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Recent work on the emotional and social interactive components of attachment system functioning (e.g., Bridges, Connell, & Belsky, 1988; Connell & Thompson, 1986; Thompson & Connell, 1985) and theoretical discussions of self-regulatory capacities in infancy (Connell, in press; Kopp, 1982; Thompson, in press) have highlighted the importance of the infant’s ability to cope with emotional arousal under conditions of stress (such as separation). In two previous studies using a component process approach to analyze attachment system functioning, Bridges et al. (1988) and Connell and Thompson (1986) have noted that emotional reactions account for considerable variability in social interactive behavior in the Strange Situation, and may assist in its regulation. The importance of emotional arousal is indicated in several ways. First, individual differences in emotional arousal (specifically, distress) are more consistent across Strange Situation episodes than are differences in social interactive behavior. Second, differences in emotionality are more consistent across the two parents than are differences in interactive behavior. Third, emotion has a strong influence on subsequent social interaction: Within the Strange Situation, emotional responses to separation are significantly predictive of social interactive behavior with mother during reunion (although interactive behavior does not comparably predict subsequent emotionality). Fourth, this influence holds across time, such that stability of emotional responsiveness across several months is predictive of concurrent stability of social interactive behavior.

Previous studies have not yet addressed, however, the source of these individual differences in emotional responsiveness. These differences may derive from several sources, including (a) temperamental variation, (b) affective styles acquired from caregiving experiences over time, (c) reactions to the immediate behavior of social partners, and (d) random mood fluctuations. This study was designed to distinguish and examine the contri-

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butions of temperamentally and nontemperamentally based emotional behavior to the organization of attachment system functioning within the Strange Situation.

The role of temperament in attachment system functioning has received much attention recently, but there is little consensus on its significance. This may be due, in part, to how temperamental influences have typically been studied. In reviewing this literature, Lamb, Thompson, Gardner, and Charnov (1985) noted that whereas research findings do not support a view of strong temperamental effects, nearly all studies have focused only on the most direct effects of temperament. That is, most researchers have simply correlated temperament ratings with attachment classifications. Lamb and colleagues argued that more definitive conclusions will be realized from studies in which the indirect influences of temperament (that are hypothesized by most theorists in this area) are examined. For example, some have suggested that temperament may affect attachment behavior indirectly through its effects on the infant's separation distress (Chess & Thomas, 1982; Connell & Goldsmith, 1982; Kagan, 1982). Indirect models of temperamental effects have not been tested, however, and thus we have an incomplete portrayal of how temperament influences attachment within the Strange Situation (see also Sroufe, 1985).

Connell and Goldsmith (1982) and Lamb et al. (1985) noted that researchers interested in testing these more elaborate models of temperamental influence may have to use alternative approaches to assessing attachment system functioning in the Strange Situation. Reliance on Ainsworth's tripartite classification system (A, B, C) may be a liability in this case because the classifications are so inclusive, encompassing variability on many behavioral dimensions; hence links between temperamental attributes and attachment may be masked by the behavioral heterogeneity within each classification. Recent work by Belsky and Rovine (1987) has provided evidence for such intraclassification variability in temperament. Moreover, it is likely that temperamental effects on attachment will cut across the secure-insecure distinction (e.g., distress proneness may heighten proximity-seeking in insecurely as well as securely attached infants).

The first goal of this study was to examine the role of maternally reported temperament (specifically, infant fearfulness) in attachment with these considerations in mind. We focused on fear because this dimension of temperament is implicated most frequently in theoretical accounts of links between temperament and attachment owing to the novelty of the setting, the presence of a stranger, and the unusual sequence of events in the Strange Situation. Instead of Ainsworth's classification scheme, we used a component process analytic strategy (Connell, 1985; Connell & Thompson, 1986) to explore linkages between temperament and the infant's social interactive behavior (such as proximity-seeking, contact maintenance, etc.) during reunions. We examined both the direct effects of temperament on interactive behavior and also indirect effects through the intensity of emotional distress during the preceding separation (indexed via independent measures of facial and vocal expressions). Our analyses of these components of infant behavior in the Strange Situation (i.e., social interactive behavior, emotional distress reactions, and temperament) were designed to elucidate both the direct and indirect influences of temperament on the child's mother-directed interactive behavior and thus to better understand the influence of temperament on crucial dimensions of social behavior reflecting attachment system functioning.

Two approaches to understanding the role of temperament were used. First, temperament was correlated with episode-by-episode measures of social interaction and of emotional distress to examine the relative strength of its direct effects on each. Second, path-analytic techniques were used to examine alternative models of temperamental influences on social interactive behavior during reunions with mother. The direct effects of temperamental fear on interactive behavior were compared with the effects of temperament as mediated by the intensity of the child's distress during the preceding separation episode.

The second goal of this study was to examine the significance of nontemperamental contributors to emotional influences on Strange Situation behavior. Given that temperament is most frequently cited as the source of individual differences in emotional reactions within this procedure, it is important to understand whether the emotional variability that remains when temperamental variance is removed has a significant influ-

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1 An exception is Crockenberg (1981), who has shown the interactive influences of temperament and social support on attachment classification.
ence on attachment system functioning. If so, it may indicate that our models of emotional influences on attachment within the Strange Situation must be broadened to encompass nontemperamental sources, such as mood fluctuations, specific emotional reactions to the behavior of adult partners, or the infant’s emergent emotional self-regulatory capacities. Furthermore, examining the nature of these nontemperamental influences may help us frame useful hypotheses concerning their source. Accordingly, in this study, new measures of “context-specific distress” were created by removing temperamental variance from episode-by-episode measures of emotional distress.

We then examined the characteristics of “context-specific distress” in two ways. First, we tested whether these context-specific distress scores remained as consistent across Strange Situation episodes as did the original distress scores (which included temperamental variance). If temperament is the basis for the consistency of the child’s emotional behavior within this procedure, they should not. Second, we examined the path-analytic models described above to determine whether these distress scores (residualized for temperament) could still predict the child’s later social interactive behavior in the Strange Situation (as noted earlier, the original distress scores were significantly predictive). If temperament is the basis for the links between distress and subsequent social interactive behavior, context-specific distress scores should be unpredictive of subsequent sociability. Findings from these analyses would thus help us describe the nature of context-specific emotional influences on Strange Situation behavior and begin to identify its sources (e.g., if they are due to mood fluctuations, they should be neither consistent nor predictive of later social behavior).

Finally, because Strange Situation assessments were repeated at 12½ and 19½ months, we could explore developmental changes in the role of temperament and nontemperamental contributors to attachment system functioning. In addition to replicating the analyses outlined above at each age, we also examined links between stability in the child’s distress reactions across the two assessments and concurrent stability in social interactive behavior in the Strange Situation. As noted earlier, we had previously found that infants who were stable in their distress reactions at each age were also significantly stable in their interactive behavior (Connell & Thompson, 1986). Given that temperament is commonly thought to be the locus of consistent individual differences in socioemotional behavior over time, we examined whether this remained true when temperamental variance was removed from distress scores at each age to create new measures of context-specific distress. If temperament is the basis for this consistency, then stability over time in these context-specific distress scores should no longer predict concurrent stability in social interactive behavior across the two assessments.

To summarize, using a component process analytical approach rather than the conventional classification system for characterizing attachment system functioning, we hoped to elucidate the various kinds of emotional influences on infants’ interactive behavior with their mothers. In so doing, we were not only studying indirect as well as direct temperamental influences on social interactive behavior but also examining the significance of influences of context-specific distress that is nontemperamental in origin.

Method

Subjects and Procedure

Forty-three infants (21 males) and their mothers from middle-class families participated in the standard Strange Situation procedure when the infants were 12½ and 19½ months old (± 2 weeks at each age) (see Ainsworth, Blehar, Waters, & Wall, 1978, for further details concerning the Strange Situation). Observations were videotaped for later analysis.

Measures

Social interactive measures.—For each episode (except the brief initial episode), the baby’s interactive behavior directed to mother or the stranger was rated on five 7-point scales, using Ainsworth’s behavioral criteria (see Ainsworth et al., 1978). They concerned the baby’s (a) proximity-seeking, (b) contact-maintaining, (c) resistance, (d) avoidance, and (e) distance interaction. Consistent rating criteria were used at each age, and ratings of 19½-month observations were conducted without knowledge of 12½-month ratings or of the emotion ratings at either age. Pairs of highly trained research assistants working independently obtained a mean reliability of \( r = .95 \) (range = .90–.98) on interactive ratings for all the 12½-month observations and \( r = .93 \) (range = .89–.95) for all the 19½-month sessions.

To summarize these individual measures, ratings for the five scales were
weighted and summed for each episode based on the results of a mega-analysis of five American Strange Situation data sets involving both exploratory and confirmatory factor analyses previously reported by Connell (1985). (Although the results of the mega-analysis were used because they permit greater confidence in the factor structure derived from a large aggregated population, independent analyses of the present sample alone yielded the same composites [see Connell & Thompson, 1986, for further details].) Measures for the two separation and two reunion episodes at each age were summarized in this manner; episodes 2 and 3 of the Strange Situation (i.e., mother and baby alone, and mother and baby with stranger) were not analyzed because of insufficient variability in the measures, and the baby-alone separation episode (episode 6) was eliminated because no social partners were present. This procedure yielded two dimensions of social interactive behavior for each of the four episodes under study. The social interactive dimensions for behavior directed to the stranger during each separation (episodes 4 and 7) were Proximity/Contact with Stranger (positive on proximity-seeking and contact-maintaining) and Un sociability with Stranger (positive on avoidance and resistance, negative on distance interaction). The social interactive dimensions for mother-directed behavior during each reunion (episodes 5 and 8) were Proximity/Contact versus Avoidance with Mother (positive on proximity-seeking and contact-maintaining, negative on avoidance) and Resistance versus Distance toward Mother (positive on resistance, negative on distance interaction; at 12½ months, this dimension was also positive on contact-maintenance) (see Connell & Thompson, 1986, for further details).

Distress measures.—Continuous timesampled ratings of the infant's vocalizations (based on pitch, loudness, rhythmicity, etc.) and facial expressions were made for each Strange Situation episode (the measures are described in detail in Thompson & Lamb, 1984). Distress ratings were made independently for assessments at each age and without knowledge of the social interactive measures; rating criteria were consistent across age. The videotapes of eight subjects at each age were rescoped by an independent rater to assess reliability. Exact agreement for vocalization and facial expression ratings was 92% and 91%, respectively, at 12½ months, and 88% and 92% at 19½ months. Following procedures developed by Thompson and Lamb (1984), five summary measures of emotional distress were independently derived from vocalization and facial expression ratings. These consisted of episode-by-episode measures of peak distress intensity and minimum distress intensity, latency to distress onset for the first separation (episode 4), and measures of both initial and sustained emotional recovery for episodes 5, 7, and 8.

Exploratory and confirmatory factor analyses were performed on the correlations among the distress measures for the separation and reunion episodes (4, 5, 7, and 8), yielding a single negative to positive dimension of Distress for each of these episodes for each age. For episodes 5, 7, and 8, this dimension was positive on vocal intensity and minimum distress measures and on both facial and vocal recovery measures; for episode 4, it was positive on vocal intensity and minimum distress measures and negative on the facial expression latency score (see Connell & Thompson, 1986, for further details). High scores on this dimension thus reflected relatively greater distress intensity than lower scores.

Temperament Inventory
Following each Strange Situation assessment, the Infant Behavior Questionnaire (IBQ; Rothbart, 1981) was completed by mothers and returned by mail. The IBQ elicits behaviorally based and situationally specific appraisals of the infant's behavior over delimited periods (e.g., during the previous week) and is thus less prone to maternal response bias than other temperament measures. Scoring the 92-item questionnaire involves computing mean values for each subscale (see Rothbart, 1981, for further details concerning the questionnaire and its psychometric properties). As indicated earlier, the Fear subscale was selected for special analysis in this study.

Results
Correlations of Temperament, Distress, and Social Interactive Behavior
The significant correlations of the IBQ Fear dimension at each age with the social interactive and distress dimensions for Strange Situation assessments at the same age are shown in Table 1. As expected, Fear showed predominantly moderate but significant relations with the Distress dimension at each age and most consistently during separation episodes. Fear also correlated to a comparable degree with each of the mother-directed interactive dimensions during reunions at each age, with the exception of the Resistance versus Distance dimension in the
second reunion at 12½ months. It did not correlate significantly with either of the stranger-directed social interactive dimensions at 12½ months, and it correlated only with the Unsociability with Stranger dimension at 19½ months. Thus the fear measure maintained the same pattern of correlations with both the distress measures and the dimensions of social interactive behavior at each age and showed additional significant relations to infant-stranger interactive measures at 19½ months.

Path Analyses of Temperamental Influence on Social Interactive Behavior

Our next step was to compare two models of temperamental effects on social interactive behavior in the Strange Situation. One model, the direct effects model, predicts links between temperament and interactive behavior unmediated by the infant’s prior emotional behavior. The other model, the indirect effects model, focuses on the effects of temperament on the intensity of separation distress which then influences mother-directed interaction. A series of multiple regression analyses was performed in which both temperamental fear scores and separation-episode distress scores were used to predict each of the two reunion-episode mother-directed social interactive dimensions. The resulting path models are presented in Figure 1, with standardized regression coefficients representing the unique contribution of each predictor variable.

The path models are quite similar across the two separation episodes and for each age. They indicate that each of the separation-episode distress dimensions had a moderate to strong direct influence on subsequent mother-directed interactive dimensions (B’s range from .34 to .74, all p < .05). Temperament had a much weaker direct influence on the interactive dimensions (B’s range from .03 to .25, all p’s N.S.). As reported in Table 1 and Figure 1, significant and moderate direct associations exist between temperament scores and the distress dimensions (r’s range from .30 to .42, all p < .05). Taken together, these findings indicate that temperamental influences on the social interactive dimensions were also mediated by their effects on the intensity of separation distress. This was true across both separation episodes at each age.2

It is noteworthy that the path analyses presented in Figure 1 indicate that the distress dimensions had a strong, direct influence on subsequent social interactive behavior which was independent of temperament. We now turn to other findings relating to the effects of context-specific (i.e., non-temperamentally based) distress on Strange Situation behavior.

Context-Specific Distress: Consistency within the Strange Situation and Effects on Socioemotional Stability over Time

The next set of analyses pertains to the characteristics of context-specific distress and...
the nature of its influence within the Strange Situation. Accordingly, the original distress dimensions for each episode were residualized for the same-age IBQ Fear score, creating a new set of distress dimensions with temperamental variance removed (i.e., context-specific distress). To determine whether context-specific distress reflected merely random variation in infant mood, we then compared the consistency of these residualized scores to the original, unresidualized distress scores across Strange Situation episodes. Simple variations in infant mood should not remain consistent across the Strange Situation, given the emotional stressors the infant experiences. Next, we examined the relations between context-specific distress and the infant’s social interactive behavior within the Strange Situation. The path analyses reported above indicated that context-specific distress dimensions retained a significant ability to predict later interactive behavior independently of temperament. In this analysis, therefore, we tested whether the stability of interactive behavior over time (i.e., 12½–19½ months) could be predicted by concurrent stability in residualized distress scores. If so, such context-specific distress may tap stable rather than random aspects of infant emotionality which have a significant influence on interactive behavior.
Cross-episode consistency of distress dimensions.—The intercorrelations among the original, unresidualized distress scores for episodes 4, 5, 7, and 8 were high at 12½ months (mean r = .77, p < .0001; range = .70–.81) and 19½ months (mean r = .64, p < .0001; range = .56–.73), although somewhat lower at the older age. Intercorrelations among residualized distress scores were similarly high at each age (12½ months: mean r = .75, p < .0001, range = .68–.80; 19½ months: mean r = .60, p < .0001, range = .50–.69), indicating that the consistency of context-specific distress was not substantially weaker than distress measures that included temperamental variance.

Effects on the stability of social interactive behavior from 12½ to 19½ months.—We noted earlier that infants who were stable in their distress reactions in Strange Situation assessments at each age were also found to be significantly stable in their interactive behavior (Connell & Thompson, 1986). Of course, temperamental attributes are commonly thought to remain relatively stable over time, and in this sample the IBQ Fear dimension correlated .65 (p < .0001) from 12½ to 19½ months. We now examined whether stability in context-specific distress dimensions, residualized for temperamental fear, would also predict stability in interactive behavior over this 7-month period. If temperament is the basis for the child’s socioemotional stability in this procedure, they should not.

To address this issue, the scores on the original distress dimensions were residualized as described above for temperamental fear. A mean distress score for each age was calculated from scores for the four episodes we studied. There were 21 infants whose mean score remained consistently either above or below the group median at each age, and these constituted the “stable distress group.” A canonical correlation was then calculated for this group between summary scores for the four social interactive dimensions at 12½ months and the four summary scores for these dimensions at 19½ months, which were calculated by summing individual scores for each of the four dimensions across the relevant episodes. The resulting squared canonical correlation was .77 (p < .01). (For comparative purposes, when unre-

sidualized emotion dimensions were used in the same analysis, the squared canonical correlation was .89 [p < .005].) Thus consistency over time in measures of context-specific emotionality strongly and significantly predicted concurrent stability in the child’s social interactive behavior. Although the removal of temperamental variance from distress scores at each age reduced somewhat their predictive power, there was still strong prediction remaining across this 7-month period.3

Discussion

The results of this study support earlier assertions that emotional reactions, particularly those related to distress, play a central role in attachment system functioning in the Strange Situation. The findings also indicate that temperamental fear influences the child’s social interactive behavior both directly and indirectly through the intensity of separation distress. Finally, the results reveal that non-temperamental sources of variability in distress also assume a significant role in shaping and maintaining the infant’s mother-directed interactive behavior.

Contrary to the portrayal of negligible temperamental influences offered by studies that rely exclusively on the A-B-C classification system, the component process approach used in this study revealed that temperamental fear correlated moderately with both emotional and social interactive behavior in the Strange Situation. Scores on the IBQ Fear dimension were associated with the intensity of distress, as expected, and were also comparably associated with the quality of the infant’s mother-directed social interactive behavior during reunions at each age. Infants rated as temperamentally more fearful showed more intense distress and also displayed greater proximity/contact-seeking and more resistance toward the mother when compared with infants rated lower on fear.

How did temperament have these influences? Path-analytic models were constructed that tested both for direct influences of temperamental fear on interactive behavior and indirect effects of temperament through separation distress on the same interactive behavior. Only the linkages in the indirect models were statistically significant. These

3 Whether residualized or unresidualized distress scores were used, infants who were selected because they were stable in their social interactive behavior at each age did not generally show significant stability in their distress reactions over time. Thus stability in distress behavior predicted stability in interactive behavior, but not the reverse, over this 7-month period.
findings were consistent at each age and across the two separation episodes. The direct influence of IBQ fear on separation distress was strong and significant; in contrast, the direct effects of fear on social interactive behavior were much weaker. The reason is that temperamental fear also appeared to influence interactive behavior indirectly as it was mediated by distress reactions. Thus, as some students of temperament-attachment interrelations have hypothesized, temperament does play a role in Strange Situation behavior through its effects on the quality and intensity of the infant’s separation distress. Infants who are high on fearfulness are likely to react more negatively to the separation episodes and consequently exhibit heightened proximity/contact-seeking and resistance during reunions with the mother. It is noteworthy that, in these findings, fear is related to both functional (i.e., contact-seeking) and dysfunctional (i.e., resistance) forms of mother-directed behavior, cutting across the security-insecurity delineation, and reflecting the diverse motivational consequences of this emotional quality in infancy.

There was considerable consistency in these temperamental influences in assessments at 12½ and 19½ months. There were, however, some differences with age in the correlations. First, scores for temperamental fear correlated with one of the stranger-directed interactive dimensions—Unsociability with Stranger—at 19½ months but not at 12½ months. It is worth noting that resistant behavior loaded heavily on this interactive dimension. Second, scores for temperamental fear correlated with the Resistance versus Distance toward Mother dimension at 19½ months but not at 12½ months. Taken together, these findings suggest that temperamentally based fear may become more integrated into the child’s resistant behavior with increasing age in ways that influence both stranger-directed and mother-directed sociability. However, despite these variations with age, the overall picture of great consistency in the nature of temperamental influences on emotion and social interactive behavior remains the same.

A second purpose of this study was to explore the importance of nontemperamental sources of emotional variability that might also influence the child’s social interactive behavior in the Strange Situation. We found that even with variance due to temperamental fear removed, measures of context-specific distress still showed (a) significant consistency across Strange Situation episodes, (b) significant predictive links to later dimensions of social interactive behavior within the Strange Situation, and (c) a capacity to significantly predict the stability of interactive behavior between assessments made at 12½ and 19½ months.

These findings are inconsistent with the view that our measures of context-specific distress simply tapped random mood fluctuations in infants. Instead, we suggest that the findings may derive from at least two sources. First, infants may be reacting emotionally to the parent’s behavior within the Strange Situation, such as through social referencing (see Dickstein, Thompson, Estes, Malkin, & Lamb, 1984) and other kinds of secure base behavior. Insofar as the child is responding to consistent cues from the adult, this may affect both the child’s emotional reactions and social interactive behavior within this procedure (and perhaps also across time). Second, infants may be exhibiting variations in an acquired capacity to use rudimentary self-regulatory strategies that help them to cope with emotional distress, such as during separations or encounters with strangers. This emergent coping capacity may also affect their interactive behavior with the caregiver both within the Strange Situation and over time. Although we think the latter explanation is somewhat better suited to these data than the former, both may be involved, and our current findings do not provide a basis for rejecting either account.

With regard to the latter account, further inquiry is needed into the origins of these emotional self-regulatory capacities in these and other contexts and the predictive centrality of what we believe to be relationally based, but emotionally expressed, rudiments of childhood personality (see Kobak, 1987, for a provocative account of the emergence of these affective regulatory capacities in relation to the security of attachment).

Our use of a component process analytic strategy (Connell, 1985; Connell & Thompson, 1986) has helped to identify more precisely how an important dimension of temperamental variability—that is, fear—affects both emotional and social interactive behavior within the Strange Situation. In addition, the results of this study clearly indicate that nontemperamental, “context-specific” emotional influences merit greater examination both as an important part of the emotional underpinnings of attachment system functioning and as a theoretical construct in its own right.
References


