

The role of infant soothability in the relation between infant negativity and maternal sensitivity

Melissa M. Ghera^{a,*}, Amie Ashley Hane^a, Elizabeth E. Malesa^b, Nathan A. Fox^a

^a Department of Human Development, University of Maryland, 3304 Benjamin Building, College Park, MD 20742, USA

^b Department of Psychology & Human Development, Vanderbilt University, Peabody #512, 230 Appleton Place Nashville, TN 37203, USA

Received 25 March 2005; received in revised form 30 August 2005; accepted 26 September 2005

Abstract

Maternal perceptions of infant soothability moderated the relation between negative infant temperament and maternal sensitivity. Infant negative temperament and maternal sensitivity were significantly positively related when maternal perception of infant soothability was high and significantly negatively related when maternal perception of infant soothability was low.

© 2005 Elsevier Inc. All rights reserved.

Keywords: Temperament; Sensitivity; Soothability; Negativity; Infants

There is some evidence to suggest that infants manifesting high degrees of negative reactivity are more likely to experience a suboptimal relationship with their mothers (see Crockenberg, 1986 for review). Crockenberg and Acredolo (1983) found that maternal report of infant distress to limitations at 3 months was concurrently related to low degrees of maternal contact with her infant after controlling for earlier maternal contact. Mangelsdorf, Gunnar, Kestenbaum, Lang, and Andreas (1990) revealed that infant proneness to distress was contemporaneously related to lower levels of maternal warmth at 9 months. Additional evidence indicates that temperamental negativity in infancy (Van den boom & Hoeksma, 1994) and early childhood (Braungart-Rieker, Garwood, & Stifter, 1997) predict subsequent low levels of maternal sensitivity.

In contrast, there is other evidence to suggest that higher degrees of infant distress are associated with more sensitivity from the caregivers. Sroufe (1985) suggested that parents adapt to their child's changing needs, thereby giving attention to children who demand it. Crockenberg and Smith (1982) reported that neonates identified as irritable, as measured on the Newborn Behavior Assessment Scale (NBAS), received more visual, vocal and tactile stimulation from their parents during caretaking and non-caretaking situations at 3 months of age. Indeed, it has been demonstrated that the amount of distress in the infant cry is salient to young women, whether or not they are mothers (Gustafson & Harris, 1990) and that latency to respond to infant cries decreases as the perceived intensity of infant distress increases (Wood & Gustafson, 2001).

Such disparate findings in the temperament and parenting literature may be a function of unaccounted factors that moderate the relation between infant negativity and maternal sensitivity (Crockenberg, 1986). We contended that maternal perception of infant soothability may be one such key factor.

* Tel.: +1 301 405 8490/2834; fax: +1 301 405 2891.

E-mail address: mghera@umd.edu (M.M. Ghera).

Temperamentally negative infants are more difficult to calm than less distress-prone children (Crockenberg & Smith, 1982). Additionally, recent data show that not all methods of soothing are effective at calming extreme distress (Jahromi, Putnam, & Stifter, 2004). Building upon Bandura's efficacy theory (Bandura, 1977), Leerkes and Crockenberg (2002) suggested that mothers of temperamentally difficult infants who are successful at calming them may develop higher degrees of sensitivity than mothers who do not have difficult infants or mothers who have difficult infants but are unsuccessful at soothing. This may be due to the feelings of efficaciousness that flourish when one achieves success under challenging circumstances. Consistent with this notion, we anticipated that when mothers view their 9-month-old infants as soothable, the relation between infant-negative reactivity at 4 months and maternal sensitivity at 9 months is positive. This is in contrast to mothers of temperamentally negative infants who view their child as more difficult to soothe. Here, we hypothesize that the relation between infant negativity and later sensitivity will be negative.

Fifty-six mothers and their developmentally healthy infants (25 males, 31 females) participated in this study when their infants were 9 months old ($M = 9.50$ months, $S.D. = .266$). Participants were seen as part of a larger, longitudinal investigation that explores the role of temperament in the growth of social competence from ages 4 months to 5 years. Of the mothers, 66.7% were Caucasian, 21.7% African American, 8.3% Hispanic, 1.7% Asian, and 1.7% of mixed ethnicity. The mothers in this sample were well educated: 18.3% completed high school, 35.0% earned a college degree, 38.3% completed a graduate degree, and 8.3% attained a professional or trade certificate.

In order to obtain a sample of temperamentally extreme and randomly selected children, 849 four-month-olds underwent screening procedures to evaluate levels of positive, negative, and motor reactivity to novel auditory and visual stimuli (see Calkins, Fox, & Marshall, 1996; Fox, Henderson, Rubin, Calkins, & Schmidt, 2001). A negative reactivity score was obtained by averaging ratings of intensity of negative affect and intensity and duration of motor activity including arm and leg movements and back arching. Previous research has found direct relations between degree of negative reactivity in infancy and auditory sensitivity in infancy (Marshall & Hardin, 2005) and behavioral inhibition in toddlerhood and early childhood (Calkins et al., 1996; Fox et al., 1995). Negative reactivity has also been shown to act in concert with a pattern of right frontal EEG asymmetry in the prediction of social reticence in early childhood (Fox et al., 2001). And, when coupled with insensitive caregiving in infancy (Hane & Ghera, 2005), negative reactivity is associated with an avoidant pattern of responding to novelty later in infancy.

Of these screened infants, 245 were selected to participate in the 9-month portion of the project, a portion of whom served as random controls. Data presented here were derived from the subsample of random control infants who participated in the home visit. At 9 months of age, 56 randomly selected infants who previously participated in the 4-month laboratory visit returned to participate with their mothers in laboratory and home visits. Infants and their mothers were observed during a 1-h, video-taped home visit, which included episodes involving mother busy in kitchen, feeding, free play, and changing. The home visit was video-recorded and subsequently rated for the degree of global maternal sensitivity. Sensitivity was determined based on a modified version of Ainsworth's system for rating Maternal Care Behavior (Ainsworth, Bell, & Stayton, 1972) and consisted of nine, 9-point Likert-type scales, with scale points 1, 3, 5, 7 and 9 anchored in detailed behavioral descriptions. Discrete episodic sensitivity scores were averaged in order to obtain one robust composite of maternal sensitivity, such that a higher score indicates more sensitivity. All sensitivity data were coded by two independent raters who overlapped on 40 cases and achieved reliability coefficients (intraclass r s) ranging from .59 to .84 on the separate home visit episodes and an overall sensitivity reliability coefficient of .80.

Maternal perception of infant soothability was assessed at 9 months of age via the soothability subscale of the Infant Behavior Questionnaire (IBQ; Rothbart, 1981). The IBQ consists of 87 items that require mothers to assess the frequency of the occurrence of temperamentally relevant infant behaviors along a 7-point Likert-type scale across a number of temperamental dimensions. The soothability subscale consists of nine items, which capture the infant's reduction in distress as a result of caregiver soothing techniques (see Rothbart, 1981). Items on this scale include efficacy of rocking, walking, and singing to the infant. The ratings on the soothability items are averaged, such that a higher score indicates higher degrees of perceived soothability.

Prior to testing the hypotheses, zero-order correlations among negative reactivity, IBQ soothability, and maternal sensitivity were computed and no significant relations were found. Consistent with the recommendations of Aiken and West (1991), the predictors that entered into the regression equations were mean-centered. In order to examine the degree to which maternal report of infant soothability moderates relations between observed infant reactivity and observed maternal sensitivity, a hierarchical multiple regression was computed in which maternal sensitivity scores were regressed onto negative reactivity, IBQ soothability, and their product. No direct effects for soothability or negative

Table 1
Summary of hierarchical regression analyses for variables predicting maternal sensitivity ($N=56$)

Variable	<i>B</i>	S.E. <i>B</i>	β	ΔR^2
four-month negative reactivity	.13	.16	.11	
Maternal perceptions of infant soothability	−.08	.12	−.08	.03
Reactivity \times soothability	.60	.16	.47	.20**

** $p < .001$.

reactivity were found (see Table 1). A significant interaction effect between maternal report of soothability and infant reactivity in the laboratory on maternal sensitivity was found, $F(1, 51) = 13.59$, $p < .05$, incremental $r = .452$. In order to elucidate the nature of the interaction effect, a graphical depiction of the effect was obtained as suggested by Cohen and Cohen (1983), such that the predicted means for negative reactivity based on “high” (obtained by adding one S.D. to the mean) and “low” (obtained by subtracting one S.D. from the mean) for each predictor were computed (see Fig. 1). Post hoc regressions to examine the significance of the simple slopes depicted in Fig. 1 were computed (see Aiken & West, 1991) and indicated that the relation between the observed infant negative reactivity and maternal sensitivity was significant and positive for infants who were perceived to be highly soothable by their mothers: $\beta = .571$, $t(51) = 2.89$, and $p < .05$; and significant and negative for infants who were perceived by their mothers to be unsoothable: $\beta = -.358$, $t(51) = -2.29$, and $p < .05$.

The results support the hypothesis that maternal perceptions of infant soothability moderate the predictive relation between early degrees of infant negative reactivity and subsequent maternal sensitivity. As expected, the relation between negative reactivity and subsequent maternal sensitivity was significant and positive when mothers viewed their infants as more soothable and significant and negative when mothers perceived their infants as less soothable.

The challenges of soothing an irritable infant are paramount for the parents of temperamentally distress-prone infants. Irritable infants have been found to be harder to soothe than their non-irritable counterparts (Crockenberg & Smith, 1982). For some mothers, the increased time and effort spent comforting their infant may serve as a learning opportunity during which they have ample opportunity to practice and refine their regulatory strategies. The data presented here indicate that under such circumstances, infant negativity predicts elevated degrees of maternal sensitivity. Indeed, mothers of negatively reactive infants who viewed their infants as highly soothable engaged their infants with the highest degrees of sensitivity, lending support for Leerkes and Crockenberg’s (2002) contention that the successful soothing of an irritable infant leads to heightened feelings of maternal self-efficacy. For mothers of irritable infants who view them as difficult to soothe, intense and persistent infant negativity may lead to feelings of inefficaciousness (Bandura, 1977; Leerkes & Crockenberg, 2002), which may in turn yield a sense of learned helplessness that may serve to gradually extinguish their attempts to soothe.

Although maternal report of soothability may not be a function of infant temperament, this report has not demonstrated that it is a function of a maternal factor, such as self-efficacy either. However, previous research has shown that maternal self-efficacy is also positively associated directly with infant soothability, such that successful soothing promotes feelings of efficacy (Leerkes & Crockenberg, 2002). Additional evidence indicates that infant soothability is

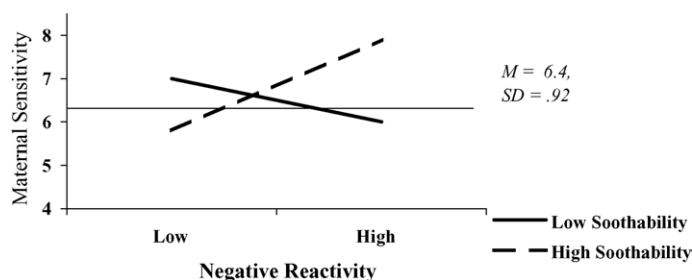


Fig. 1. The moderating role of infant soothability in the relation between negative reactivity and later maternal sensitivity.

a function of both mothers and infants. Crockenberg and Leerkes (2004) found that both infants and their mothers were involved in the reduction of infant distress during the first year such that, in addition to the efficacy of the individual infant or maternal behaviors in decreasing infant distress, the co-occurrence of infant and maternal behaviors further decreased infant distress. Specifically, contingent engagement of the mother with the infant while the infant was disengaging from the stimuli resulted in lower levels of infant distress than infant disengagement alone (Crockenberg & Leerkes, 2004).

Given the results reported herein suggesting that maternal perceptions of infant soothability influence degree of maternal sensitivity for mothers of temperamentally negative infants, future work which elucidates the nature of maternal perceptions of infant soothability are requisite before clear conclusions regarding the role of soothability in the relations between infant temperamental reactivity and maternal sensitivity can be drawn. Indeed, such a field of inquiry may mark an important contribution to the study of relations between infant temperament and caregiver behavior.

The finding reported here suggests that mothers of negatively reactive infants who do not perceive their infants as readily soothable may be at-risk for developing insensitive parenting techniques. Importantly, the interaction effect indicates that parents of distress-prone infants are at-risk for insensitive parenting, but that such risk may be attenuated substantially by intervention efforts that serve to promote the development of effective soothing techniques.

Acknowledgements

We would like to thank S. Barton, S. Bong, and L. Driscoll for their assistance in data collection. We are deeply indebted to the families who have participated and continue to participate in this research. A complete version of this document may be provided upon request. This research was partially supported by a grant from the National Institute of Health (HD# #17899) to Nathan A. Fox.

References

- Aiken, L., & West, S. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage.
- Ainsworth, M. D., Bell, S. M., & Stayton, D. J. (1972). Individual differences in the development of some attachment behaviors. *Merrill-Palmer Quarterly*, *18*, 123–143.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavior change. *Psychological Review*, *84*, 191–215.
- Braungart-Rieker, J., Garwood, M. M., & Stifter, C. A. (1997). Compliance and noncompliance: The roles of maternal control and child temperament. *Journal of Applied Developmental Psychology*, *18*, 411–428.
- Calkins, S. D., Fox, N. A., & Marshall, T. R. (1996). Behavioral and physiological antecedents of inhibition in infancy. *Child Development*, *67*, 523–540.
- Cohen, J., & Cohen, P. (1983). *Applied multiple regression*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Crockenberg, S. (1986). Are temperamental differences in babies associated with predictable differences in care-giving? In J. V. Lerner & R. M. Lerner (Eds.), *Temperament and social interaction in infants and children. New directions for child development* (Vol. 31, pp. 53–73). San Francisco, CA: Josey-Bass.
- Crockenberg, S., & Acredolo, C. (1983). Infant temperament ratings: A function of infants, of mothers, or both? *Infant Behavior and Development*, *65*, 61–72.
- Crockenberg, S. C., & Leerkes, E. M. (2004). Infant and maternal behaviors regulate infant reactivity to novelty at 6 months. *Developmental Psychology*, *40*, 1123–1132.
- Crockenberg, S. C., & Smith, P. (1982). Antecedents of mother–infant interaction and infant irritability in the first three months of life. *Infant Behavior and Development*, *5*, 105–119.
- Fox, N. A., Henderson, H. A., Rubin, K. H., Calkins, S. D., & Schmidt, L. A. (2001). Continuity and discontinuity of behavioral inhibition and exuberance: Psychophysiological and behavioral influences across the first four years of life. *Child Development*, *72*, 1–21.
- Fox, N. A., Rubin, K. H., Calkins, S. D., Marshall, T. R., Coplan, R. J., Porges, S. W., et al. (1995). Frontal activation asymmetry and social competence at four years of age. *Child Development*, *66*, 1770–1784.
- Gustafson, G. E., & Harris, K. L. (1990). Women's responses to young infants' cries. *Developmental Psychology*, *26*, 144–152.
- Hane, A. A., & Ghera, M. M. (2005, April). *The role of mother–infant interaction in early emotional development: The case for interactive context*. Paper presented at the meeting of the Society for Research in Child Development. Atlanta, GA.
- Jahromi, L. B., Putnam, S. P., & Stifter, C. A. (2004). Maternal regulation of infant reactivity from 2 to 6 months. *Developmental Psychology*, *40*, 477–487.
- Leerkes, E. M., & Crockenberg, S. C. (2002). The development of maternal self-efficacy and its impact on maternal behavior. *Infancy*, *3*, 227–247.
- Mangelsdorf, S., Gunnar, M., Kestenbaum, R., Lang, S., & Andreas, D. (1990). Infant proneness-to-distress temperament, maternal personality, and mother–infant attachment: Associations and goodness of fit. *Child Development*, *61*, 820–831.

- Marshall, P.J., & Hardin, M.G. (2005). *Event-related potentials to auditory novelty at 9 months of age in relation to infant temperament*. Paper presented at the meeting of the Society for Research in Child Development. Atlanta, GA.
- Rothbart, M. K. (1981). Measurement of temperament in infancy. *Child Development*, *52*, 569–578.
- Sroufe, L. A. (1985). Attachment classification from the perspective of infant-caregiver relationships and infant temperament. *Child Development*, *56*, 1–14.
- Van den boom, D. C., & Hoeksma, J. B. (1994). The effect of infant irritability on mother-infant interaction: A growth–curve interaction. *Developmental Psychology*, *30*, 581–599.
- Wood, R. M., & Gustafson, G. E. (2001). Infant crying and adults' anticipated caregiving responses: Acoustic and contextual influences. *Child Development*, *72*, 1287–1300.