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Anger and Children's Socioemotional Development: Can Parenting Elicit a Positive Side to a Negative Emotion?

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Abstract This study examined the role of anger in infancy and its interaction with maternal warmth in predicting children's socioemotional development. Participants included a demographically diverse sample of 316 mothers and children from the Project on Human Development in Chicago Neighborhoods (PHDCN) study. Infants were followed across 3 waves of data collection from birth through 5 years of age. Mothers reported on infant anger when children were approximately 4 months of age. Maternal warmth was assessed via observation at both 4 months and 2 years. Children's socioemotional outcomes were assessed at age 5, and included a direct assessment of delay of gratification and maternal reports of internalizing and externalizing behaviors. Anger in infancy significantly predicted higher levels of internalizing and externalizing behaviors at age 5. A main effect of anger on delay of gratification was not supported. However, anger in infancy moderated the association between maternal warmth and delay of gratification, such that only high-anger infants benefited from high maternal warmth. Similar interactive effects were not supported for problem behaviors. These results provide modest support for the differential susceptibility hypothesis, which proposes that highly reactive children are more susceptible to environmental risks and assets than other children. Specifically, findings suggest that although anger can increase children's vulnerability to problem behaviors, it can also be a motivating factor for self-regulation in the presence of supportive parenting.

Keywords Anger · Maternal warmth · Delay of gratification · Problem behavior · Differential susceptibility

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Introduction

Negative emotionality is a broad dimension of temperamental reactivity that reflects a predisposition toward various forms of negative affect such as anger and fear (Rothbart and Bates 2006). The literature suggests that it is the key contributor to parental perceptions of infant "difficulty" (Bates 1989) and an important risk factor for socioemotional development. Specifically, high negative emotionality in infancy is associated with increased levels of both internalizing and externalizing behaviors across early childhood (Eisenberg et al. 2009; Gilliom and Shaw 2004; Morris et al. 2002). Recent studies point to the wisdom of investigating anger and fear as distinct facets of negative emotion with divergent etiologies and outcomes (Buss and Goldsmith 1998; Braungart-Rieker et al. 2010; Henderson and Wachs 2007). First, anger is thought to be related to the approach motivational system and fear to the avoidance motivational system, which are governed by different regions of the brain (Carver and Harmon-Jones 2009). Second, anger and fear have different developmental trajectories in early childhood, and are differentially responsive to parenting (Braungart-Rieker et al. 2010). Therefore there is reason to believe that their implications for self-regulation and behavior may also diverge.

A growing number of studies demonstrates complex associations between early parenting practices and child

temperament in the prediction of child outcomes (Belsky 1997; Kochanska1997; Rothbart and Bates 2006). Specifically, research shows that infant reactivity moderates associations been environmental contexts and other indicators of socioemotional adjustment, most notably, externalizing behaviors. Belsky (1997; Belsky et al. 2007) cites this research to support his differential susceptibility hypothesis (i.e., the hypothesis that highly reactive children are more susceptible to environmental risks and assets than other children). To date, most evidence supporting the differential susceptibility hypothesis has used discipline to measure parenting. Considerably less is known about the potential for negative emotionality to moderate parental affect, another central dimension of parenting behavior (Brooks-Gunn and Markman 2005; Maccoby and Martin 1983; Zaslow et al. 2006). Moreover, the majority of research on the interaction between negative emotionality and parenting has focused on avoidance rather than approach motivation (Dennis 2006), and thus less is known about anger than fear. Although anger is typically presented as a risk factor (Eisenberg et al. 2009; Gilliom and Shaw 2004; Morris et al. 2002), results from the motivation literature are mixed and suggest that anger also has the potential to be an asset (Harmon-Jones and Allen 1998; Lewis et al. 1992). We attempt to clarify the role of anger in infancy by exploring its association with socioemotional development in preschool, with a particular interest in its interaction with maternal warmth in the prediction of both positive and negative child outcomes.

Negative Emotionality

Temperament in infancy is predominantly characterized by reactivity (Rothbart et al. 2000). Reactivity is a multidimentional construct that represents an individual's ease and intensity of behavioral arousal to environmental stimuli (Kagan et al. 1994; Rothbart and Bates 2006). Reactive processes are thought to be largely automatic, as opposed to volitional, and are reflective of differences in individuals' somatic, endocrine, and autonomic functioning (Rothbart et al. 2007). Negative emotionality or affectivity is the broad temperamental reactivity factor that is characterized by the tendency to display various negative affect states. Although researchers use different terms to describe negative reactivity (e.g., "difficultness," Miner and Clarke-Stewart 2008; "negative emotionality," Sanson et al. 2004), most definitions include the following two key dimensions: fear and anger or frustration (Rothbart and Bates 2006). Measures of reactivity along these dimensions typically assess the latency, duration, and intensity of motor, affective, and attentional reactions to stimuli, with highly reactive infants demonstrating faster, longer, and more intense responses (Rothbart and Bates 2006).

Although anger and fear are both negative emotions, there is growing evidence that they are distinct constructs that have different etiologies, follow different trajectories, and serve different functions (Braungart-Rieker et al. 2010; Carver and Harmon-Jones 2009; Denham et al. 1995). Anger, one of the first basic emotions expressed, is reliably observed by 2 or 3 months of age (Izard and Malatesta 1987), and shows an increasing rate of growth between 4 and 16 months of age (Braungart-Rieker et al. 2010). In contrast, fear, which develops later in the first year of life, is detectable and reliable after 6 months (Izard and Malatesta 1987; Rothbart 1986), and its rate of increase slows between 4 and 16 months of age (Braungart-Rieker et al. 2010).

These two facets of negative emotionality also differ in their underlying motivational processes. Specifically, anger, which arises when a goal has been interrupted or blocked (Berkowitz and Harmon-Jones 2004; Lewis et al. 1990), is associated with an approach motivational orientation that reflects sensitivity to rewards, exuberance, and behavioral approach to novelty and challenge. Fear, on the other hand, emerges when there is a threat of harm (Frijda 1986) and is associated with an avoidance motivational orientation that reflects sensitivity to threats, fear, and behavioral withdrawal (Carver and Harmon-Jones 2009; Derryberry and Rothbart1997). Approach and avoidance reactivity are thought to be related, yet independent systems derived from distinct neurological and physiological processes. Approach is associated with greater left anterior activity and activation of the behavioral approach system (BAS), while avoidance is linked with greater right brain processing and activation of the behavioral inhibition system (BIS; Cacioppo et al. 2007; Gray 1982). Although both have important implications for children's socioemotional development, the majority of child development research has focused on avoidance reactivity, and thus we know less about the role of approach reactivity for predicting self-regulatory and socioemotional outcomes (Dennis 2006).

The abovementioned research suggests that anger lies at the intersection of the emotional reactivity and motivation literatures. Interestingly, the juxtaposition of these literatures highlights the complexity of anger, as there is evidence to suggest that it may be both a risk and a protective factor for children's socioemotional development. For example, when viewed from the negative emotionality perspective, anger has been linked with reduced effortful control (Kochanska and Knaack 2003) and higher levels of both internalizing and externalizing behaviors across early childhood (Eisenberg et al. 2009; Murphy and Eisenberg 1996). Evidence from the approach motivation literature, however, is inconsistent. On the one hand, the research suggests that high approach can have negative implications for children's socioemotional development. For example, high approach can lead to higher levels of frustration and

aggression, especially when children's goals are blocked (Dennis 2006; Derryberry and Rothbart 2001), and it is linked with reduced inhibitory control (Rothbart et al. 2001). In addition, temperamental exuberance in infancy, which describes children high in both approach and positive affect, is associated with increased problem behaviors in early childhood (Degnan et al. 2010; Putnam and Stifter 2005; Stifter et al. 2008). It has been suggested that reward sensitivity increases children's self-regulatory vulnerability (Fox 1994). For example, it is possible that a high approach motivation depletes the self-regulatory strategies, such as attentional control, that children can deploy to distract themselves in stressful situations (Rodriguez et al. 2005).

Additional research, however, suggests that high approach motivation may have benefits for children's socioemotional development. Specifically, high approach can result in greater exploration of the environment and positive emotion, particularly in the context of reward, which may be beneficial for development (Blandon et al. 2010). For example, in one study of infant learning, children who displayed high levels of anger when a reward was removed demonstrated the highest levels of positive affect, interest, and increased engagement with the task when the reward was reinstated (Lewis et al. 1992). Moreover, anger is believed to aid in goal persistence due to its underlying approach motivation (Harmon-Jones and Allen 1998). Adults who reported higher levels of anger in response to an unsolvable problem demonstrated higher levels of performance on a subsequent cognitive task than those who reported less anger (Mikulincer 1988). Together, these studies indicate that the association between approach and socioemotional development is complex and requires further investigation. Moreover, past studies on approach may have limited applicability to the study of anger. Not only are approach and anger separate constructs, but past studies examining approach have used multi-dimensional measures, such as exuberance (Degnan et al. 2010; Stifter et al. 2008), which includes positive affect. Thus, the unique role of anger is unclear and deserves additional attention.

The Role of Parenting

Early interactions with parents play a central role in children's socioemotional development, as these experiences serve as the foundation for children's regulatory functioning (Campos et al. 1989; Rothbart and Bates 2006). Warm and supportive parenting, in contrast to harsh or controlling parenting, prevents overarousal and allows children to respond to caregivers' attempts to focus attention and control behavior (Eisenberg et al. 2005; Kochanska et al. 2000). Positive parenting also provides models of appropriate self-regulatory strategies and induces compliance by instilling feelings of reciprocity (Eisenberg et al. 2003). Accordingly, warm and nonintrusive parenting is associated with increased internalization of rules (Maccoby and Martin 1983), higher levels of effortful control (Graziano et al. 2010), more focused attention (Gaertner et al. 2008), and fewer problem behaviors (Miner and Clarke-Stewart 2008; Shaw et al. 1994). For children high in negative emotionality, who face a significant challenge in managing their reactivity (McEwen 2005; Raver 1996), positive parenting may be especially beneficial.

The importance of early parenting-by-temperament interactions for child adjustment has gained increasing attention in recent years (e.g., Lahey et al. 2008; Morris et al. 2002). A good deal of research now shows that infant reactivity often moderates the influence of parenting practices on behavior problems. Generally speaking, studies find that the associations between negative parenting practices (low positivity, intrusive parenting, negative control, harsh discipline) and externalizing problems are stronger among children who demonstrate high levels of negativity or difficult temperament during infancy or toddlerhood (e.g., Belsky et al. 1998; Calkins 2002; Gilliom and Shaw 2004; Miner and Clarke-Stewart 2008; Morrell and Murray 2003).

Recent studies, however, suggest that difficult children can also benefit more from positive parenting, which is consistent with the differential susceptibility hypothesis (Belsky 1997). The differential susceptibility hypothesis posits that highly reactive children are more susceptible than other children to the assets, as well as the risks, in their environment (Belsky 1997; Belsky et al. 2007). For example, in a sample of infants, maternal sensitivity to infant distress was associated with less affect dysregulation only among those considered temperamentally reactive (Leerkes et al. 2009). In a Dutch sample of toddlers, Van Zeigl et al. (2007) found that children rated as having difficult (negatively emotional, persistent, and inadaptable) temperaments were at lower risk of externalizing problems than "easy" children when they experienced positive discipline (e.g., inductive reasoning), in addition to being at higher risk when experiencing negative discipline (e.g., prohibition).

Most studies of the interaction between parenting and negative emotionality have focused exclusively on the fear component on negative emotionality. For example, Kochanska (1997, 2002) found that the parenting practices that predicted compliance diverged for fearful and nonfearful children. Moreover, consistent with the differential susceptibility hypothesis, highly fearful children were more likely than less fearful children to benefit from warm and responsive parenting in circumstances requiring self-regulation (Kochanska 1993, 1995). What remains unclear, however, is whether similar patterns hold true for children high in anger in the prediction of both positive and negative socioemotional outcomes.

The Current Study

The main objective of this study was to increase our understanding of the role of anger and its interaction with maternal warmth in predicting children's socioemotional development. Given the predominant focus of the parenting-by-temperament literature on negative child outcomes, we examined a positive self-regulatory skill—delay of gratification—in addition to externalizing and internalizing behaviors. This aspect of self-regulation may be particularly relevant to anger, as sensitivity to rewards can be a motivating factor in delay of gratification tasks, where children are rewarded for waiting with a tangible gift. The first aim of this study was to examine the association between anger reactivity in infancy and all three socioemotional outcomes at age 5. Based on previous research (Eisenberg et al. 2009; Morris et al. 2002), we hypothesized that anger would be positively associated with later internalizing and externalizing behavior. Given that approach can be associated with both increased frustration and persistence, we did not specify the direction of the association between anger and delay of gratification.

The second aim of the study was to examine whether early anger reactivity moderated associations between maternal warmth and child self-regulation and problem behavior. Although there is little past evidence to draw on, we present some preliminary hypotheses. It is thought that maternal warmth is typically associated with greater compliance and effortful control because it induces feelings of trust and reciprocity with the child (Eisenberg et al. 2003; Graziano et al. 2010; Kochanska 1997). Given that infants high in anger may be in particular need of supportive parenting to achieve effective self-regulation, it is possible that the benefits of maternal warmth are heightened for these children. Therefore, we expected high-anger infants to have a stronger positive association between maternal warmth and delay of gratification than low-anger infants.

The interaction between infant anger and maternal warmth in the prediction of problem behavior is less predictable. For the reasons reviewed above, positive parenting may be particularly helpful for angry children with respect to self-regulation, but it is less obvious why it would have a differential impact on behavior problems. Although delay of gratification and self-regulation more broadly, are associated with externalizing problems, their predictors are not necessarily identical. Additionally, although there is evidence suggesting that the associations between negative parenting practices and externalizing problems are stronger among children with a difficult temperament (e.g., Belsky et al. 1998; Miner and Clarke-Stewart 2008), we know little about the presence of positive parenting, which is not the same as the absence of negative parenting, and even less about the specific role of anger. Thus, our test of an interaction between maternal warmth and anger in predicting internalizing and externalizing behaviors was largely exploratory.

Methods

Sample

The Project on Human Development in Chicago Neighborhoods (PHDCN) is a multilevel study of individuals and neighborhoods designed to examine human development in context. The present study relies exclusively on the individual-level Longitudinal Cohort Study, which tracked children in multiple age cohorts over three waves of data collection. Sampling was designed to ensure representation of all neighborhoods in Chicago. Neighborhood clusters ("NCs") were created out of groups of 2–3 census tracts that were relatively homogeneous with respect to racial/ethnic mix and socioeconomic status (Sampson et al. 1997). A stratified random sample of 80 NCs was selected. Within these NCs, children in 7 age groups (0, 3, 6, 9, 12, 15, and 18), or cohorts, were recruited from a randomly selected sample of 35,000 households.

We select the "0 cohort," so named because children had just been born or were due to be born shortly at the time of the first wave (1994–1997). We further select a subsample of the 0 cohort randomly selected for the Infant Assessment Unit ($n = 413$), a battery of measures administered at wave 1 to assess perinatal health and infant temperament. At wave 2 (1997–1999), there was an 88% retention rate, and at wave 3 (2000–2001), there was an 83% retention rate. To be eligible for the present analysis, children had to be seen at wave 1, when they 4 months old on average ($SD = 2.8$ months), and wave 3, when they were 5 years old on average ($SD = 6$ months), and they had to have a non-missing value on one of the three outcomes of interest ($n = 317$). One case was dropped because the primary caregiver was male, leaving a final analytic sample of 316 children. Compared to the analytic sample, excluded children were slightly older, had smaller families, and had mothers who were less educated, more depressed, and more likely to be Hispanic or other race/ethnicity (results not shown). Excluded children also had mothers who scored higher on maternal warmth. The exclusion of these children may have resulted in a lack of power, thus weakening our ability to detect associations among anger, parenting, and socioemotional outcomes.

As shown in Table 1, the sample was sociodemographically diverse. Twenty-one percent of mothers were white, 28% were black, 47% were Hispanic, and 4% were another race/ethnicity. Thirty-seven percent of mothers had less than a high school degree, 14% had a high school degree, and 48% had more than a high school degree. Children were evenly split by sex. Approximately half (56%) of mothers were married.

Table 1 Descriptive statistics for control, predictors, and outcome variables

Variable	M	SD	%
Demographics			
Maternal race/ethnicity			
White			21
Black			28
Hispanic			47
Other			4
Maternal education			
Less than high school			37
High school graduation/GED			14
Some college or more			48
Maternal marital status			56
Child male			52
Child age (years)	4.90	0.50	
Adult:child household ratio	0.90	0.73	
Household per capita income ($)	6,209	5,811	
Maternal depression	1.04	2.07	
Infant observed reactivity to novelty	−0.07	0.68	
Predictors			
Infant anger	1.70	0.34	
Maternal warmth	0.79	0.13	
Outcomes			
Delay of gratification	0.01	0.92	
Internalizing behavior	6.42	5.41	
Externalizing behavior	8.31	5.55	

Calculations are based on five multiply imputed data sets. $N = 316$

Measures

At all waves, data collectors visited families in their homes to interview parents, observe the home environment, and assess children. All measures are described below and summarized in Table 1.

Infant Anger

At wave 1, mothers completed the Distress to Limitations scale of the Infant Behavior Questionnaire (Rothbart 1981). This scale assesses the infant's reactions to limitations such as delays in feeding and being placed in a confining position such as a car seat. There were 11 items, all scored on a 3-point scale. Items ($\alpha = .66$) were averaged. Higher scores indicate greater proneness to anger.

Maternal Warmth

Maternal warmth was captured at waves 1 and 2 by observational items recorded by the data collector during or shortly after the home visit. Items were drawn from the Home Observation for the Measurement of the Environment (HOME) Inventory (Caldwell and Bradley 1984), and captured the mother's expression of affection and responsivity to her child (sample items: mother caresses, kisses, cuddles, or hugs child at least once during visit; mother helps child demonstrate an achievement during the visit). There were 7 items at wave 1 ($\alpha = .57$) and 9 items at wave 2 ($\alpha = .83$); all were dichotomous and averaged at each wave. Scales were correlated across waves ($r = .56$), so they were averaged to form a composite measure of maternal warmth.

Socioemotional Outcomes

There were three socioemotional outcomes measured at wave 3. The first, delay of gratification, was captured by the "gift wrap" task (Kochanska et al. 2000). Trained data collectors informed the child that she had a gift for him/her, but needed to wrap the gift so that it would be a surprise. The data collector stood behind the child's back and asked the child not to peek while she wrapped the gift. The data collector then began a 60-second observation period while pretending to wrap the gift by crinkling the paper. The data collector recorded the number of seconds that elapsed before the child peeked and the intensity of the peeking behavior (0 = child gets out of chair and goes over to tester, 5 = child does not try to peek). Prior to release into the field, data collectors coded 17 previously videotaped administrations of this task. Comparisons with a gold standard coder revealed high inter-rater reliability (mean % agreement on latency scores within ±3 s = 94%; mean % exact agreement on peaking intensity = 88%). Because these two variables were highly correlated ($r = .80$), they were standardized and averaged to form a composite score.

The second and third measures of socioemotional development at wave 3 were mothers' reports of internalizing and externalizing problems via a reduced version of the Child Behavior Checklist (CBCL 4–18; Achenbach 1991). The internalizing scale included 31 items capturing anxiety/depression, withdrawal, and somaticization. The externalizing scale included 21 items capturing aggression and delinquency. Mothers were asked to rate how well each item described their child's behavior in the previous 6 months (0 = not true, 1 = sometimes true, 2 = often true). Items were summed (α for internalizing = .83; α for externalizing = .84).

Controls

Child and family characteristics included as controls in multivariate models were selected on the basis of previous literature supporting their associations with infant temperament, maternal warmth, and children's socioemotional

development. With the exception of child age, which was drawn from wave 3 (when the outcomes were measured) and maternal depression, which was not measured until wave 2, all control variables reflect data from wave 1 (baseline).

Child sex and maternal marital status, race/ethnicity, and education were based on maternal report. Maternal race/ethnicity was coded as white, black, Hispanic, or other. Maternal education was coded as less than high school, high school degree, or more than high school degree. Mothers reported on their depressive symptoms during the previous year at wave 2 using an adapted version of the Composite International Diagnostic Interview—Short Form (CIDI-SF; Kessler and Mrozek 1997). The eight items corresponded to the diagnostic criteria for a major depressive episode in the DSM-IV (American Psychiatric Association 1994) and were summed. Household per capita income was computed based on reported total household income and number of residents. A ratio of adults to children living in the house was calculated based on reported household occupants. Finally, in order to discriminate anger (distress to limitations) from fear (distress to novelty), we included infant's observed reactivity to novelty (number of frets and cries) during the Kagan Mobile Task (Kagan et al. 1994) at wave 1.

Missing Data

Among the 316 families in the analytic sample, 15% were missing data on at least one of the control variables. Each of these variables was missing for less than 5% of cases, with the exception of household income per capita, which was missing for 10%. Infant temperament data were missing for less than 1% children. Based on the assumption that data were missing at random (that is, their missingness could be modeled by observed characteristics; Allison 2009), we used multiple imputation in Stata 10 (StataCorp, College Station, TX) to create 5 complete data sets with control and predictor variables. The ICE command in Stata (Royston 2007) conducts multiple imputation based on a regression switching protocol using chained equations. Although the outcome variables were used in imputation models for other missing variables, they themselves were not imputed, as recommended by von Hipple (2007). The 5 data sets were analyzed using the MIM prefix for regression analyses in Stata (Royston 2007), which combines coefficients and standard errors across imputed data sets.

Results

Table 1 presents the percentages or means, standard deviations, and sample sizes for control, predictor, and outcome variables. Bivariate correlations among the study variables are displayed in Table 2. Anger was negatively associated with maternal warmth and was significantly related to all three socioemotional outcomes. Specifically, higher anger was associated with higher levels of internalizing and externalizing problems and, notably, with higher levels of delay of gratification. Maternal warmth was negatively related to externalizing behavior, such that higher maternal warmth was associated with lower problem behavior. Unexpectedly, maternal warmth was not associated with internalizing behavior or delay of gratification.

Analytic Approach

A series of regression models were computed to examine the main effects of infant anger and maternal warmth on the outcomes and also test for an interactive effect between them. As a whole, mothers scored high on maternal warmth, which resulted in considerably less variability on this measure compared to anger; thus both variables were dichotomized. Infants were classified as either high or low in anger using a median split. Similarly, mothers were classified as either high or low in warmth using a median split. Two regression models were run for each outcome. The first model entered high infant anger and high maternal warmth simultaneously; the second added the interaction between them. As previously noted, all models included controls for child sex, child age, maternal race/ethnicity, maternal education, maternal marital status, maternal depression, household adult:child ratio, household income

Table 2 Correlations among infant anger, maternal warmth, and socioemotional outcomes at age 5

	1.	2.	3.	4.	5.
1. Infant anger	–	−.13***	.09***	.24***	.24***
2. Maternal warmth		–	.01	−.03	−.09***
3. Delay of gratification			–	.03	−.05^{+}
4. Internalizing behavior				–	.62***
5. Externalizing behavior					–

Table presents bi-variate correlations with imputed data sets

$^{+}$ $p < .10$, *** $p < .001$

per capita, and observed reactivity to novelty. All models used robust standard errors to adjust for the non-independence of observations within NCs.

The Effects of Infant Anger and Maternal Warmth on Children's Socioemotional Development

The results of analyses examining both main effects and interactions are displayed in Table 3. As expected, main effects of high anger were reported for both internalizing ($B = 2.29$, $p < .001$) and externalizing behaviors ($B = 2.24$, $p < .001$), which is consistent with previous research suggesting that anger can increase the likelihood of problem behavior (e.g., Eisenberg et al. 2009). A main effect of high anger on delay of gratification, however, was not supported, suggesting that high anger during infancy neither promotes nor inhibits children's delay of gratification at age 5 after controlling for covariates. No main effect of high maternal warmth was found for any of the three outcomes, suggesting that contrary to expectations, high maternal warmth did not have a direct impact on children's socioemotional development at age 5 after controlling for covariates and high child anger.

As predicted, the interaction between high anger and high warmth was significant ($B = .42$, $p < .05$) in the prediction of children's delay of gratification. Specifically, results supported anger as a significant moderator of the association between warmth and delay of gratification, such that high-anger infants benefited more than low-anger children from high maternal warmth. Indeed, the coefficient for high maternal warmth was not significant, indicating that low-anger infants did not benefit at all from high maternal warmth. In contrast to delay of gratification, internalizing and externalizing problems did not show evidence that high anger interacted with high maternal warmth. Thus, in this sample, high maternal warmth was not associated with either type of behavior problems, regardless of the child's level of anger in infancy. Given that these analyses were largely exploratory, the implications of these results are addressed in the discussion.

Discussion

The present study extends our understanding of anger as a unique facet of infant emotional reactivity and highlights its role in children's socioemotional development. Specifically, anger during infancy was found to have both main effects on behavior problems in early childhood, as well as interactive effects with maternal warmth in the prediction of children's delay of gratification. Overall, results support anger as a double-edged sword, such that it can increase children's vulnerability to problem behaviors, but can also be a motivating factor that can support self-regulation in the presence of a supportive environment.

In particular, this study makes three significant contributions to the temperament literature. First, our study is

Table 3 Models examining the influence of infant anger and maternal warmth on socioemotional development

	Model 1			Model 2		
	B	*SE*	*β*	*B*	*SE*	*β*
Delay of gratification (n = 305)						
High infant anger	0.14	0.12	0.07	−0.01	0.15	−0.01
High maternal warmth	−0.03	0.12	−0.02	−0.23	0.16	−0.12
High anger x high warmth	–	–		0.42*	0.20	0.17
R^2 or ΔR^2		0.12			0.01	
Internalizing behavior (n = 300)						
High infant anger	2.29**	0.69	0.21	2.48**	0.80	0.23
High maternal warmth	0.26	0.94	0.02	0.52	1.25	0.05
High anger x high warmth	–	–		−0.54	1.46	−0.04
R^2 or ΔR^2		0.05			0.00	
Externalizing behavior (n = 300)						
High infant anger	2.24***	0.66	0.20	2.03**	0.84	0.18
High maternal warmth	−0.52	0.90	−0.05	−0.83	1.17	−0.07
High anger × high warmth	–	–		0.62	1.46	0.04
R^2 or ΔR^2		0.07			0.00	

Models include controls for child sex, child age, maternal race/ethnicity, maternal education, marital status, maternal depression, household adult:child ratio, household income per capita, and infant observed reactivity to novelty

* $p < .05$; ** $p < .01$; *** $p < .001$

one of the first to examine anger per se, instead of including it as an indicator of negative emotionality or approach. Although the constructs of negative emotionality and approach both include anger as a component, and although these constructs tend to covary (Laptook et al. 2008), they should not be viewed as interchangeable (e.g., Putnam and Stifter 2002). Indeed, when anger was considered separate and apart from its parent construct it was difficult to hypothesize the direction of its influence on delay of gratification, as it could be a problematic or protective for self-regulation.

Second, we applied Belsky's (1997) differential susceptibility hypothesis to determine whether infant anger reactivity moderates the association between warm parenting and socioemotional development. In contrast to differential vulnerability research, which focuses on the tendency for negative emotionality to exacerbate the influence of environment risk, differential susceptibility research addresses the possibility that negative emotionality enhances the influence of environment assets. This study found mixed evidence that high infant anger increases children's susceptibility to the favorable effects of maternal warmth on socioemotional development. Results provide modest support for the differential susceptibility hypothesis.

Third, this study extends the examination of early temperament-by-parenting interactions to a more demographically diverse sample of children and families. Much of the previous literature in this area examines child outcomes within predominantly white and/or advantaged samples (e.g., Braungart-Rieker et al. 2010; Leerkes et al. 2009; van Zeigl et al. 2007). Thus, whether these associations are generalizable to more diverse samples has been largely unexamined.

The Association Between Anger and Socioemotional Development

As expected, anger in infancy was positively associated with both internalizing and externalizing behaviors in early childhood. These findings are consistent with previous research linking anger to problem behavior (Eisenberg et al. 2009; Morris et al. 2002; Murphy and Eisenberg 1996) and support the view that negative emotions have a direct influence on internalizing and externalizing problems. Past researchers have proposed that negative emotions are associated with externalizing behaviors because they trigger coercive parenting behaviors that contribute to externalizing problems (Patterson 1982). Our findings support a direct link from anger to externalizing while controlling for maternal warmth.

In contrast, anger in infancy did not undermine children's delay of gratification. In fact, high-anger children performed better on delay of gratification when they had mothers who were high in warmth (addressed in detail below). This finding appears to contradict Kochanska and Knaack (2003), who found that anger was linked with reduced effortful control. However, these studies are not necessarily irreconcilable. Kochanska and Knaack (2003) used a composite measure of effortful control, of which delay of gratification was only one of five facets assessed. The unique relationship between anger and delay of gratification was not examined. It may be the case that delay of gratification is the one aspect of effortful control that profits from anger because it taps reward sensitivity. We discuss this point in further detail below.

Anger as Moderator of the Link Between Parenting and Socioemotional Development

Anger moderated the effects of maternal warmth on children's delay of gratification. Specifically, only children who were high in anger scored better on delay of gratification in the presence of high maternal warmth. That is, high anger was *advantageous* for delay skills in the presence of high maternal warmth. This finding partially supports the differential susceptibility hypothesis (Belsky 1997), which suggests that highly reactive children may not only perform worse in the presence of environmental risks than low reactive children, but may also perform better in the presence of environmental protective factors. Although the differential susceptibility hypothesis suggests that children high in anger should also score lower on delay of gratification in the presence of low maternal warmth, our findings did not support this association. Thus, our study indicates that anger has the potential to be beneficial and should not be solely considered a liability. These results are consistent with past studies of approach suggesting that anger can be adaptive (Harmon-Jones and Allen 1998; Lewis et al. 1992) and point to the need to distinguish anger from other facets of negative emotionality.

Anger did not moderate associations between maternal warmth and problem behaviors. One explanation for why this interaction may exist for delay but not for problem behavior is that the causal pathways from anger to internalizing and externalizing behaviors may be more complicated than that to delay. A delay of gratification task may be particularly sensitive to anger because it involves a reward (the wrapped gift). Anger reflects activation of the BAS, which also controls reward-sensitivity (Carver and Harmon-Jones 2009). Thus, a task measuring the delay of a reward may be particularly challenging to high-anger children. Indeed, to the extent that being told to wait for a gift by an experimenter simulates the blockage of a goal, the task comes close to measuring anger itself. Compared to delay of gratification, internalizing and externalizing problems are less proximal expressions of anger. There are likely to be many intervening factors, such as social

competence, that determine whether anger is manifested in behavior problems. For example, if children high in anger are also deficient in social competence, they may be particularly unlikely to make friends. This, in turn, may lead to internalizing problems such as sadness and anxiety.

Surprisingly, maternal warmth did not predict delay of gratification among low-anger children and was not associated with internalizing or externalizing behavior. This contradicts previous research demonstrating a positive effect of warm and sensitive parenting on children's self-regulation and behavior problems (Kochanska et al. 2000; Shaw et al. 1994; Spinrad et al. 2007). As mentioned above, our measure of self-regulation was unidimensional, which may have limited our ability to detect associations with warmth. Our measure of maternal warmth was also limited in that it reflected observed behaviors during a home visit, rather than during a situation designed to elicit child stress. Research suggests that maternal warmth during emotionally challenging tasks may be of particular salience for children's socioemotional development (Dennis 2006; Leerkes et al. 2009). Warm and sensitive responses to negative emotions, such as encouraging attention shifting by providing a distractor or modeling adaptive solutions to frustration, may promote learning of self-regulatory strategies among infants (Eisenberg et al. 1998). Thus, the measure of maternal warmth used in our study may not have been as pertinent to children's socioemotional development as more context-specific assessments of parenting. Further, Dennis (2006) has differentiated maternal warmth (e.g., frequency of positive affect synchronized with child) from maternal approach (e.g., showing affection and praising child), as they were associated with child persistence and compliance, respectively. Our measure was a combination of both of these constructs, as it captured observed expressions of affection and responsivity by mothers to their children.

Because we used a median split, and thus relative rather than absolute scores, to generate low- and high-warmth groups, the mothers in our low warmth group may be more properly conceived of as mothers who were lower than average than mothers with extremely low scores. However, it should be noted that mothers in our sample appear to be comparable on average to other samples. For example, their mean score, when expressed as a percent of the possible total score, was 79%, compared to a range of 75–88% on the HOME warmth scale at child ages 1–3 in national samples such as the National Longitudinal Study of Youth—Child Supplement and the NICHD Study of Early Child Care and Youth Development (original calculations based on Fuligni et al. 2004; Leventhal et al. 2004). The mean score for our low warmth group was 70%, compared to 94% for our high warmth group. While this differential suggests a meaningful distinction between the two groups, it is still the case that many mothers in the low-warmth group scored close to average.

Conclusions and Limitations

Although the present study adds to our understanding of anger as a unique component of both negative emotionality and approach, and describes its implications for children's socioemotional development, it is not without limitations. First, shared-method variance across measures is a concern because mothers reported on both infant anger and child problem behavior. Given that the parents of children who score high on negative emotionality also tend to report more behavior problems (Lahey et al. 2008; Lawson and Ruff 2004; Paulussen-Hoogeboom et al. 2008), the association between anger and problem behaviors may have been inflated.

A second limitation of this study is that the PHDCN study was not designed to address our specific research questions. Thus, as noted above, we only had one measure of children's self-regulation. The delay of gratification task involves a reward, which may make it particularly sensitive to children's anger. It remains to be seen whether or how other aspects of self-regulation, such as inhibitory control and sustained attention, are associated with child anger. Future studies should attempt to replicate these findings with more robust measures of self-regulation and parenting. Moreover, although our sample was ethnically diverse, maternal ethnicity was confounded with poverty status and unevenly distributed across subgroups. Given that parenting practices are impacted by sociocultural context, it is possible that associations among maternal warmth, infant anger, and children's socioemotional development may vary by race/ethnicity (Hill et al. 2003). Additional studies with sufficient power to detect possible differences across ethnic subgroups are necessary to examine the universality of these associations.

Third, a thorough test of Belsky's differential susceptibility hypothesis would require that negative parenting behaviors also be tested for interactions with high anger. Although PHDCN included a measure of observed maternal hostility, the variability on this outcome was prohibitively limited given that the mothers in our sample were particularly low in hostility. Future studies should ideally include both positive and negative aspects of parenting and test for differential susceptibility to both of these factors with respect to anger and children's socioemotional development.

In sum, this study is part of a growing body of research that highlights the value of disaggregating negative emotionality into distinct emotions and considering anger, in particular, from an approach perspective. Although infant anger predicted higher levels of problem behaviors in childhood, the results also support anger as a condition of the association between maternal warmth over the first 2 years of life and children's delay of gratification at age 5. We know that parents play a pivotal role in children's

acquisition of self-regulatory skills throughout toddlerhood and preschool (Kopp 1982). Our findings indicate that supportive parenting techniques may be especially beneficial for children high in anger, as these children outperformed even low-anger children when raised in families high in maternal warmth. Thus, supportive parenting may be a critical ingredient for successful self-regulation among high-anger infants. Specifically, when parents learn how to respond to their infant's temperament in productive ways, the motivation behind anger can be harnessed for the good.

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