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Negative (but not Positive) Parenting Interacts with Infant Negative Affect to Predict Infant Approach: Evidence of Diathesis-Stress

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Abstract

Temperament by parenting interactions may reflect that individuals with greater risk are more likely to experience negative outcomes in adverse contexts (diathesis-stress) or that these individuals are more susceptible to contextual influences in a ‘for better or for worse’ pattern (differential susceptibility). Although such interactions have been identified for a variety of child outcomes, prior research has not examined approach characteristics – excitement and approach toward pleasurable activities – in the first year of life. Therefore, the current study investigated whether 6-month maternal reported infant negative affect – a phenotypic marker of risk/susceptibility – interacted with 8-month observed parenting behaviors (positive parenting, negative parenting) to predict 12-month infant behavioral approach. Based a sample of mothers and their infants ($N=150$), results indicated that negative parenting was inversely associated with subsequent approach for infants with high, but not low, levels of early negative affect. Similar results did not occur regarding positive parenting. These findings better fit a diathesis-stress model rather than a differential susceptibility model. Implications and limitations of these findings are discussed.

Keywords

Parenting; Approach; Negative Affect; Diathesis-Stress; Differential Susceptibility

Developmental scientists often examine whether temperament characteristics – biologically-based individual differences in emotional reactivity and regulation that are influenced by experience (Rothbart, Ahadi, & Evans, 2000) – are shaped, in part, by the interaction between within person characteristics, such as risk/susceptibility factors, and contextual factors, such as parenting behaviors. Evidence of such interactions have often been explained under the guiding rubric of the diathesis-stress model (Zuckerman, 1999), which posits that vulnerable children, as marked by various phenotypic (e.g., high infant negative affect [NA]), endophenotypic (e.g., low vagal tone), and/or genotypic (e.g., 5-HTTLPR short allele) characteristics, are more likely to experience poor outcomes in the context of maladaptive contexts. Indeed, negative parenting behaviors (e.g., harshness, controlling

behavior, displays of negative affect) are more strongly linked to negative outcomes (e.g., externalizing problems, inhibition, fearfulness) for infants with greater risk than those with less risk (e.g., Belsky, Hsieh, & Crnic, 1998; Brooker & Buss, 2014).

The differential susceptibility framework shares the viewpoint of the diathesis-stress model and additionally suggests that susceptible individuals are more likely to experience adaptive outcomes in positive contexts (Belsky & Pluess, 2009). Supporting this notion, evidence suggests that positive parenting behaviors (e.g., engagement, warmth, sensitivity) protect against negative outcomes and promote adaptive outcomes, particularly for children with heightened susceptibility (Hankin et al., 2011; van Ijzendoorn, Belsky, & Bakermans-Kranenburg, 2012).

Temperament $\times$ parenting interactions are often considered when examining relations with negative outcomes, such as internalizing problems (e.g., Lengua, 2008) or externalizing problems (e.g., Belsky, Hsieh, & Crnic, 1998); however, limited research has investigated similar interactions with respect to outcomes that are generally viewed as being more positive. Behavioral approach – defined as excitement and approach toward pleasurable activities – is a candidate characteristic to investigate considering that it is a unique dimension of temperament underlying the development of adaptive outcomes, such as positive emotionality, sociability, and motivation (Elliot & Thrash, 2002; 2010).

Along similar lines, it also is common for studies to consider the interplay among reactive and regulatory temperament characteristics, such as attention or effortful control and NA (Bridgett et al., 2009; Eisenberg et al., 2007). However, little work has considered the interplay among context (e.g., parenting) and risk/susceptibility factors, such as NA (a “reactivity” aspect of temperament; Rothbart et al., 2000), in relation to a distinct reactivity aspect of temperament, such as approach. Importantly, from a developmental perspective, infant NA tends to emerge earlier in the first year of life than approach (Rothbart, 2007), thus rendering early infant NA to be a candidate marker for examining whether individual differences in levels of this risk/susceptibility factor influence links between parenting and the development of behavioral approach (e.g., Rothbart et al., 2000). Given this notable gap in the existing literature, and in light of approach being a distinct aspect of temperament that has unique, and often beneficial associations with subsequent social and emotional functioning (Beauchaine, 2001; Gartstein & Rothbart, 2003), research is needed that examines whether temperament $\times$ parenting interactions predict behavioral approach.

The current study sought to address gaps in the literature by examining whether infant susceptibility (as indicated by infant NA) and parenting interacted to predict approach characteristics during the first year of life. We conceptualized 6-month infant NA as the moderating variable because early infant NA is a phenotypic marker of risk/susceptibility (for a review, see Belsky & Pluess, 2009) and, as mentioned earlier, infant NA tends to emerge earlier in the first year of life than approach (e.g., Rothbart et al., 2007). Both negative parenting and positive parenting were hypothesized to interact with earlier infant NA to predict approach such that significant relations between parenting and approach would occur at high levels of infant NA (i.e., that children high in NA would experience low approach in the presence of high negative parenting, and low positive parenting). In order to

examine whether significant interactions better fit models of diathesis-stress or differential susceptibility, follow-up analyses were planned for significant interactions to determine which model better explained the shape of the interaction based on recommendations from Roisman and colleagues (2012).

Method

Participants

Mothers and their full-term, healthy infants ($N = 150$) from a rural community participated in the current investigation. Participants were recruited through birth announcements in local publications, flyers posted throughout the community, and an OB/GYN practice. Eighty-one infants were girls (54.0%) and 69 were boys (46.0%). Most mothers identified as Caucasian (70.3%), followed by African-American (13.8%), Hispanic/Latino (10.3%), and Other (5.5%). Mothers, on average, were 27.53 ($SD = 6.25$) years old, had 14.84 ($SD = 2.85$) years of education, and were predominantly married, cohabitating or in a relationship (84.9%). Approximately 26% of families were at or below the poverty threshold based on their family income-to-needs ratio.

Procedures

The present study was conducted according to guidelines laid down in the Declaration of Helsinki, with written informed consent obtained from a parent or guardian for each child before any assessment or data collection occurred. All procedures involving human subjects in this study were approved by the Institutional Review Board at Northern Illinois University.

When infants were 4 months old, mothers provided demographic information and were assessed for the presence of a current or past major depressive episode using the Structured Clinical Interview for DSM-IV Diagnoses (First, Spitzer, Gibbon, & Williams, 1996). At 6 months, mothers completed the Revised Infant Behavior Questionnaire (IBQ-R; Gartstein & Rothbart, 2003). At 8 months, mothers and infants engaged in an unstructured free-play interaction task in the laboratory. At 12 months, mothers again completed the IBQ-R. Participants were compensated with \$50.00 at the 4-month visit and with \$30.00 at each subsequent visit/time point. Compensation was provided regardless of participant's performance.

Measures

Infant Temperament—The 6-month NA factor¹ from the IBQ-R (Gartstein & Rothbart, 2003) was used to index infant's risk/susceptibility, which consisted of the fear, frustration and sadness subscales (46 items in total; $\alpha = .92$). Higher scores reflected greater NA.

¹Infant NA was also measured at 12 months as a part of the administration of the IBQ-R. We excluded 12 month Infant NA from the current study given that our conceptualization of infant NA was examining whether it acted as a risk/susceptibility marker for subsequent development and (2) 12-month infant NA did not demonstrate any significant relations with independent variables (i.e., positive parenting $r = -.10$; negative parenting $r = .12$) or the dependent variable (i.e., 12-month approach $r = -.08$). We did find a significant relation between 6-month NA and 12-month NA ($r = .56$) suggesting that NA was fairly stable.

To assess approach characteristics, the approach subscale measured at 6 (to control for continuity) and 12 months was used. This subscale is comprised of 12 items with higher scores reflecting greater levels of excitement, approach, and anticipation of pleasurable activities (6-month and 12-month α 's = .81 and .80, respectively).

Parenting Behaviors—Parenting behaviors recorded during the 8-month parent-child interaction task were coded using the Parent Child Early Relational Assessment (PCERA; Clark, 1985). Coded behaviors are intended to reflect global parenting behaviors (e.g., engagement, sensitivity, warmth, harshness) represented by the behavioral and affective characteristics that parents brought to the parent-child interaction. Behaviors were coded on a scale from 1 to 5. Coders received approximately 20 hours of training during which they learned the code and then were required to reach adequate inter-rater reliability (i.e., 80% or higher agreement) on eight training cases, chosen to reflect a range of caregiving behaviors, that were obtained from the current sample. Based on prior factor analytic research (Clark, 1999), PCERA global codes reflect two parenting dimensions: negative parenting (e.g., harshness, controlling behavior, displays of negative affect) and positive parenting (e.g., engagement, warmth, sensitivity). Five coded behaviors² were averaged with higher scores reflecting more negative parenting (α = .89). Eleven coded behaviors³ were averaged with higher scores reflecting greater positive parenting (α = .89). Inter-rater reliability was adequate, based on intra-class correlations (Negative Parenting = 0.74, Positive Parenting = 0.83), which was determined on the basis of an independent rater coding 20% of the interactions a second time.

Contextual Cumulative Risk—Given that the presence of multiple risk factors confers greater risk for poor outcomes, contextual cumulative risk was included as a covariate. Risk factors included maternal education less than high school, teenage motherhood, single parenthood, poverty status (Income to Needs Ratio ≥ 1.0), and a history of or concurrent clinical depression (e.g., Goodman et al., 2011; Jackson, Brooks-Gunn, Huang, & Glassman, 2000; Jaffee et al., 2001). Risk factors were summed to derive the cumulative risk index.

Analytic Approach

Variables exhibiting significant non-normality (i.e., Cumulative Risk, 6-month Approach, 6-month NA, 8-month Negative Parenting, and 8-month Positive Parenting) were log-transformed. Four cases of univariate outliers (z -score $> \pm 3.00$) within single variables were truncated to the closest value in the distribution for the respective variable. Two cases were identified as multivariate outliers (Mahalanobis distance > 16.55 , $p < .01$) and were excluded from analyses. Moderation analyses were conducted separately to examine potential independent effects of negative parenting and positive parenting, consistent with previous work (Belsky & Pluess, 2009). Infant sex and contextual cumulative risk were

²Coded behaviors reflecting negative parenting: expressed negative affect, angry tone of voice, hostile mood directed toward child, displeasure/disapproval/criticism of child, and contingent responsiveness to children's negative behavior.

³Coded behaviors reflecting positive parenting: flat/unemotional tone of voice (reversed), expressed positive affect, depression/withdrawal (reversed), enjoyment/pleasure, visual regard, amount of verbalization, quality of verbalization, social initiatives, structuring and mediating the environment, mirroring child's emotional state, and creativity/resourcefulness.

included as covariates in all analyses because prior research has found these variables to influence temperament (e.g., Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006).

Attrition resulted in missing data at the 6-month (12.8%), 8-month (15.4%), and 12-month (20.8%) time points. Little's (1988) MCAR was not significant, $\chi^2(18) = 23.35, p > .05$, suggesting the absence of systematic reasons for missing data. Multiple imputation – a robust technique for estimating missing data (Graham, 2009) – was used, with a total of 10 imputations, to estimate missing data, allowing for inclusion of the entire sample.

Results

Zero-Order Associations

Descriptive statistics and correlations are in Table 1. Sex was marginally associated with 6-month NA and significantly associated with 8-month Positive Parenting with boys showing less NA and experiencing less 8-month Positive Parenting. Cumulative risk was significantly, positively associated with 8-month Negative Parenting and significantly, inversely associated with 8-month Positive Parenting. Six-month NA was not significantly related to 12-month Approach. Six-month Approach was marginally associated with 8-month Negative Parenting and significantly related to 12-month Approach. Significant links between parenting and 12-month Approach were not observed.

Temperament * Parenting Interactions Predicting Approach

Two separate hierarchical multiple regression analyses (Tables 2 and 3) were conducted to test whether 6-month NA interacted with parenting to predict 12-month approach. Variables were standardized with the exception of sex. Interaction effects were computed as the product of the standardized variables. In the first analysis, covariates (i.e., sex, cumulative risk, and 6-month approach) were entered in Step 1; 6-month approach was the only significant predictor. In Step 2, 6-month NA was entered and did not account for significant additional variance. In Step 3, 8-month negative parenting was entered and did not account for significant additional variance. In Step 4, the 6-month NA $\times$ 8-month negative parenting interaction effect was entered, which accounted for significant additional variance. The 6-month NA $\times$ 8-month negative parenting interaction effect and 6-month approach were significant predictors in the final step.

In the second analysis, Steps 1 and 2 remained the same. On Step 3, 8-month positive parenting was entered and did not account for significant additional variance. On Step 4, the 6-month NA $\times$ 8-month positive parenting interaction was entered and did not account for significant additional variance. Six-month approach was a significant predictor in the final step.

Follow-up Analyses—Follow-up analyses were conducted following recommendations from Roisman and colleagues (2012) to determine whether the significant NA $\times$ negative parenting interaction better fit a diathesis-stress or differential susceptibility model, controlling for sex, cumulative risk, and 6-month approach. Simple slopes analyses indicated that 8-month negative parenting was significantly related to 12-month approach at high (plus 2 SDs), but not low (minus 2 SDs), levels of 6-month NA (Figure 1). A regions of

significance analysis indicated that 8-month negative parenting was significantly associated ($p < .05$) with 12-month approach when 6-month NA levels were -5.60 SDs below and 1.27 SDs above the 6-month NA mean. A regions of significance analysis indicated that 6-month NA was significantly associated ($p < .05$) with 12-month approach when 8-month negative parenting levels were -7.62 SDs below and 0.56 SDs above the 8-month negative parenting mean. For both regions of significance analyses, independent variables were significantly related to 12-month approach within the conventional range of the upper bound (i.e., significant within 2 SDs); however, significant relations were only observed outside the conventional range of the lower bound (i.e., significant only outside of -2 SDs). These findings are consistent with diathesis-stress, not differential susceptibility, based on guidelines provided by Roisman and colleagues (2012).

Additionally, a proportion of the interaction index was calculated using Roisman and colleague's (2012) formula. This statistic indexes the proportion of the interaction that is accounted for by both the 'for worse' and 'for better' conditions. Roisman and colleagues (2012) suggest that values between 40% and 60% reflect differential susceptibility, whereas values outside of this range are inconsistent with a differential susceptibility model. When the negative parenting distribution was bounded to ± 2 SDs, the proportion of the interaction index favored the diathesis-stress model such that, when negative parenting levels were high, vulnerable children showing less approach than less vulnerable children (i.e., 'for worse' condition) accounted for approximately 71% of the interaction. Additionally, the interaction was more indicative of diathesis-stress than differential susceptibility when the negative parenting distribution was restricted (i.e., 87% and 100% of the proportion favored diathesis-stress when negative parenting was bounded to within ± 1 SDs and ± 0.5 SDs, respectively). In other words, diathesis-stress seemed increasingly more fitting than differential susceptibility when focusing on more prevalent proportions of the negative parenting distribution.

Discussion

The purpose of the current study was to test whether a phenotypic marker of risk/susceptibility (i.e., 6-month infant NA) and parenting interacted to predict infant approach characteristics. Findings indicated that negative parenting behaviors were inversely linked to subsequent approach characteristics for infants with heightened vulnerability (i.e., greater NA), but not for those with less vulnerability. Based on follow-up analyses, this finding better fit a diathesis-stress model than a differential susceptibility model. A parallel Positive Parenting $\times$ NA interaction did not occur.

Our main finding suggests that vulnerable children (who are higher in NA relative to less vulnerable children who are lower in NA) show less approach when parents engage in more negative parenting. This may be because negative parenting reflects greater controlling behavior, which, for vulnerable children who are high in NA, reduces their motivation to approach aspects of their environment. Alternatively, it may be that, although behavioral inhibition – reticent behavior in the presence of novel stimuli – and behavioral approach are distinct, negative parenting induces inhibition in vulnerable children, which overrides the approach system and leads to inhibited behavior. Given that our study was limited to only

maternal report of infant's approach characteristics, future research may wish to examine whether the observed Negative Parenting $\times$ NA interaction effect predicts observed approach behavior across both novel and non-novel environments, since environmental novelty helps distinguish whether limited approach-related behavior may be due to low behavioral approach or high behavioral inhibition (Laptook et al., 2010).

In addition, the Negative Parenting $\times$ NA interaction finding fit best with a diathesis-stress model than a differential susceptibility model based on follow-up analyses. Such discriminating analyses provided evidence that vulnerable children's approach characteristics do not seem to be greater in the presence of low negative parenting; rather, it seems that only heightened negative parenting may hinder the development of approach characteristics for children who exhibit higher NA at 6 months.

Surprisingly, positive parenting did not interact with NA to predict approach characteristics, though prior research has observed evidence of differential susceptibility with respect to predicting a similar outcome (i.e., positive emotionality; Hankin et al., 2011). Several methodological differences between the current study and Hankin and colleagues' (2011) work may have contributed to this finding. In particular, our study was limited to younger children, a specific facet of positive emotionality (i.e., behavioral approach versus broad positive emotionality), and only used a phenotypic marker of risk/susceptibility rather than endophenotypic or genotypic markers. Thus, future work will need to consider whether such an interaction emerges later in development, perhaps as a result of further maturation of approach-related behavior or the cumulative effects of positive parenting, or whether such an interaction may be identified in younger children using methods similar to those employed by Hankin et al (2011). It is also possible that an interaction between risk/susceptibility, as measured by infant NA in the current study, and positive parenting does not exist. As such, the malleability of infant approach may not extend to 'for better' contexts (i.e., contexts characterized high positive parenting) for those with heightened risk; rather, changes in infant approach may only be observed in 'for worse' contexts for those with heightened risk – a possibility consistent with our findings.

Taken together, findings from the present study suggest that exposure to heightened negative parenting behaviors may be particularly detrimental to the development of approach behaviors in children who are vulnerable in terms of having higher NA during infancy. Given these findings better fit a diathesis-stress model, it appears that the influence of negative parenting reflects a 'for worse' pattern (i.e., vulnerable children do not necessarily show more approach in the absence of negative parenting). Future efforts may examine whether providing interventions intended to reduce mother's engagement in negative parenting mitigate the adverse effects of negative parenting on vulnerable children's behavioral approach.

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Note: RoS = Region of Significance

Figure 1.
Depiction of Simple Slopes Analysis Predicting Approach
Note: RoS = Region of Significance

Table 1

Descriptive Statistics and Intercorrelations among Study Variables

	1.	2.	3.	4.	5.	6.	7.
1. Sex	-						
2. Cumulative Risk [^]	.10	-					
3. 6-Month Approach [^]	.05	.10	-				
4. 6-Month Negative Affect [^]	-.17 [†]	.04	-.04	-			
5. 8-Month Negative Parenting [^]	-.03	.19 [*]	.16 [†]	.04	-		
6. 8-Month Positive Parenting [^]	-.23 [*]	-.38 ^{**}	-.07	.12	-.43 ^{**}	-	
7. 12-Month Approach	-.03	.07	.28 ^{**}	-.02	.00	-.05	-
<i>Mean</i>	-	0.84	5.42	4.57	3.97	1.68	5.90
<i>SD</i>	-	0.87	0.89	2.57	0.56	0.61	0.62

[^] Intercorrelations based on transformed variable. Sex coded as 0 = girl, 1 = boy.[†] $p < .10$,^{*} $p < .05$,^{**} $p < .01$

Table 2

Interaction between 6-month NA and 8-month Negative Parenting Predicting 12-month Approach

Predictors	F(df)	R ²	Step 1	Step 2	Step 3	Step 4
Dependent Variable = 12-month Approach						
Step 1	3.66 (3) *	.07 **				
Sex			-.01	-.02	-.02	-.02
Cumulative Risk			.01	.02	.03	.02
6-month Approach			.25 **	.25 **	.26 **	.27 **
Step 2	2.94 (4)	.01				
6-month Negative Affect			-	-.06	-.06	-.10
Step 3	2.57 (5)	.01				
8-month Negative Parenting			-	-	-.06	-.05
Step 4	3.26 (6) *	.04 *				
6-month Negative × Affect d 8-month Negative Parenting			-	-	-	-.20 *

* $p < .05$,** $p < .01$.

Table 3
Interaction between 6-month NA and 8-month Positive Parenting Predicting 12-month Approach

Predictors	F(df)	R ²	Standardized Betas			
			Step 1	Step 2	Step 3	Step 4
Dependent Variable = 12-month Infant Approach						
Step 1	3.66 (3) *	.10 **				
Sex			.00	-.01	-.01	-.01
Cumulative Risk			.03	.03	.04	.04
6-month Approach			.26 **	.26 **	.27 **	.26 **
Step 2	2.96 (4)	.00				
6-month Negative Affect			-	-.08	-.08	-.08
Step 3	2.49 (5)	.00				
8-month Positive Parenting			-	-	.02	.02
Step 4	2.16 (6)	.00				
6-month Negative Affect × 8-month Positive Parenting			-	-	-	.01

* $p < .05$,

** $p < .01$