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Maternal Emotional Availability at Bedtime Predicts Infant Sleep Quality

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In the present study, linkages were examined between parental behaviors (maternal practices) at bedtime, emotional availability of mothering at bedtime, and infant sleep quality in a cross-sectional sample of families with infants between 1 and 24 months of age. Observations of maternal behaviors and maternal emotional availability were conducted independently by 2 sets of trained observers who were blind to data being coded by the other. With infant age statistically controlled, specific maternal behaviors at bedtime were unrelated to infant sleep disruptions at bedtime and during the night. By contrast, emotional availability of mothering at bedtime was significantly and inversely related to infant sleep disruption, and, although these links were stronger for younger infants, they were significant for older infants as well. Maternal emotional availability was also inversely linked with mothers' ratings of whether their infants had sleep difficulties. These findings demonstrate that parents' emotional availability at bedtimes may be as important, if not more important, than bedtime practices in predicting infant sleep quality. Results support the theoretical premise that parents' emotional availability to children in sleep contexts promotes feelings of safety and security and, as a result, better-regulated child sleep.

Keywords: emotional availability, infants, sleep quality

Sleep disturbances can appear as early as the first year of life and can place families in turmoil (Mindell, Kuhn, Lewin, Meltzer, & Sadeh, 2006). Chronic sleep disruption in childhood is linked with daytime externalizing and internalizing behavioral problems, sleepiness and attention problems, and poor academic performance (El Sheikh, Buckhalt, Keller, Cummings, & Acebo, 2007; O'Brien & Gozal, 2004; Sadeh, Gruber, & Raviv, 2002), and plays a critical role in the regulation of neurocognitive and neuroaffective systems in children and adults (O'Brien & Gozal, 2004). Thus, when children's sleep disruptions create parent sleep disruptions, both parents and children are at risk.

The etiology of sleep disturbance in infancy is poorly understood. Some have attributed infant sleep problems to factors intrinsic to the infant (e.g., temperamental difficulty) (Sadeh, Lavie, & Scher, 1994) or to the role of parental cognitions about infant sleep disruption in organizing parent behavior (e.g., parent attempts to soothe the infant, from parent report) and, in turn, infant sleep problems (Tikotzky & Sadeh, 2009). Other work highlights the utility of consistent, positive bedtime routines in promoting infant sleep quality (Mindell, Telofski, Wiegand, & Kurtz, 2009). Very few studies have focused on actual observations of parenting in the home in relation to infant sleep disruption. Among those studies that have, the focus was on practices parents used to put infants to sleep (i.e., what parents do), but not on the emotional quality of these behaviors. These studies reported that infants who experience prolonged physical contact with parents when settling to sleep (e.g., in the context of being nursed or rocked to sleep, or when infants and parents cosleep) exhibit more frequent and prolonged bouts of night waking than infants of parents who refrain from such practices (Burnham, Goodlin-Jones, Gaylor, & Anders, 2002; Mao, Burnham, Goodlin-Jones, Gaylor, & Anders, 2004).

The present study also conducts real-time observations of parenting in the home but examines not only what mothers do at bedtime (actual bedtime practices) but also how mothers do it (emotional availability; EA), in predicting nonclinical sleep disruptions among infants between 1 and 24 months of age. To date, no data exist addressing linkages between observations of parental bedtime EA and infant sleep patterns. In a study of sleep patterns of 12-month-olds, Scher (2001) assessed mothers' EA during a daytime observation of mother–infant free play and found no association between EA and infant sleep regulation. EA in sleep contexts, however, was not assessed. The lack of informa-

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tion on emotional aspects of parenting at bedtime and infant sleep quality is noteworthy, in light of the vast literature linking qualitative aspects of parenting (e.g., sensitivity, warmth, intrusiveness) with socioemotional and cognitive outcomes in children (Teti & Huang, 2005). Biringen et al. (2005) conceptualized EA as dyadic, in that parental EA dimensions such as sensitivity, intrusiveness, and so forth took into consideration children's emotional responses to parent behavior during ongoing interactions with parents.

Attending to emotional aspects of bedtime parenting can be defended on theoretical grounds. Dahl and El-Sheikh (2007) proposed that achieving a state of deep sleep requires one to relinquish consciousness and vigilance, and thus depended on the degree to which one felt safe in one's sleeping environment. Feeling safe under any circumstances depended on a belief that one's environment is reasonably predictable, controllable, and free of potential threats. Trusting in one's environment has been identified repeatedly by developmental theorists as a core achievement that is foundational for later psychosocial achievements (e.g., Erikson, 1980).

To our knowledge, the present study is the first to assess the emotional quality of parenting from direct observations of parenting during infant bedtimes and to determine its link, along with parenting practices, with infant sleep quality. Such a study, we believe, is overdue, in light of the long-standing associations between emotional aspects of parenting and early development (Teti & Huang, 2005). The following hypotheses are proposed:

Hypothesis 1: With infant age statistically controlled, infants' ability to settle to sleep at bedtime, and infant nighttime sleep, will be less disrupted when mothers refrain from close contact with the infant during bedtimes and from nursing their infants to sleep. These expectations are based on similar linkages established in earlier observational studies of parenting practices in child sleep contexts (Burnham et al., 2002; Mao et al., 2004).

Hypothesis 2: Infants will settle to sleep more easily and their nighttime sleep will be less disrupted when mothers are emotionally available to their infants at bedtime than when they are not. This prediction was based on the proposition that emotionally available parenting will promote feelings of safety and security in infants. The ability to feel safe in one's sleep environment is prerequisite to the ability to relinquish consciousness and vigilance and, in turn, achieve deep sleep (Dahl & El-Sheikh, 2007).

Hypothesis 3: Mothers' EA will be associated with mothers' self-reported adaptation to their infants' sleep behavior. We base this hypothesis on empirical findings demonstrating inverse associations between maternal EA during mother–infant play and broader indexes of maladaptation, such as depressive symptoms (Trapolini, Ungerer, & McMahon, 2008) and previous histories of abuse (Moehler, Biringen, & Poustka, 2007). No previous data exist that directly inform expectations about how parenting practices will relate to maternal adaptation to infant sleep. We will examine these associations, but hypotheses regarding them are withheld.

Method

Participants

There were 45 families with infants 24 months and under (23 girls) who served as participants. Fathers were also recruited into the larger study but only seven interacted with their infants long enough (at least 2 to 3 min) to enable coding of bedtime practices and EA. Thus, the present study focused on maternal bedtime behavior only. Video data could not be obtained on six families due to technical difficulties. In addition, EA could not be coded for an additional four families because there was little or no mother–infant interaction (less than 1 min). This left 39 families for whom bedtime practices were coded, and 35 families for whom EA could be scored.

Five "cohorts" of families were recruited: families with 1-month-olds, 3-month-olds, 6-month-olds, 12-month-olds, and 24-month-olds. Table 1 presents the means, ranges, and standard deviations of infant age in each cohort, and the number of female infants in each cohort. Twenty infants were firstborns, and 25 later borns. Birth order was unrelated to cohort and to infant gender. Mothers were 91% White, 7% Asian American (three mothers), and 2% African American (one mother). Mothers ranged in age from 22 to 42 years ($M = 30.5$, $SD = 4.9$). Mothers were recruited from a local hospital (the 1- and 3-month infant age cohorts), and from local advertisements (the 6-, 12-, and 24-month cohorts). Seventy-three percent of mothers had

Table 1
Means, Ranges, and Standard Deviations of Infant Age in Each Cohort

Cohort[a]	*n*	*M*	Range	*SD*	No. of girls
1	9	5.0 weeks	4.0–6.0 weeks	1.0 weeks	5
3	8	2.9 months	2.5–3.0 months	0.19 months	3
6	8	6.2 months	5.0–7.0 months	0.65 months	4
12	12	12.25 months	10.0–14.0 months	1.06 months	7
24	8	25.31 months	24.0–27.0 months	1.10 months	4

Note. Cohort 1 consisted of 1-month-olds; however, the statistics are given in weeks.
[a] Given in months.

completed some postsecondary education, and 93% were married. Annual family income ranged widely from $11,000 to $200,000 ($M$ = $61,323, SD = $36,151). Family income and parental education did not vary by cohort. Twenty-four mothers were employed outside the home, with 13 employed full-time (36 or more hours/week) and 11 employed part-time. Mothers' age, education, family income, and employment status were not associated with any measure of infant sleep quality. In addition, mothers' reports, from the Sleep Practices Questionnaire (SPQ; Goldberg & Keller, 2007), of father involvement with infants at bedtime (frequency of feeding, rocking, and walking the infant) and during the night (frequency of feeding, rocking, giving a pacifier/toy, and checking on the infant) were uncorrelated with infant sleep measures, with one exception. The exception, among the 28 correlation analyses conducted, was that the frequency of fathers walking with the infant at bedtime was correlated with the number of times mothers had to return to their infants at bedtime, $r(37) = .38$, $p = .02$. Only three families reported that they were currently using a sleep training method (from the SPQ), which precluded conducting meaningful comparisons with families who were not engaged in sleep training.

Thirteen infants shared a room with their parents at night. These infants were significantly younger (M = 5.12 months) than infants who slept in separate rooms (M = 11.40 months), $F(1, 43) = 5.53$, $p = .02$. Of the 13 infants who room shared, five slept in the same bed as their parents for at least part of the night. No information was available to determine whether these five parents proactively chose to sleep with their infants or were doing so in reaction to infant sleep problems. One-way analyses of variance revealed no differences between infants who room shared and those who did not in mothers' EA, $F(1, 33) = 0.54$, $p = .47$, nor were differences in EA found between mothers who shared a bed with their infants, who slept in the same room as their infants but did not bed share, and who slept separately from their infants, $F(2, 32) = 0.77$, $p = .47$. Not surprisingly, there was more close contact between mothers and infants when they shared the same room at night, $F(1, 37) = 6.88$, $p = .01$. No other differences in bedtime practices were found between parents who room shared and parents who did not.

Overall Procedure

Throughout this study, all procedures were approved and monitored by Penn State University's Office of Research Protections. Each family was visited in the home three times during 1 full week of data collection. On the first visit (Day 1), following informed consent, mothers were given a variety of questionnaires to complete (see below). Also on Day 1, mothers were provided with an infant sleep diary and were asked to complete the diary, which inquired about their infants' sleep behavior during the previous night, each morning for 7 consecutive days. On Day 6, mothers were again visited to set up video equipment in the area(s) where their infants typically slept, to make continuous recordings of parent–infant interactions during infant bedtimes and during infant night waking. Families were visited a third time on Day 7, to retrieve the video equipment and to answer any questions mothers had about the study.

Questionnaire/Diary Measures

SPQ. Mothers completed an adaptation of Goldberg and Keller's (2007) SPQ, in which parents reported on their infants' sleep arrangements and sleeping habits and who cared for the infant at bedtime and at night. The SPQ was used to obtain information on fathers' involvement with the infant at bedtime and at night (e.g., frequency with which fathers fed, walked, rocked, gave a pacifier to, and checked on the infants), and whether parents were using a sleep training method with their infants. In addition, five SPQ items (5-point Likert-type scales) tapped the quality with which mothers had adapted to their infants' sleep arrangements and sleep patterns. One item inquired about mothers' satisfaction with their infants' sleep arrangements (1 = not at all satisfied, 5 = very satisfied), and another inquired about whether mothers thought their infants' sleep location was a problem for them (1 = not at all a problem; 5 = definitely a problem). Two additional items asked mothers to rate whether they felt their infants' ability to settle to sleep at bedtime, and their infants' night wakings, were a problem (1 = not at all a problem; 5 = definitely a problem). Finally, mothers were asked if they felt that, if they were not sleeping well, was it due to their babies (1 = not at all because of baby; 5 = definitely because of baby). These items were re-scaled as needed so that higher scores reflected better adaptation and were summed to create a composite scale; internal reliability of this composite was satisfactory ($\alpha = .78$). Countermine and Teti (2010) found maternal adaptation to infant sleep, as indexed by this composite, to relate predictably (i.e., inversely) to mothers' depressive symptoms and spousal criticism of mother about her handling of infant sleep behavior, and positively to mother's sleep efficiency (from actigraph recordings).

Infant sleep diary. Each morning during the week of data collection, parents completed an infant sleep diary, adapted from Burnham et al. (2002), that inquired about the number of times mother had to return to the infant while settling the infant to sleep during bedtime, the number and duration of infant night wakings during the previous night and of infant naps during the previous day, and infant sleep locations.

The infant sleep diary yielded three infant sleep variables, summing across the seven consecutive days mothers completed the diary: Total frequency of infant night waking, total time (minutes) infants were awake at night, and total number of times mothers had to go to their infants before they fell asleep at bedtime. Five mothers did not fully complete the infant sleep diaries for the full 7 days. In these cases, a procedure was used that substituted the mean sleep disruption score computed from the other days of the week on which data on that index were available. This procedure was used only when data were missing for no more than 2 of the full 7 days of data collection. This procedure resulted in viable data for 44 families for total number of occasions mothers had to return to their infants at bedtime, and 45

families for total frequency of night waking and total time infants were awake at night.

Two of the three sleep diary measures of infant sleep disruption showed strong stability over time. Pearson correlations for frequency of infant night waking across the 7 days of data collection ranged from .37 to .75 ($M = .57$) and for total time infants spent awake at night from .35 to .85 ($M = .60$). The number of times mothers had to return to their infants at bedtime showed less stability (Pearson *r*s range: 0 to .95, $M = .12$). Nevertheless, we believe these indexes are more representative of infant sleep behavior than data collected from a single occasion.

ISQ. Mothers also completed the Infant Sleep Questionnaire (ISQ; Morrell, 1999), a 10-item assessment of mothers' perceptions about the frequencies with which infants signaled to parents during bedtime, and how often infants awakened during the night. These frequency items were followed by a final item, which simply asked, "Do you think that your infant has sleeping difficulties?" This item was rated on a 4-point scale ranging from 0 (*no*), 1 (*yes, mild*), 2 (*yes, moderate*), to 3 (*yes, severe*). We were particularly interested in this final item because it did not assess frequencies of sleep disruptive behaviors, which were correlated with infant age (see below), but just provided a straightforward assessment of whether mothers' believed their infants currently had sleep difficulties, regardless of infant age.

Parent–Infant Videorecording

On the evening of Day 6 of data collection, families were visited to set up a digital videorecording system to videorecord parent–infant interactions during bedtimes and at night. Videorecording done on the evening of Day 6, commencing when the parents began to put their infants to bed and continued, without interruption, throughout the night until the infant awoke the following morning. The present study focused on mother–infant interactions at bedtime because, for virtually all families in the study, bedtimes provided the longest and arguably the most representative bouts of interaction of any point during the night, enabling clear assessments what parents did, and how well or poorly they did it.

Videorecordings made use of a Telexper (Telexper, Inc., Union City, CA) DVR–X4/80 digital video recorder with portable hard drives, Channel Vision (Channel Vision Technology, Costa Mesa, CA) (CV–5005–W) night-vision cameras, a small TV monitor, Channel Vision (CV–5104MIC) microphones, and CS–IR200 infrared illuminators. Placement of cameras and microphones had been carefully piloted to ensure that most, if not all, parent–infant interactions during the night would be recorded. This involved the use of 2 to 3 cameras for each family, depending on parents' particular bedtime routines as communicated to project staff prior to setup. For all families, one camera and microphone set-up was suspended on a boom stand above the location where the infant slept, providing a clear view of the infant's head and body. A second camera was placed at the far end of the room opposite the door and focused on the doorway, which enabled us to keep track of who entered and exited the room. Finally, another camera and microphone set-up was placed in a separate room if the parents routinely took the infant there during bed and night times. Infrared illuminators were set up to provide bounce lighting to illuminate infants' rooms if needed. All video equipment was connected to a single surge strip, and parents were instructed to turn on the video system (the switch on the surge strip) when infant bedtime commenced. The end of bedtime was marked by the end of 5 min of continuous infant sleep (infant eyes closed, with no movement, for 5 consecutive min).

Coding of Video Data

Maternal bedtime practices were coded by Gail Mayer and another project staff member, both of whom were trained by the Douglas M. Teti, using a 30-s interval sampling technique. Both coders were blind to other data on the families. Presence or absence of specific parenting behaviors were scored in each interval, and the proportion of each behavior, which served as the unit in analyses, was computed for each mothers by dividing the number of intervals in which a given behavior occurred by the total number of bedtime intervals. Parenting practices coded were close contact (mother cuddles or holds infant close to the body), casual contact (mother touches infant without close contact), quiet activities (e.g., quiet play, interaction, book reading), and nursing. These behaviors were not mutually exclusive, and thus in a given interval a mother could have been coded simultaneously for close contact, nursing, and quiet activities, if all three were co-occurring in that same interval. Bedtime length varied widely across the sample, ranging from 6 to 123 min ($M = 37$ minutes, $SD = 24.59$), reflecting the fact that parents varied considerably in how much time they devoted to bedtime. Number of bedtime intervals was not correlated with infant age or emotional availability, and it was correlated with only one bedtime practice measure: amount of casual contact, $r(37) = .52$, $p = .001$.[1] Intercoder reliabilities in bedtime practices were very high (M intraclass correlation = 0.99, range = .98 to 1.00), based on 10 families (two from each cohort).

Maternal EA. Mothers' EA during bedtimes was coded with the Emotional Availability Scales (EAS; Biringen, Robinson, & Emde, 1998), a system designed to characterize the emotional quality of parenting from observations of interactions between parents and children. The EAS uses four scales to assess parental EA: sensitivity (parent's ability to read accurately and respond contingently to child signals with warmth and emotional connectedness), structuring (parent's capacity for appropriate scaffolding of child activities and setting appropriate limits), nonintrusiveness (reverse-scored, reflecting parent's capacity to respect the child's autonomy and personal space), and nonhostility (reverse-scored, assessing parent's ability to interact with

[1] Because the lengths of bedtimes varied widely across, all analyses were repeated with the number of bedtime intervals (as well as infant age) statistically controlled. There were no differences in the results.

the child without signs of covert or overt irritability/anger). The EAS takes into consideration the emotional responsiveness of the child in scoring. Two additional EAS scales explicitly tap the child's emotional availability to the parent, including responsiveness (child's capacity for responding with warmth and emotional connectedness to the parent) and involvement (child's ability to initiate and involve the parent in ongoing activities). The child scales were not used, however, because the limited behavioral repertoire of infants 6 months and younger made the scoring of these scales difficult. The EAS scoring manual provides guidelines for scoring parental EA for parents of very young infants, however, and maternal behavior was readily scorable using the EAS system, regardless of infant age.

The construct validity of the EAS is well-established. Mothers with depressive symptoms, and with previous histories of abuse, have been found using the EAS to be less emotionally available during play interactions in comparison to nondepressed and nonabused mothers (Moehler et al., 2007; Trapolini et al., 2008). In addition, there is extensive evidence that maternal EA is associated with secure infant–mother attachment and with autonomous attachment in mothers (Biringen et al., 2000; Biringen et al., 2005). Douglas M. Teti and Bo-Ram Kim were trained and certified on EAS 2007. Mothers' EA during bedtimes was coded by the Bo-Ram Kim, who was blind to all other data on the families.

Because to date no studies have examined parents' EA during child bedtimes, some consideration had to be given to how EA should be assessed in a context in which parents' goals are actually not to engage the infant in play (which is more typically how the EAS has been used), but to disengage from the infant (i.e., to prepare the infant to go to sleep and, in most cases, separate from attachment figures). We took into consideration whether infants and parents shared the same room at night. For infants who shared the same room as their parents, the coding of EA was straightforward: Maternal sensitivity was high when mothers were affectively attuned to their infants, demonstrated a clear awareness of infant cues, interpreted them accurately, and responded contingently and appropriately. Structuring was rated highly when mothers prepared their infants for bed using positive, quiet, soothing bedtime routines that gently guided infant toward sleep. Mothers were judged nonintrusive when they showed recognition of their infants' need for sleep by not initiating new interactions with the infant and avoiding high-volume, intrusive talk with their infants or other family members. Finally, mothers were judged to be nonhostile when they showed no overt or covert irritability or anger toward the infant at any point during bedtime. Among families whose infants slept in their own rooms, EA was coded very similarly, with some minor modifications because, in these families, the parents' goal was to encourage their infants to fall asleep on their own, in the parents' absence. Having infants learn to fall sleep in separate rooms from parents is normative in the United States (McCoy et al., 2004), and thus we did not "penalize" mothers if (1) they did not respond to nondistressed infant vocalizations after the infant was put down to sleep, and (2) mothers delayed slightly (for 1 min or less) before responding to distressed infant cries. If the infant continued crying for longer than 1 min without a maternal response, however, the mother received a lower sensitivity score.

Interrater reliability was established between Bo-Ram Kim and Douglas M. Teti on the four EA dimensions, based on 10 mother–infant bedtime observations that were equally interspersed across the five infant cohorts. Intraclass correlations (IC) for absolute agreement on maternal sensitivity, structuring, nonintrusiveness, and nonhostility were .83, .55, .94, and .88, respectively. Because interrater reliability for structuring was comparatively low, it was dropped from analysis. A composite maternal EA score was computed by converting individual EA scores for sensitivity, nonintrusiveness, and nonhostility to z scores and summing across the three standardized dimensions. Internal reliability for this composite was .88, and interrater reliability (IC), based on absolute agreement, was .89.

Data Analytic Strategy

For descriptive purposes, preliminary analyses were first conducted to examine the overall amounts of bedtime practices and EA that were observed, the relations between the infant sleep variables, and to report on any interrelations between parenting practices and EA. Preliminary analyses were also conducted to examine the degree to which infant age was associated with infant sleep disruption variables and parenting variables.

Study hypotheses were assessed with partial correlations, controlling for infant age, because of associations (reported below) between infant age and sleep disruption, mothers' bedtime practices, and EA.[2] In addition, because of the wide infant age range in this cross-sectional study, and because the magnitude of relations between parenting and sleep disruption linkages could be different for older versus younger infants, hierarchical multiple-regression analyses were conducted that assessed whether parenting-infant sleep linkages were moderated by infant age. These multiple-regression analyses followed procedures outlined by Aiken and West (1991) and involved centering infant age and the parenting variable being examined around their means, entering both at Step 1, and then entering their multiplicative interaction term at Step 2. Significant moderation by infant age would be indicated by obtaining a statistically significant interaction term (i.e., a significant change in variance accounted in the dependent variable by the interaction, denoted by a significant F_{change} statistic). Significant interactions were further probed, again following Aiken and West, by computing the individual slopes of the relations between the parenting and infant sleep variable under analysis for older (1 *SD* above the mean infant age) and younger (1 *SD* below the mean infant age) infants, and determining their statistical significance by converting them to t scores.

[2] Because total infant nap time (minutes) during the day correlated with the total number of minutes infants were awake at night, $r(42) = .61$, $p < .001$, all analyses were repeated controlling for both infant age and total infant nap time. The results were virtually identical to those obtained when controlling for infant age alone.

Results

Preliminary Analyses

Frequency of infant night waking was significantly associated with the total time infants were awake at night, partial $r(43) = .72$, $p < .001$, and with the number of times mothers had to return to their infants during bedtime, $r(42) = .30$, $p = .04$. Total time infants were awake at night was marginally associated with the number of times mothers has to return to their infants during bedtime, $r(42) = .29$, $p = .051$. As Table 2 indicates, mothers spent more time in close contact with their infants and nursing their infants during bedtimes than in casual contact or in quiet activities. Mothers' nonstandardized mean EA scores were above scale midpoints on all EA dimensions, suggesting that the emotional availability of parenting in this sample was generally good. Maternal bedtime practices were not intercorrelated, and maternal bedtime practices and EA were also uncorrelated. Thus, the practices mothers did when putting their infants to bed were not associated with their underlying emotional quality.

Because the present sample was cross-sectional, analyses were conducted to examine linkages between infant age, infant sleep behavior, mothers' bedtime practices, and mothers' EA. As expected, infant age was significantly and negatively associated with the total number of infant night wakings, $r(43) = –.50$, $p < .001$, and the total number of minutes infants spent awake at night, $r(43) = –.49$, $p < .001$, but not with the total number of times mothers had to return to the infant at bedtime to settle the infant to sleep, $r(42) = –.09$, $p = .54$. Infant age was inversely associated with the amount of time mothers spent in close contact with infants, $r(37) = –.49$, $p = .002$, and marginally associated with the amount of time mothers nursed their infants, $r(37) = –.30$, $p = .06$. Infant age was also positively associated with the amount of time mothers spent in casual contact, $r(37) = .51$, $p = .001$, and in quiet bedtime activities with their infants, $r(37) = .56$, $p < .001$. Infant age was inversely related to mothers' EA, $r(33) = –.51$, $p = .002$.

Hypothesis 1

This hypothesis was addressed with partial correlations, controlling for infant age, between bedtime practices, and the three sleep disruption variables derived from the infant sleep diary and mothers' perceptions of whether their infants had a sleep difficulty (from the ISQ). Results are presented in Table 3. The proportion of time mothers spent in close contact, casual contact, nursing their infants, and quiet activities with their infants bore no relation to infant sleep disruption. Multiple-regression analyses were then conducted to determine if infant age moderated relations between each bedtime practice and each measure of infant sleep disruption, as described above. No significant Infant Age × Bedtime Practices interactions were obtained.

Table 2
Descriptive Information on Maternal Practices and Emotional Availability at Infant Bedtime

Bedtime practices	*n*	*M* (*SD*)
Close contact[a]	39	0.39 (0.32)
Nursing infant[a]	39	0.13 (0.21)
Casual contact[a]	39	0.05 (0.08)
Quiet activities[a]	39	0.10 (0.13)
Emotional availability[b]	35	0.00 (2.84)

[a] Proportion of 30-s intervals behavior during bedtime. [b] Sum of standardized scores for sensitivity, nonintrusiveness, and nonhostility.

Hypothesis 2

Partial correlations, controlling for infant age, revealed significant negative associations between mothers' EA at bedtime and infants' night waking frequency and the number of times mothers had to return to their infants at bedtime (see Table 3). Thus, infants of mothers who were more emotionally available to their infants at bedtime, from observations of bedtime parenting by blind raters, experienced less sleep disruption during the night and fewer disruptions in settling to sleep at bedtime than infants of mothers rated as less emotionally available. Also as presented in Table 3, maternal EA was significantly and inversely associated with mothers' perceptions of whether their infants had a sleep difficulty.

To determine whether linkages between EA and infant sleep quality were moderated by infant age, hierarchical multiple-regression analyses were conducted as described above. Four separate analyses were conducted, one for each infant sleep measure. Significant Infant Age × Maternal EA interactions were found in predicting the frequency with which mothers had to return to their infants at bedtime, F_{change} (1, 29) = 29.93, $p < .001$, and in predicting frequency of infant night waking, F_{change} (1, 30) = 6.61, $p = .02$. These interactions were probed as described above (see Data Analytic Strategy). The slopes of the links between maternal EA and the frequency with which mothers had to return to their infants at night were negative for both younger and older infants and both were statistically significant ($p < .05$). However, the magnitude of the slope for younger infants was larger (–6.22) than that for older infants (–1.83). A similar pattern of results was obtained for the Infant Age × EA interaction that predicted the frequency of infant night waking. The slopes for the relation between EA and night waking were both negative and statistically significant ($p < .05$), but the slope was larger for younger (–3.00) than for older (–1.04) infants. Thus, probes of each of these interactions indicated that maternal EA at bedtime was significantly and inversely related to infant sleep quality at night for younger and older infants, but the magnitude of these linkages was stronger among younger infants.

Differences between mothers in EA become evident in the following descriptions, taken directly from our videorecordings. One mother, rated high on EA, directed quiet and gentle vocalizations to her 6-month-old infant while breastfeeding. She continuously gazed at the infant's face and, whenever the infant vocalized, she responded promptly

Table 3
Partial correlations, Controlling for Infant Age, Between Maternal Bedtime Practices, Emotional Availability, and Infant Sleep Disruption

	Infant sleep disruption			
	No. of times mother returns to infant at bedtime[a]	No. of infant night wakings	No. of minutes infant awake at night[a]	Mothers' perception of infant sleep difficulties[b]
	r (*df*)	*r* (*df*)	*r* (*df*)	*r* (*df*)
Maternal bedtime practices[c]				
Close contact	.12 (32)	.26 (36)	.18 (36)	−.03 (36)
Casual contact	−.01 (32)	.09 (36)	.16 (36)	.11 (36)
Quiet activities	.11 (32)	−.14 (36)	−.12 (36)	.07 (36)
Nursing infant	.43* (32)	.11 (36)	.17 (36)	−.13 (36)
Maternal emotional availability	−.44* (31)	−.44** (32)	−.16 (32)	−.56** (32)

[a] Summed across 7 consecutive days, from infant sleep diary. [b] From the Infant Sleep Questionnaire (Morrell, 1999) based on a scale ranging from 0 (*no*), 1 (*yes, mild*), 2 (*yes, moderate*), to 3 (*yes, severe*). [c] Proportion of 30-s intervals behavior occurred during bedtime. * $p < .05$. ** $p < .01$.

(e.g., "It's OK."). When necessary, the mother adjusted the infant's position for easier access to the breast, and hugged and patted the infant's back to burp the infant following nursing before putting the infant down to sleep. Another mother highly rated on EA responded to her 24-month-old's questions during book reading with explanation and reassurance. When the book was finished, the mother said a brief prayer, caressed her child's head, kissed and hugged her, then spoke softly to her, and sung to her. She then handed a soft toy to the child, tucked the child into bed, and left the room. Low EA, by contrast, is exemplified by another mother, who used stern directives with her 24-month-old during book reading whenever the child got up out of bed, and at one point physically pulled the child back to her. This mother continually attempted to engage the child in the book despite clear signs that the child was losing interest (e.g., child was fidgety and continually turned his attention elsewhere). The child continued to squirm in bed after the book reading was finished and was having trouble settling down to sleep. The mother repeatedly directed the child to lie down and close his eyes, threatening to take his toys away if he does not settle down. At the same time, she asked for hugs and kisses from him, to which he did not comply. The child got up and left the room four times before he eventually fell asleep.

Hypothesis 3

Partial correlations, controlling for infant age, were conducted between overall maternal EA at bedtime and mothers' adaptation to their infants' sleep behavior. EA at bedtime was significantly and positively correlated with maternal adaptation to infant sleep, partial $r(31) = .40$, $p < .05$. Thus, mothers who were more satisfied with their infants' sleep location, their infants' ability to settle to sleep at bedtime, and their infants' night wakings, were more likely to be rated as more emotionally available to their children than mothers who were less satisfied with their infants' sleep patterns. Similar analyses revealed no significant associations between maternal bedtime practices and mothers' adaptation to infant sleep behavior.

Discussion

The present study was the first to examine, from direct observations of maternal behavior, the role of maternal EA at bedtime as a predictor of infant sleep quality. Results suggest that what mothers do with their infants at bedtime (e.g., whether they make use of close physical parent–infant contact, quiet bedtime activities) may be less important than the emotional quality that underlies bedtime activities in promoting quality sleep in infants. Specifically, maternal EA was inversely associated with the frequency with which mothers had to return to their infants at bedtime, the frequency of infant night waking, and mothers' ratings of whether their infants had a sleep difficulty. By contrast, no linkages were obtained between specific bedtime practices and infant sleep disruption. The absence of associations between bedtime practices and infant sleep quality is at odds with earlier work, which found infant sleep problems to be higher among infants nursed to sleep, and who had experienced high amounts of close bodily contact with parents when being put to bed (Burnham et al., 2002; Mao et al., 2004). The reasons for these discrepancies are unclear but may relate to the fact that the Burnham et al. (2002) and the Mao et al. (2004) studies were longitudinal, which enabled these relations to be examined over time.

The linkages between maternal EA and infant sleep quality were obtained with infant age statistically controlled, which was necessary because of the significant associations between infant age, infant sleep disruption, and parenting in this study. It was of interest that maternal EA was negatively associated with infant age. From informal observation, we believe this is due to the fact that infants 12 months and older were more likely than younger infants to have their own bedtime agenda, which was not always in agreement with those of their mothers. This prompted mothers of infants in the second year to be more directive and some-

times more frustrated with their infants compared to mothers of younger infants. Further analyses revealed that infant age moderated the associations between EA and the frequency with which mothers had to return to their infants at bedtime, and the frequency of infant night waking. Probes of these Infant Age × EA interactions indicated that, whereas the inverse relations between infant age and these sleep measures were statistically significant for both younger and older infants, the association was stronger among younger infants than among older infants. The weaker, albeit still significant link between maternal EA and sleep quality among older infants may result from the fact that sleep patterns are more established in second-year infants, and thus are less reactive (but not nonreactive) to qualitative aspects of caregiving. Stated differently, the effects of parental EA, as an environmental influence on infant sleep, may be stronger when infant sleep is less consolidated, as is the case in younger infants. Developmental studies of across-time linkages between parental EA and infant sleep are clearly needed to address this question.

This study supports Dahl and El-Sheikh's (2007) theoretical premise that feeling safe in one's sleep environment is a prerequisite to good sleep, and that this is as true for infants as it is for adults. Emotionally available parents may promote feelings of safety and security in their infants, and in turn, the ability to settle into and enjoy better quality sleep, than emotionally unavailable parents. Such parenting, we propose, promotes infants' trust in their sleep environments. We also propose that, whereas emotionally available parenting is important for children's socioemotional development (Biringen et al., 2005), it may be particularly important in sleep contexts because it is in such contexts that children experience and learn to negotiate the longest separation of the day from attachment figures, both psychologically and (at least in the United States) physically. Thus, the emotional quality of parenting at bedtime may be highly salient, and perhaps more salient, to socioemotional development than parenting in daytime contexts. Such a hypothesis has not yet been tested and awaits empirical support, and requires more studies that make use of real-time observations, rather than parental questionnaires and surveys, to characterize parenting in infant sleep contexts. Indeed, very little is known about actual, observed parental behavior in such contexts, in terms of how parents deal emotionally with child provocations (e.g., signaling to parents when settling to sleep), how bedtime and night time parenting evolves and differentiates over time, and how parenting in sleep contexts relates to the quality of daytime parenting and to both proximal (e.g., child sleep quality, security of attachment) and more distal child developmental outcomes (e.g., cooperativeness, social competence with adults and peers). We believe such studies would be of value to the field.

Poor sleep in children has been linked with externalizing and internalizing behavioral problems, attentional deficits, sleepiness, and poor academic outcomes (El-Sheikh et al., 2007; Sadeh et al., 2002). The relations in the present study between maternal EA and infant sleep quality suggest it may be important to give careful scrutiny to the unique roles played by infant sleep disruption and parenting in sleep contexts in predicting child developmental outcomes. Some of the previously established links between poor sleep in children and adverse outcomes could actually be accounted for by the quality of parenting that takes place in child sleep contexts. Emotionally unavailable parents in sleep contexts may predispose young children both to sleep poorly and to develop troubled, stressed relationships with parents, with problematic parent–child relationships explaining a greater share of the variance in child behavior problems than poor child sleep. Thus, parenting quality in sleep contexts may be a critically important third variable in understanding the established links between child sleep disruption and adverse developmental outcomes, and one that deserves careful attention in future work.

The present study had several limitations. First, sample size was modest, limiting statistical power. We are heartened, nevertheless, that a number of statistically significant findings of moderate-to-strong magnitude emerged from this study. Second, parental EA was limited to mothers because so few fathers ($n = 7$) were involved in infant bedtimes. Whether fathers' influence is direct or indirect, we believe that observational studies of how well parents work together to promote quality sleep in their children would contribute importantly to the field. Third, the sample was almost exclusively White, precluding meaningful analyses of relations between ethnicity, parenting, and infant sleep disruption and limiting our ability to generalize to other racial/ethnic groups. Fourth, videorecordings of bedtime parenting were limited to one night and thus may not be as representative of bedtime parenting as would be the case if multiple recordings had been obtained and averaged across the week. Fifth, the use of a single SPQ item to tap mothers' current, age-free perceptions of infant sleep difficulties was a weakness. This construct would have been better assessed with multiple indicators.

This study was cross-sectional, and thus directions of influence between parenting and sleep quality cannot be determined. It is possible that mothers' EA at bedtime was predicted by infant sleep quality during the night. That is, infant sleep difficulties at night may have fostered more problematic mother–infant relationships during the day, predisposing mothers to be less emotionally available to their infants at bedtime. We suspect that relations between parental EA and the quality of child sleep are bidirectional. Finally, the results of the present study should not be taken to indicate that bedtime practices used by parents are irrelevant in predicting infant sleep quality. It is unclear, for example, what parents might have been doing outside of camera range and how such activities might predict infant sleep. The present findings suggest, however, that whatever bedtime practices parents decide to use, the emotional quality of these practices will bear importantly on infants' ability to settle to sleep and to regulate their sleep behavior throughout the night. We expect that EA and specific bedtime practice will interrelate in complex ways as infants develop, and that such interlinkages can best be determined by longitudinal, real-time observational studies of bedtime and night time parenting practices and emotional availability, and their predictive associations with infant sleep and

infant development. We hope to contribute to this cause in future work.

References

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions.* Thousand Oaks, CA: Sage.

Biringen, Z., Brown, D., Donaldson, L., Green, S., Krcmarik, S., & Lovas, G. (2000). Adult attachment interview: Linkages with dimensions of emotional availability for mothers and their prekindergartners. *Attachment and Human Development, 2,* 188–202. doi:10.1080/14616730050085554

Biringen, Z., Damon, J., Grigg, W., Mone, J., Pipp-Siegel, S., Skillern, S., & Stratton, J. (2005). Emotional availability: Differential predictions to infant attachment and kindergarten adjustment based on observation time and context. *Infant Mental Health Journal, 26,* 295–308. doi:10.1002/imhj.20054

Biringen, Z., Robinson, J., & Emde, R. N. (1998). *Emotional availability scales* (3rd ed.). Fort Collins: Department of Human Development and Family Studies, Colorado State University.

Burnham, M. M., Goodlin-Jones, B. L., Gaylor, E. E., & Anders, T. (2002). Nighttime sleep-wake patterns and self-soothing from birth to one year of age: A longitudinal intervention study. *Journal of Child Psychology and Psychiatry, 43,* 713–725. doi:10.1111/1469-7610.00076

Countermine, M. S., & Teti, D. M. (2010). *Sleep arrangements and maternal adaptation in infancy.* Manuscript submitted for publication.

Dahl, R. E., & El-Sheikh, M. (2007). Considering sleep in a family context: Introduction to the special issue. *Journal of Family Psychology, 21,* 1–3. doi:10.1037/0893-3200.21.1.1

El-Sheikh, M., Buckhalt, J. A., Keller, P. S., Cummings, E. M., & Acebo, C. (2007). Child emotional insecurity and academic achievement: The role of sleep disruptions. *Journal of Family Psychology, 21,* 29–38. doi:10.1037/0893-3200.21.1.29.

Erikson, E. H. (1980). *Identity and the life cycle.* New York, NY: Norton.

Goldberg, W. A., & Keller, M. A. (2007). Parent-infant co-sleeping: Why the interest and concern? *Infant and Child Development, 16,* 331–339. doi:10.1002/icd.523

Mao, A., Burnham, M. M., Goodlin-Jones, B. L., Gaylor, E. E., & Anders, T. F. (2004). A comparison of the sleep-wake patterns of cosleeping and solitary-sleeping infants. *Child Psychiatry and Human Development, 35,* 95–105. doi:10.1007/s10578-004-1879-0

McCoy, R. C., Hunt, C. E., Lesko, S. M., Vezina, R., Corwin, M. J., & Willinger, M. (2004). Frequency of bed sharing and its relationship to breastfeeding. *Journal of Developmental and Behavioral Pediatrics, 25,* 141–149. doi:10.1097/00004703-200406000-00001

Mindell, J. A., Kuhn, B., Lewin, D. S., Meltzer, L. J., & Sadeh, A. (2006). Behavioral treatment of bedtime problems and night wakings in infants and young children. *Sleep: Journal of Sleep and Sleep Disorders Research, 29,* 1263–1276.

Mindell, J. A., Telofski, L. S., Wiegand, B., & Kurtz, E. S. (2009). A nightly bedtime routine: Impact on sleep in young children and maternal mood. *Sleep, 32,* 599–606.

Moehler, E., Biringen, Z., & Poustka, L. (2007). Emotional availability in a sample of mothers with a history of abuse. *American Journal of Orthopsychiatry, 77,* 624–628. doi:10.1037/0002-9432.77.4.624

Morrell, J. (1999). The Infant Sleep Questionnaire: A new tool to assess infant sleep problems for clinical and research purposes. *Child Psychology and Psychiatry Review, 4,* 20–26. doi:10.1017/S1360641798001816

O'Brien, L. M., & Gozal, D. (2004). Neurocognitive dysfunction and sleep in children: From human to rodent. *The Pediatric Clinics of North America, 51,* 187–202.

Sadeh, A., Gruber, R., & Raviv, A. (2002). Sleep, neurobehavioral functioning, and behavior problems in school-age children. *Child Development, 73,* 405–417. doi:10.1111/1467-8624.00414

Sadeh, A., Lavie, P., & Scher, A. (1994). Sleep and temperament: Maternal perceptions of temperament of sleep-disturbed toddlers. *Early Education and Development, 5,* 311–322. doi:10.1207/s15566935eed0504_6

Scher, A. (2001). Mother-child interaction and sleep regulation in one-year olds. *Infant Mental Health Journal, 22,* 515–528. doi:10.1002/imhj.1015

Teti, D. M., & Huang, K. Y. (2005). Developmental perspectives on parenting competence. In D. M. Teti (Ed.), *Handbook of research methods in developmental science* (pp. 161–182). Malden, MA: Blackwell.

Tikotzky, L., & Sadeh, A. (2009). Maternal sleep-related cognitions and infant sleep: A longitudinal study from pregnancy through the 1st year. *Child Development, 80,* 860–874. doi:10.1111/j.1467-8624.2009.01302.x

Trapolini, T., Ungerer, J. A., & McMahon, C. A. (2008). Maternal depression: Relations with maternal caregiving representations and emotional availability during the preschool years. *Attachment and Human Development, 10,* 73–90. doi:10.1080/14616730801900712

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