian, 25% (N=23) were African American, 14.1% (N=13) others, and 4.3 % (N=4) missing ethnicity information. See Table 1 for participant information.

Measures:

Positive Affect and Negative Affect Schedule

The Positive Affect and Negative Affect Schedule (PANAS) is a self-report questionnaire developed by Watson, Clark and Tellegen (1988) that consists of 20 mood descriptions to assess PA and NA. In the development of PANAS, the researchers identified ten mood descriptors for positive affect including attentive, interested and ten for negative affect including distressed, hostile, and nervous. Factor analysis were performed in order to choose the items that had high loadings on the target construct but low on the other. The PANAS-X, which is the original version of this scale, discriminates positive and negative affect in adults.

Joiner and colleagues (2000) successfully administered the PANAS to children ages 8 to 16 year, although the scale needed to be modified for children. In order to make this scale suitable for children, Laurent and colleagues (1999) developed the PANAS-C based on the PANAS-X, a 60 item version of PANAS. The word selection process was similar to that of the original process, but researchers replaced some of the difficult words with simpler words on the PANAS-C. The 30-item version of PANAS-C was used in this study, with 15 items for positive affect and 15 for negative affect. The PANAS-C has been found to have good internal consistency reliability, test-retest reliability, and convergent validity (Crook, Beaver, & Bell, 1998).

The PANAS was administered to the children twice, once with regard to their mood in general, which is a trait measure, and once regarding their mood at that moment, which measures affect as a state. Children were asked how much they have felt/ are feeling this way within the time frame for each mood descriptor using a 5-point scale with 1= not much/not at all to 5 = a lot. The experimenters read each question to the children, and the children rated each mood word; the experimenter entered the responses on the computer.

Mood Rating (Smiley Faces)

The Smiley Face mood rating assesses children's feelings at the moment. The rating consists of two questions: (a) "How are you feeling right now?" happy/good or unhappy/bad" and then (b) "How much do you feel this way?" a little, a lot, or somewhere in between?" When asking the first question, the experimenter shows the children a happy smiling face and a sad face along with the corresponding words. After the children first indicate if they feel happy (good, pleasant) or unhappy (sad, bad), the experimenter shows another picture demonstrating three different levels of the selected mood and asks the second question regarding how much they feel "happy" or "unhappy" right now.

The utility of the method of using pictorial self-report scales has been evidenced by Harter's study (1984) on the pictorial scale of perceived self-esteem. The picture is used to help children understand the questions and response options. The smiley faces are accompanied with mood descriptive words, such as happy, cheerful, unhappy and bad.

Parenting Perception Inventory

PPI (Hazzard, Christensen, & Margolin, 1983) is a child-report of perception of parenting in reference to the frequency of 34 target behaviors. Factor analysis of the PPI indicated two factors, positive parenting and negative parenting. Eighteen items ask about positive parenting

behaviors and 16 items ask about negative parenting behaviors. In this study, the child evaluated their mothers' parenting behaviors by reporting how often the mother engaged in the behavior using a 5-point Likert scale from 1 = never to 5 = all the time.

Center for Epidemiologic Studies Depression Scale (CES-D)

Mothers completed the *Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977)*, which is a 20-item measure of depressive symptoms over the past week. Mothers reported how often they felt each item using a 4-point Likert ranging from "Rarely or none of the time/Less than 1 day" to "Most or all of the time/5-7 days". The items include statements such as "I was bothered by things that usually don't bother me" and "I felt depressed."

Procedure

Children-mothers dyads who were eligible for the study based on the phone screen were invited to participate in a 3-hour visit to the lab. The website link to the mother's questionnaires was sent to the mother and completed prior to the visit. Upon arrival, the child was asked to complete the initial mood rating and the PANAS questionnaires. Items were read to the child, and the experimenter entered the child's responses on the computer. The child then was escorted by two experimenters to the EEG lab and completed the mood induction session. Before the mood inductions, the experimenters fit the child with the EEG cap to record the electrical activities in the scalp and an EKG belt for electrical activities in the heart. These recordings are not the focus of the current study.

The mood induction procedure involved the following: (a) a neutral auditory story, (b) a negative video clip (*Bambi, Lion King*, or *Land before Time)*, (c) a neutral video of fish, (d) a positive video clip (*Happy Feet, Lion King*, or *the Princess and the Frog*, (e) a different neutral fish video, and (f) another neutral narrative. Each audio and video clip was four minutes long.

The child was instructed to sit still and focus on his/her feelings while watching the video clips. After each audio and video, the child completed a mood rating using the Smiley Face measure.

Results

Of the 92 mothers, 87 completed the CES-D, which evaluated their depressive symptoms at the time of visit. Nine parents had CES-D scores that were equal to or above 16, indicating that they were experiencing at least a mild level of depression currently. The total number of participants included in the analysis was 90 out of the 92; two participants were excluded because of incomplete data.

Depression and Affect Level

The first question addressed was whether children of depressed and nondepressed mothers differed in their affect. To investigate the pattern of affect, we ran a set of independent-samples t-tests with the four PANAS measures and the two Smiley Face ratings after the negative and positive videos. Results indicated that children of depressed and nondepressed mothers did not differ significantly in their levels of positive and negative affect. Table 2 shows the means and standard deviations of the affect measures by maternal depression group.

Next, we conducted a set of multiple regression analyses to examine whether child age, sex, maternal depression history, positive and negative parenting behaviors predicted children's positive and negative affect. Six individual multiple regression analyses were run with the same set of dependent variables for positive affect/negative affect traits and states and the mood ratings.

Positive Affect

Table 3 presents the bivariate correlations among the affect measures and mood ratings. PANAS state scores were positively related to PANAS trait and Smiley Face scores after the

positive video; the correlation between PANAS trait and Smiley Faces was not statistically significant. The different settings of administration of the PANAS and Smiley Face measures may partially explain the low to moderate correlation between them (r = .382, p < .001).

Positive Affect Trait

The regression analysis included child age, sex, maternal depression history, and positive and negative parenting behaviors, and indicated a statistically significantly over association with the positive affect trait score, F(5, 84) =2.661, p=.028 (see Table 4). In particular, maternal depression history (MDE history present=1 and no MDE history=0, β= -.207, p=046) and positive parenting behaviors (β=.247, p=.020) were statistically significant predictors of the positive affect trait, and child sex showed a nonsignificant trend (β=.187, p=0.073).

Positive Affect State

The multiple regression that included child age, sex, maternal depression history, and positive and negative parenting behaviors yielded a significant effect predicting positive affect state F(5,84)=3.081, p=0.001. Positive parenting behavior was a significant predictor (see Table 5). Sex of the child yielded a nonsignificant trend to predict state PA (β=.191, p=.064).

Response to Positive Mood Induction

Children watched a neutral video (fish aquarium) prior to watching the positive video (*Lion King, Happy Feet, Princess and the Frog*). Regression analysis that included child age, sex, maternal depression history, and positive and negative parenting behaviors indicated that child sex (β=.245, p=.022) significantly predicted the mood rating after the positive video (Table 6); girls had a more positive mood rating after the positive video than did boys. There also was a nonsignificant trend for positive parenting (β=.194, p=.075) to predict children's mood rating after the positive video.

Negative Affect

Analyses of the bivariate correlations among the PANAS trait, PANAS state, and Smiley Faces after the negative video. The two PANAS scales (i.e., trait and state) were positively related, but the smiley face mood ratings did not correlate with either PANAS measure.

Negative Affect Trait and State

Regression analyses that included child age, sex, maternal depression history, and positive and negative parenting behaviors yielded an overall nonsignificant effect on either the negative affect trait, $F(5,84)=1.241, p=.297$, or the negative affect state measure, $F(5,84)=1.1$, $p = .348$.

Negative Mood Induction

Children rated their mood after watching a negative video (e.g., *Lion King, Land before Time, Bambi*). The mean mood rating for the negative video was 2.97 ($SD = 1.28$). Sex was a significant predictor of the mood rating for the negative video (Table 7), such that girls rated the negative video more negatively than did boys.

Baseline Mood Rating

The baseline affect was assessed with the smiley face mood rating after the children listened to an emotionally neutral audio presentation. The mean baseline affect for all participating children was 4.484 ($SD = 1.16$). The results of the multiple regression indicated that when child age, sex, maternal depression history, and positive parenting were controlled for, negative parenting significantly predicted children's baseline mood rating (see Table 8).

Mood Change

The mood change was assessed by taking the difference of smiley faces after positive and negative mood inductions. The mean change score was 2.33 ($SD=1.57$), with 5 as the highest and

-2 the lowest. Among all participating children, 83% reported happier mood for the positive induction than for the negative induction ($SF_{positive} - SF_{negative} > 0$); 12.5% of the children reported no mood change ($SF_{positive} - SF_{negative} = 0$), whereas 4.5% reported greater negative mood for the positive mood as compared to the negative induction ($SF_{positive} - SF_{negative} < 0$). This negative mood change might have been due to the weakness of the mood induction, or the result of children's short attention span or cognitive inability to understand the video clip. Also, other factors such as fatigue or negative emotions induced by restrained mobility may have affected children's mood ratings.

Multiple regression analysis that included child sex, age, maternal depression history, baseline mood rating, and positive parenting revealed a significant main effect of sex ($\beta=.126$, $p=.029$) as a predictors of mood change (see Table 9 and Figure 1). Girls showed significantly greater mood change in response to the video stimuli as compared to boys.

Discussion

Comparison of children of depressed mothers and non-depressed mothers

Previous studies have shown that the children of depressed mothers are at significantly higher risk of developing depression in their lifetime, compared to children of mothers without a depression history (Beardslee, Versage, & Gladstone, 1999). The present study focused on differences between offspring of depressed and nondepressed mothers in the extent of children's positive and negative affect at the trait and state level and in reaction to mood inducing stimuli. We hypothesized that these high- and low-risk children would differ on these potential markers of risk. Contrary to this hypothesis, no such group differences were found.

Several factors may account for these null results. In this sample, only 9 mothers had elevated depressive symptoms based on their CES-D at the time of visit. The total duration of

depressive episodes varied from one month from one month to over seven years, and the onset time in reference to children's lifetime varied from 14 months old to 9 years old. These variances were not taken into account in this analysis due to the incomplete data. Therefore, the lack of difference might be attributed to the large variance within the depressed mother group.

The result of the multiple regression analysis on PANAS positive affect trait indicated that children of depressed mothers had lower level of positive affect in everyday life. However, this effect was not statistically significant for PANAS positive state. This inconsistent might be due to the fact that in the previous section the children just had a 10 min playtime with their parents. Through spending quality time, children gained a high level of positive affect at the moment, but the interaction would not affect the everyday affect.

Sex Differences in Affect Intensity

Prepubescent boys and girls do not differ in the rate of depression, whereas the ratio changes around puberty (Cyranowski, Frank, Young, & Shear, 2000). Studies have examined neurological differences and changes in endocrine system in boys and girls during puberty. Less attention has been paid to the differences that might occur before puberty. Based on the tripartite model of depression and anxiety, we used affect as an indicator of risk for depression. The analysis on sex difference in affect patterns assessed the difference in terms of observable expression of feelings between boys and girls before depressive symptoms were shown.

In the further analysis of the current study, a significant sex difference in the positive mood induction rating, and a marginal significant effect in both PANAS positive affect trait and state were found this sample of children ages 8 to 10. Girls displayed higher levels of positive affect than boys in general, as well as at the time of visit. Girls also responded more positively to the positive mood induction video than boys, controlling for their baseline mood ratings.

Interestingly, girls and boys did not differ in their baseline mood, which was assessed after the children listened to a neutral audio story. Significant sex differences also were found in children's mood ratings after the negative video, but not in the two PANAS negative affect measures. Girls reported a significantly more negative mood rating after watching the negative mood induction video as compared to boys.

One possible explanation for both the elevated positive and negative mood ratings is that girls tend to experience higher affect intensity. This is consistent with the result of the study by Fajita and colleagues with college students (Fujita, Diener, & Sandvik, 1991) who found that women in the United States feel emotion more strongly than men in everyday life. One reason for why sex differences emerge around puberty is that prepubescent boys and girls experience balanced positive and negative stimuli. During puberty, they experience drastic change in body image and interpersonal relationships, which might posit more stressors and break the previous balance of negative and positive stimuli. Girls experience higher affect intensity, particularly negative affect, due to the increase in the number of stressors. However, further research is needed to determine how affect intensity contributes to the development of depression.

In addition to studying positive and negative affect separately, we also examined factors that were related to individuals' range of moods. Girls rated both their positive and negative mood in response to the video stimuli more intensely than boys. Relatedly, the overall difference between children's mood ratings for the negative and positive stimuli was greater in girls than boys, indicating that girls had higher affect reactivity than boys. The reason for this observed sex difference remains unclear, however.

The literature on parent-child interactions with girls versus boys may help explain this finding. When talking about sad events, parents typically engage in more in-depth discussion

about the emotional aspect of the event and use more emotional words with girls than boys, even though girls do not talk about sad events more extensively than boys (Fivush, Brotman, Buckner, & Goodman, 2000). That is, girls might have more experience talking about their emotions and consider it natural to express sadness. A meta-analysis of neuroimaging studies on emotions reported more frequent activation in females than males in subcallosal anterior cingulate, which is closely related to the autonomic nervous system (Wager, Phan, Liberzon & Taylor, 2003). This finding might be related to the higher level of reactivity to emotional stimuli found girls as compared to boys in the current study.

Affect and Parenting Behaviors

Previous studies have shown that depressed mothers were less responsive and positive with their children as compared to nondepressed mothers, which is related to internalizing disorders (LaFreniere & Dumas, 1992). Positive parenting assessed by the Parenting Perception Inventory was a significant predictor of the PANAS positive affect, and tended to predict the mood rating after positive video. Higher scores on the PPI positive scale predicted higher trait and state positive affect, and the response to the positive mood induction. Controlling for maternal depression history, we found that the effect of behavior is statistically significant. This finding sheds light on the understanding of the development of depressive symptoms in children of depressed parents. Lack of positive parenting may be a risk factor for children regardless of their parents' psychopathology. Depressed mothers have various types of difficulties in parenting, including negative/coercive behaviors, disengagement, and reduced positive behaviors (Lovejoy, Graczyk, O'Hare, & Neuman, 2000). Maternal depression, which is closely linked to maternal behavioral competence, was found to predict insecure attachment style in children (Teti, Gelfand, Messinger & Isabella, 1995), which contributes to future externalizing and

internalizing problems (Lee & Hankin, 2009). Therefore, the finding serves as a support for interventions targeting child psychopathology through parenting trainings.

Limitations and Future Directions

In regard to the primary hypothesis, we did not find a consistent difference in affect levels across different measures between children of depressed and nondepressed mothers. Maternal depression history predicted the PANAS positive affect trait scores, which is in line with the tripartite model of affect that depression is related to positive affect (Clark & Watson, 1991). No statistically significant level differences were found, however, in PANAS negative affect and the mood ratings in response to the video stimuli.

Several factors might have contributed to the absence of group differences. First, information about various characteristics of the mothers' depression were not considered or controlled for in the. For example, the duration and number of episodes experienced by mothers were not examined as possible moderators of the relation between maternal depression and children's affect. Second, the sample size was relatively small and uneven across the groups.

Lack of positive parenting behavior was linked to low positive affect in children; further study is needed to reveal whether low positive parenting is due to mothers' depressive symptoms or if is related to children's affect over and above the mothers' depression. In addition, children's depressive symptoms were not measured. The relations among child depressive symptoms, affect level, and maternal depressive symptoms needs to be studied further.

Another limitation was the effectiveness of videos in inducing the targeted moods. Although the video mood induction method has been found to be effective for children at this age (Brenner, 2000), the selection of videos that have the best content, valence, and age-appropriateness for inducing specific moods, should be evaluated further. The negative videos

selected for the current study were death scenes from *Lion King* (1994), *Bambi* (1942), and *The Land before Time* (1988). The positive videos were "Hakuna Matata" from *Lion King* (1994), *Happy Feet* (2006), and *Princess and the Frog* (2009). Some children were not familiar with the context of the stories, so they might not have fully understood the scene within the four minutes displayed. A knowledge check asking children to retell the story might be one way to address to this problem.

Furthermore, the order of positive and negative mood induction was not counterbalanced. The positive mood induction always came after the negative induction. Therefore, confounding factors like fatigue and short attention span were not equally distributed.

In addition, the smiley face rating measured mood on a single continuum. It was inconsistent with the tripartite model of anxiety and depression, which asserts that positive and negative affect are two distinct constructs (Clark & Watson, 1991). Also, it limited the valence to only happy/good (positive) and unhappy/bad (negative), thereby making it difficult to capture other valences in the positive and negative affect constructs. Extensive surveys after mood induction would not be effective due to the young age of the participants, and it would be counter the original intention of developing a short measure for affects. Future studies are needed to develop a valid and reliable brief measure that can effectively capture affect in the moment.

Finally, future studies should further explore sex differences and the role of parenting behavior in predicting depressive symptoms and the onset of depressive episodes. Although the level of affect intensity and reactivity differ for males and females, the processes by which these differences are related to the onset of depressive symptoms are still unknown. Comparing self-reported affect reactivity to psychophysiological responses might help to reveal possible mechanisms underlying sex differences in depression. In addition to studying child report of

parenting behavior, the discrepancy between child and parent report of parenting behavior might

be an informative predictor for child affect in terms of revealing disagreement in family

dynamics.

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Table 1: Demographic Characteristics

Demographics	Children of Depressed Mothers (N=37)	Children of Nondepressed Mothers (N=55)
Age	9.31 (SD = 0.78)	9.45 (*SD* = 0.86)
Sex Female	22 (59.46%)	29 (52.73%)
Male	15 (40.54%)	26 (47.27%)
Caucasian	22 (59.46%)	36 (65.45%)

SD = standard deviation

Table 2. Means and standard deviations on PANAS and mood ratings for children of depressed and nondepressed mothers

	Children of Depressed Mothers	Children of Nondepressed Mothers	*t*	*p*
	Mean (S.D.)	*Mean (S.D.)*		
PANAS-Trait	N=35	N=55		
Positive (PA)	3.617 (0.55)	3.794 (0.44)	-1.597	.115
Negative (NA)	1.829 (0.66)	2.001 (0.61)	-1.243	.218
PANAS-State				
Positive (PA)	3.117 (0.96)	3.092 (0.714)	.136	.893
Negative (NA)	1.202 (0.24)	1.252 (0.28)	-.912	.365
Mood Ratings	N=34	N=54		
Negative Video	2.03 (1.40)	2.93 (1.20)	.357	.722
Positive Video	5.44 (0.91)	5.26 (0.79)	.969	.336

Notes. The numbers vary due to missing data.

Table 3. Pearson correlations among PANAS and mood ratings

	PANAS Positive Trait	PANAS Positive State	MR Positive Video	PANAS Negative Trait	PANAS Negative State	MR Negative Video
PANAS Positive Trait	1	.317**	.101	.030	.011	-.028
PANAS Positive State		1	.382**	-.272*	-.117	.097
MR Positive Video			1	-.195	.011	-.065
PANAS Negative Trait				1	.331**	-.099
PANAS Negative State					1	.004
MR Negative video						1

**.Correlation is significant at the 0.01 level (2-tailed).

*.Correlation is significant at the 0.05 level (2-tailed).

Table 4. Multiple Regression Analysis of PANAS Positive Affect Trait

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	3.884	.652		5.953	.000
Child Age	-.074	.061	-.125	-1.225	.224
Sex	.183	.101	.187	1.816	.073
Maternal Depression	-.207	.102	-.207	-2.026	.046
PPI Positive	.008	.003	.247	2.365	.020
PPI Negative	.000	.007	-.004	-.040	.968

Notes. R^2=.137, p<.05

Table 5. Multiple Regression Analysis of PANAS Positive Affect State

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.852	1.067		2.673	.009
Child Age	-.155	.099	-.158	-1.563	.122
Sex	.309	.165	.191	1.875	.064
Maternal Depression	-.027	.167	-.016	-.163	.871
PPI Positive	.018	.006	.340	3.293	.001
PPI Negative	.010	.011	.095	.914	.363

Notes. R^2=.155, p<.05

Table 6: Multiple Regression Analysis of Smiley Face for Positive Video

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	6.047	1.247		4.850	.000
Child Age	-.176	.106	-.176	-1.661	.101
Sex	.412	.177	.245	2.333	.022
Maternal Depression	.069	.178	.040	.388	.699
Baseline Mood Rating	.040	.082	.054	.489	.626
PPI Positive	.011	.006	.194	1.806	.075
PPI Negative	-.006	.012	-.055	-.511	.611

Notes. R^2=.159, p<.05

Table 7. Multiple Regression Analysis of Smiley Face for Negative Video

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	4.128	1.884		2.191	.031
Child Age	-.268	.160	-.176	-1.677	.097
Sex	-.575	.264	-.226	-2.174	.033
Maternal Depression	.080	.268	.031	.297	.767
Baseline Mood Rating	.311	.123	.277	2.517	.014
PPI Positive	.000	.009	-.005	-.047	.963
PPI Negative	.008	.018	.052	.478	.634

R^2=.159, p<.05

Table 8. Multiple Regression Analysis of Baseline Mood Rating

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	6.882	1.529		4.501	.000
Child Age	-.241	.142	-.173	-1.693	.094
Sex	.239	.238	.103	1.002	.319
Maternal Depression	.234	.242	.098	.967	.337
PPI Positive	.012	.008	.152	1.457	.149
PPI Negative	-.032	.016	-.214	-2.025	.046

Notes. R^2=.150, $p < .05$

Table 9. Multiple Regression Analysis of Mood Change

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	1.242	2.169		.573	.569
Sex	1.007	.331	.320	3.045	.003
Child Age	.087	.200	.047	.436	.664
Maternal Depression	-.007	.336	-.002	-.022	.982
PPI Positive	.012	.011	.121	1.138	.258
Baseline Mood Rating	-.246	.153	-.177	-1.606	.112

Notes. R^2=.127, $p < .05$

Figure 1: Mood Ratings in Reponses to Induction Stimuli

Mood Ratings in Response to Induction Stimuli