Infant Sleep Disorders and Attachment: Sleep Problems in Infants with Insecure-Resistant Versus Insecure-Avoidant Attachments to Mother

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We hypothesized that infant sleep disorders would be significantly associated with infant-mother attachment status. Using current attachment theory, we specifically predicted that infants classified as insecure-avoidant would contrast with those classified as insecure-resistant (at 15 months of age) in terms of incidence and length of night wakings (at ages 6 and 15 months), as well as clinical sleep problems. Analyses of sleep and attachment data gathered on the insecure subset (n=342) of a larger sample of more than 1,000 mother-infant pairs indicated, as predicted, that infants with insecure-resistant attachments (n=49) evinced significantly greater numbers of night wakings and longer mean durations of night-waking episodes than their insecure-avoidant counterparts (n=193). Moreover, infants with insecure-resistant attachments were more likely than infants with insecure-avoidant attachments to evince clinically significant sleep problems. To explain our findings we suggest a special role for REM sleep in development of sleep problems and of emotional regulation vis a vis the mother. **(Sleep and Hypnosis 2003;5(1):7-16)**

Key words: *night waking, REM sleep, attachment, infant sleep, sleep problems*

INTRODUCTION

Investigations of the development of infant sleep patterns often rely on maternal reports concerning the frequency and pattern of infant night wakings as an indicator of the underlying quality and organization of infant sleep (1-7). These studies suggest that infants usually arouse one or more times for varying periods of time each night. During the first few months of life 95% of infants signal or cry after a night-time awakening and will not return to sleep without a maternal interaction. By age 15 months, however, approximately 70% of infants are able to self-soothe and return to sleep without maternal contact. This still leaves about 30% of infants with frequent problematic night wakings during the second year of life.

Despite its prevalence in infancy, clinical correlates of night wakings are not well

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understood. They may not be a mere byproduct of more fundamental sleep consolidation processes as they typically emerge out of rapid eye movement or REM sleep (8) states and can be influenced by features of the mother-infant relationship (9-11). With respect to the latter, Benoit et al. (10), documented a significant association between sleep disorder in infants and insecure attachment to the mother. In a related study of 94 mother-infant pairs in which attachment security was assessed using the classic 'strange-situation' paradigm, Scher (11) reported that infant sleep characteristics were, at least weakly, associated with the insecurity of infant-mother attachment. Scher found that 55% of the secure, 69% of the dependent secures and 60% of the insecure-resistant infants were night wakers. There was a statistically significant association between scores on a 'proximity-seeking' scale and overall sleep duration with high 'proximity-seeking' predicting longer sleep durations.

Group differences in profiles of the clinically important variables 'frequency of night wakings' and 'difficulties falling asleep' (Scher; Figure 2) showed that insecure-resistant infants were least likely among the attachment groups Scher studied to evince bedtime difficulties. Paradoxically, these infants seemed to sleep soundly despite their tendency to frequent night wakings. They did not differ from infants classified as secure in mean sleep onset time, mean sleep duration, longest uninterrupted sleep interval and overall sleep efficiency (Scher; Table 3). Overall, Scher's data suggest that there may be a clinically significant relationship between infant sleep patterns and attachment, as sleep characteristics and problems (e.g. 'night wakings' and 'difficulty falling asleep') appeared to vary with 'proximity-seeking' and attachment status. Scher, furthermore, was unable to study infants classified as 'insecure-avoidant' and it is these infants (as we discuss below) who may present the most extreme contrast with those classified as 'insecure-resistant' or 'insecure-dependent'.

Investigation of patterns of sleep problems in infants are complicated by the varying definitions of clinically significant sleep problems found in the literature. According to Zuckerman et al. (7), a child has a significant sleep problem if the child wakes 3 or more times per night, or the child is awake for an hour or more on average, or the mother reports "severe" disruption. Using this operationalization of sleep problems, Zuckerman et al. find that approximately 18% of children have a sleep problem at 8 months of age. According to Richman (5), a child is considered to have a sleep problem if the child wakes 5 or more nights per week, and the child wakes 3 or more times per night, or the child is awake for more than 20 minutes. Using this definition of sleep problems, Richmond found that 6-10% of infants at 1-2 years have sleep problems. According to Lozoff and Zuckerman (3), a child has a sleep problem if the child wakes more than 3 nights per week and the mother reports disruption. Using this definition of sleep problems, at least 30% of infants between 6 months and 4 years have clinically significant sleep problems.

No matter what definition of sleep problems is used, a substantial proportion of infants suffer from clinically significant sleep problems; and judging from the reports of Benoit et al. (10) and Scher (11), clinically significant infant sleep problems may be influenced by attachment status. Current attachment theory (12,13) helps illuminate the nature of the association between sleep patterns and various profiles of the attachment relationship. Theoretically "secure" attachment is associated with an 'honest' signaling of infant needs. Thus, secure infants cry or signal when they truly need maternal intervention. This honest signaling is based on the experience of a history of sensitive rearing which leads them to expect that needs will be met in a timely and sensitive manner. These are the infants who typically do not develop sleep disorders. In contrast, infants who develop insecure attachment profiles

appear to be more vulnerable to sleep disturbances.

Infants classified as insecure-avoidant down regulate or suppress and inhibit their attachment needs due to fear of rejection based on a history of insensitive maternal care, whereas infants classified as insecure-resistant exaggerate and amplify their attachment needs based on a history of inconsistent care (14). Thus, in the Strange Situation which stresses the child's capacity to cope with a series of stressors (i.e., unfamiliar room, unfamiliar adult, separation from mother), insecure-avoidant infants show limited distress and maintain physical and/or psychological distance from mother, insecure-resistant infants become extremely distressed and have a difficult time settling once upset, and secure infants, if they become upset, can typically settle and return to play.

It is the infants classified into either of these two core insecure attachment groups, i.e., those classified as insecure-resistant or insecure-avoidant in the strange situation, who will most likely manifest clinically significant sleep problems beyond the first year. Attachment theory allows us to go a step further to suggest that the pattern of sleep disturbances in these two insecure groups will differ according to the strategies adopted vis-à-vis the caretaker. More specifically, it is predicted that infants who develop insecure-resistant attachments will evince high night wakings (consistent with amplification of attachment needs) and great difficulty falling asleep (again to amplify attachment needs and maternal contact) relative to infants who develop an insecure-avoidant attachment (who tend to suppress attachment needs and avoid maternal contact). Overall, sleep problems should be more prevalent in the insecure-resistant infants because of their propensity to exaggerate their needs. Thus, these infants will use night wakings to "advertise" their attachment needs and to prolong maternal contact whereas insecure-avoidant infants should behave in the opposite manner (i.e., decrease their night wakings and quickly fall back to sleep).

Testing differences in sleep patterns of the two core insecure attachment groups has proven difficult in previous research because most samples yield primarily (60-75%) "secure" infants, resulting in very small sample sizes of insecurely attached infants. This may have been one reason why Scher (11), who was working with Israeli mother-infant pairs, could not make a comparison between infants with insecure-avoidant and insecure-resistant attachments. While insecure-avoidant types are relatively rare worldwide, virtually no insecure-avoidant attachments are typically identified in Israeli samples (15,16). Ultimately, in order to study sleep patterns in infants classified as insecure-avoidant a very large sample is required, one which yields a substantial number of insecurely attached infants. The large-scale study of early child care and its effects on child development conducted by the NICHD Early Child Care Research Network (17) and known as the NICHD Study of Early Child Care (NICHD SECDC) affords such a comparison, as it enrolled over 1,300 children at birth in a longitudinal study, more than 1,000 of whom were seen at 15 months of age in the strange situation, of which 342 were classified as insecure-avoidant or insecure-resistant.

This NICHD SECC dataset therefore affords a unique opportunity to examine the issue of whether infant sleep disturbances are related to infant-mother attachment security by comparing infants classified as insecure-avoidant and insecure-resistant. In order to test the aforementioned predictions and related hypotheses we used maternal reports of their infant's sleep behaviors gathered as part of the NICHD SECC when infants were 6 and 15 months of age. We analyzed maternal reports of both night wakings and mean duration of a waking episode once an infant aroused. We used the Zuckerman et al. (7) definition of sleep disturbances (based primarily on frequency of night wakings) in infants to identify such

disturbances in our participants. The Zuckerman et al. criteria received some clinical validation in a longitudinal study of sleep problems in infants. In that study Zuckerman et al. found that infants with sleep problems were more likely to evidence later serious behavior problems, especially tantrums and behavior management problems than were children without sleep problems.

Our primary hypothesis was directional: Infants classified as insecure-resistant in their attachment relationship to their mother on the basis of their behavior in the Strange Situation at 15 months of age would evince greater numbers of night wakings and longer mean durations of night waking episodes than infants classified insecure-avoidant. Further, the former children would evince greater numbers of clinically significant sleep disturbances than the latter.

METHODS

Participants

Participants were recruited from 31 hospitals located in or near Little Rock, AR; Irvine, CA; Lawrence, KS; Boston, MA; Philadelphia, PA; Pittsburgh, PA; Charlottesville, VA; Morganton, NC; Seattle, WA; and Madison, WI. During selected 24-hour sampling periods in 1991, 8,986 women giving birth were visited in the hospital. Of these, 5,416 met the eligibility criteria for the study and agreed to be contacted after their return home from the hospital. A subset of this group was selected in accordance with a conditional-random sampling plan that was designed to ensure that recruited families reflected the demographic diversity (economic, educational, and ethnic) of the catchment area at each site.

When the infants were one month old, 1,364 families (58% of those contacted) with healthy newborns were enrolled in the study. Of the 1,364 families who took part in the NICHD SSECC, only a subset is reported here, principally due to (a) our exclusive focus upon infants classified as insecure-avoidant and insecure-resistant at 15 months of age and (b) missing sleep data. Out of the subsample of 1,149 with valid Strange Situation assessments available for analysis in the data set, 342 children received primary classifications of insecure-avoidant or insecure-resistant. This subsample of 342 are the focus of this report. Of this analysis subsample, 81.3% were European American; 55.6% were male; 17.9% had mothers without partners; the average years of schooling of the mothers of these children was 14.2 years. Demographic data cited above were collected via interview with mothers when families were enrolled in the project during a home visit when the child was one month old. Attachment security was assessed during a laboratory visit when infants were 15 months of age. Information on infant sleep was obtained as part of lengthy interviews with mothers when infants were 6 and 15 months of age.

Attachment Security

The Strange Situation is a 25-minute procedure containing brief episodes of increasing stress for the infant, including two mother-infant separations and reunions (18). The Strange Situation was carried out at 10 different university laboratories, one per site, after personnel had been carefully and fully trained to implement the procedure according to standard conventions (18). It is designed to elicit and measure infants' attachment behavior. Attachment behaviors may be categorized as secure (B) or insecure (A, C, D or U). When stressed, secure (B) infants seek comfort from their mothers, which is effective and permits the infant to return to play. Avoidant (A) infants tend to show little overt distress and turn away from or ignore the mother on reunion. Resistant (C) infants are distressed and angry, but ambivalent about contact, which does not effectively comfort and allow the children to

return to play. Examples of disorganized/ disoriented (D) behaviors are prolonged stilling, rapid vacillation between approach and avoidance, sudden unexplained changes in affect, severe distress followed by avoidance, and expressions of fear or disorientation at the entrance of the mother. A case that cannot be assigned an A, B, C, or D classification is given the unclassifiable (U) code. Only infants receiving primary classifications of A (n=193) or C (n=149) are included in this study.

Videotapes of all Strange Situations were shipped to a central location and attachment security was evaluated by a team of three coders blind to children's child-care status, patterns of sleep, and family background. Each Strange Situation was scored independently by two coders using the standard classifications of secure (B), insecure-avoidant (A), insecure-resistant (C), disorganized (D), and unclassifiable (U). Disagreements were viewed by the group and a code was assigned by consensus. Across all coder pairs, before conferencing, agreement with the 5-category classification system was 83% (kappa=.69) and agreement for the 2-category system (secure/insecure) was 86% (kappa=.70). For further information on attachment scoring, see The NICHD Early Child Care Research Network (17).

Infant Sleep

All measures of infant sleep patterns were based on maternal reports of infant behaviors. Maternal reports of infant sleep typically underestimate the frequency of night wakings but they do not distort the overall pattern of night wakings across time. There were three main sleep variables obtained from maternal reports: Night wakings in the last week; Mothers were asked to respond 'yes' or 'no' to the question, "In the last week, has BABY wakened you at night?" Average length of night wakings. Mothers were also asked to report the number of minutes in response to the question, "On average, for about how long would you say BABY was up each time BABY awakened?" For the third measure, this one of sleep disturbances, we asked the mother to report on the extent to which the child's awakening caused severe disruption of the child's sleep. We constructed a sleep disorder variable based on Zuckerman et al.'s (7) criteria. According to Zuckerman et al., a child has a sleep problem if the child wakes 3 or more times per night, or the child is awake for an hour or more on average, or the mother reports "severe" disruption.

RESULTS

We chose to analyze the 6 and 15 month old sleep data separately rather than in a single, repeated measures analysis, as the latter would require dropping cases that only provided sleep data at one of the two ages and we wanted to maximize sample size. Table 1 displays results of maternal reports of their infant sleep problems at 6 and 15 months for each of our three major outcome variables: sleep problems, night wakings in last week and mean duration of a waking episode presented as a function of resistant versus avoidant attachment status. Because of the directional nature of hypotheses, one-tailed tests of significance were deemed appropriate.

Using Zuckerman's definition of a sleep disturbance, infants classified as insecure-resistant were more likely to evince clinically significant sleep problems at 6 months than infants classified as insecure-avoidant. The same was true at 15 months, even though overall rate of sleep problems declined from 58.8% to 48.5% over time. Differences between the two attachment groups in terms of the presence of 'night wakings in the last week' were less pronounced. Even though mothers of infants classified as insecure-avoidant (at 15 months of age) reported fewer night wakings in the last week when infants were 6 months old than did mothers of infants classified as

Table 2. Sleep patterns of avoidants and ambivalents at 6 and 15 months.

	Insecure-Avoidant	Insecure-Resistant	Significance test	P value (one-tailed)
% with evidence of sleep problems at 6 months	53 (102/193)	66 (99/149)	X2 (1) = 6.41	.008
% with evidence of sleep problems at 15 months	44 (85/193)	56 (81/149)	X2 (1) = 3.58	.03
% reporting night wakings in last week at 6 months	69 (129/188)	76 (112/147)	X2 (1) = 2.34	.06
% reporting night wakings in last week at 15 months	61 (118/193)	65 (97/149)	X2 (1) < 1.00	.26
Mean (SD) duration of night waking episode at 6 mos.	14.7 (24.8)	16.1 (29.6)	T(340)=.475	.21
Mean (SD) duration of night waking episode at 15 mos.	7.63 (16.4)	11.21 (22.7)	T(340) = 1.68	.04

insecure-resistant, by 15 months of age no such group differences were detectable. This patterning in terms of age of measurement of significant group differences in the case of night wakings was reversed in the case of duration of night waking. That is, whereas mean duration for a night waking episode did not significantly differ between the two insecure attachment groups at 6 months, at 15 months of age infants classified as insecure-avoidant were returning to sleep faster on average than infants classified as insecure-resistant. In sum, infants classified as insecure-resistant were more likely than infants classified as insecure-avoidant to awake at night at 6 months of age, experience longer night wakings at 15 months of age, and were more likely to meet Zuckerman et al.'s (7) criteria for sleep disturbances at both 6 and 15 months of age.

DISCUSSION

In an analysis of data on sleep and attachment patterns gathered from approximately 340 mother-infant pairs we found convincing evidence that infant sleep patterns and sleep disorders were significantly related to infant attachment status. With respect to sleep patterns, both the frequency of infant night wakings and the mean duration of night waking episodes once infants did awake were found to be related to the quality of infant insecurity. More specifically, infants classified as insecure-avoidant evinced significantly fewer night wakings (at 6 months) and shorter durations of night waking episodes (at 15 months) relative to their insecure-resistant counterparts. With respect to sleep disorders, a significantly greater proportion of insecure-resistant infants satisfied clinical criteria for the presence of significant sleep disturbances in infancy than did insecure-avoidant infants.

Studies of the development of infant sleep show that most infants learn to "settle" or start sleeping throughout the night by 6 months of age with a transient increase in night wakings in the second 6 months of life (19). Night wakings are still frequent enough to be considered a "problem" by parents, however, in at least 23% of 1 year olds (19). Nevertheless, for most infants night wakings and associated sleep problems decrease in frequency by 15 months of age relative to frequencies at 6 months of age. Data collected as part of the NICHD SECC suggest, however, that this overall decline in sleep problems does not hold equally for all

infants. Indeed, just as predicted, clinically significant sleep problems are less likely to 'disappear' by 15 months of age for infants classified as insecure-resistant than for infants classified as insecure-avoidant.

These results are congruent with Scher's (11) recent report but add crucial clinical information on infants classified as insecure-avoidant. Recall that Scher could not investigate sleep problems in infants so classified due to their extremely low incidence in Israeli samples. Scher, therefore, could not undertake comparisons of sleep patterns for insecure-resistant and insecure-avoidant infants, a comparison apparently crucial for understanding the relation of infant sleep to attachment. Indeed, our major finding is that infants who have insecure-resistant attachments to their mothers experience greater sleep problems (frequent night wakings, longer times awake, and more prevalent sleep disorders, etc.) than do their insecure-avoidant counterparts, particularly by age 15 months. Why should this be the case? Why should insecure-resistant infants be more vulnerable to sleep problems than insecure-avoidant infants? To adequately answer these questions we first must address the more fundamental question of why infant sleep should be related to attachment at all.

Recent advances in our understanding of neural and developmental correlates of sleep, particularly REM sleep, help illuminate this issue. REM is abundant in newborns and infants, constituting approximately 60% of infant sleep (20). From its peak in infancy, proportion of time spent in REM gradually declines and then stabilizes at about 23% of total sleep time once maturity is reached. This overabundance of REM during infancy and its diminishment with age has led many to suggest that REM performs an especially important function for infant development (20-22).

While attention has focused on REM's possible contributions to brain and cognitive development, there is recent evidence to suggest that REM may also play a role in development of non-cognitive, emotional responses as well, particularly in development of emotional responses to the mother. First, it is now clear that REM involves intense activation of brain sites, such as limbic system and the amygdala, traditionally associated with emotional activation and functions (23-28). Second, REM appears to play a role in the regulation of select neuroendocrine circuits, such as those involving release of prolactin and oxytocin, which control development of behavioral interactions and affectional ties between the mother and the infant (29-31). Third, REM appears to play a special role in nursing at least in some mammals. Infant rats nurse while they are in REM or active sleep and the amount of REM/active sleep displayed by the infant rat varies with the length of the nursing bout. Lorenz and Lorenz (32) and Lorenz et al. (33) for example, find that the amount of REM displayed in the suckling rat pup increases as the volume of milk received from the mother increases up to 4% of the pup's body weight. Fourth, studies of the effects of maternal separation on developing rats (34) and monkeys (35-38) have conclusively shown that measures of REM (but not NREM) are selectively disrupted in the infant after maternal separation. Finally, measures of REM vary systematically with co-sleeping status of the human infant (39-41), with increases in REM duration (relative to sleeping alone) when the baby sleeps with the mother. Considered collectively, these facts about REM suggest that it constitutes, among other things, a periodic source of endogenous activation of filiative or attachment-related neural circuits.

It may be that infant REM functions as a kind of activator of CNS circuits involved in motivational, filiative or approach and emotional processes. If REM can function in this manner, and there is some evidence that it can (42-45), then indicators of REM activation levels such as night wakings should vary with attachment status and that is, of course, what

we found. But how does this conceptualization of REM help us explain the sleep differences between infants classified insecure-resistant and insecure-avoidant which we discerned in this inquiry? Recall that infants classified as insecure-resistant are conceptualized as pre-occupied with seeking out contact with the caregiver (14). Thus, the filiative or attachment 'drive' systems of these infants need to be highly activated to support this 'striving after contact' or excessive (relative to secure and insecure-avoidant infants) proximity-seeking. Now, given REM's capacity for periodic activation of limbic, amygdala, and related neuroendocrine circuits that support these same filiative systems, it follows that insecure-resistant infants would evince high REM activation levels. High activation of REM, in turn, would facilitate proximity-seeking behaviors. To get to REM, however, resistant infants must fall asleep and thus they will show, just as Scher (11) reported, no difficulties falling asleep. But once asleep the relatively high REM activation levels in these babies will eventually awaken them. This is due to the fact that to arouse from sleep organisms that experience REM typically must pass through REM to awake (8,46). Thus the paradoxical sleep pattern of insecure-resistant infants described by Scher of high frequency of night wakings, long waking episodes (relative to insecure-avoidants), with no difficulty falling asleep and efficient overall sleep, is explained.

What about the sleep patterns of insecure-avoidant infants? These infants adopt a distance-maintaining stance relative to the caretaker and therefore want to inhibit filiative and approach tendencies. If REM functions, in part, to support these filiative and approach tendencies, then, in stark contrast to their insecure-resistant counterparts, insecure-avoidant infants will 'want' to inhibit REM. Lower REM activation levels will lead to fewer night wakings and less 'difficulty in falling asleep'. If insecure-avoidant infants inhibit REM and high REM activation levels are associated with arousals and night wakings, then these infants should display even less difficulty falling asleep than insecure-resistant infants, and that is exactly what we found.

Invoking REM's apparent capacity to activate filiative neural circuits may also help to explain the greater numbers of clinically significant sleep disturbances in infants classified as insecure-resistant as compared to those classified as insecure-avoidant. As explained above the insecure-resistants very likely experience high REM activation levels- and thus are chronically overaroused. We know, however, of no published polygraphic data on infants whose attachment styles have been measured.

We relied on data obtained from maternal interviews- a research strategy dictated by our desire to take advantage of the uniquely large number of infants classified as insecure-avoidants in the NICHD dataset. We believe, however, that future studies of the sleep-attachment relation in infants should focus on effects of attachment classification on sleep architecture in the developing infant. Our results suggest that effects of attachment on infant sleep will be most clearly observed when comparing insecure-resistants and insecure-avoidants as these are predicted by current theory to be most discrepant in terms of their attachment behavioral strategies. In addition, our conceptualization of the role played by REM in articulating the sleep–attachment physiological relation, though somewhat speculative, suggests that measurement of various components of REM (e.g. latency to REM, REM bursts, phasic vs. tonic components) may be important in elucidating the relation of sleep processes to development of emotional responses in the infant, especially those directed to the mother.

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