VIII. ATTACHMENT AND SLEEP AMONG TODDLERS: DISENTANGLING ATTACHMENT SECURITY AND DEPENDENCY

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ABSTRACT Many scholars have proposed that parent-child attachment security should favor child sleep. Research has yet, however, to provide convincing support for this hypothesis. The current study used objective measures of sleep and attachment to assess the longitudinal links between mother-child attachment security and subsequent sleep, controlling for child dependency. Sixty-two middle-class families (30 girls) were met twice, when children were 15 months (Wave 1; W1) and 2 years of age (Wave 2; W2). At W1, mother-child attachment was assessed with the observer version of the Attachment Q-Sort. At W2, children wore an actigraph monitor for 72 hr. Results indicated that children more securely attached to their mothers subsequently slept more at night and had higher sleep efficiency, and these predictions were not confounded by child dependency. These findings suggest a unique role for secure attachment relationships in the development of young children's sleep regulation, while addressing methodological issues that have long precluded consensus in this literature.

Dahl (1996) proposed that the process leading to sleep is based on a distinct decrease of alertness and vigilance, requiring that individuals feel a sense of safety and emotional security sufficient to surrender to sleep. Consistent with Bronfenbrenner's (1986) ecological model, which proposes the critical importance of the immediate context, major developmental theories converge to suggest that among young children, such a sense of safety hinges strongly on the family context and on the quality of parent-child relationships (e.g., Bowlby, 1982; Cummings & Davies, 1996). This study's focus on attachment security is representative of the *immediate context* depicted in Figure 1 of Chapter I (in this volume). Many scholars have proposed that

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parent-child attachment security, or the quality of the emotional bond between a child and his or her primary attachment figures, should favor child sleep (e.g., Keller, 2011; Sadeh & Anders, 1993; Schore, 1996). Empirical research has, however, "provided so far only very limited support for this hypothesis" (Sadeh, Tikotzky, & Scher, 2010, p. 91).

Studies in the field have largely relied on subjective measures (maternal reports) of sleep. Most of these studies suggest that mothers of resistant children report more sleep problems in their children than mothers of children characterized by secure or avoidant attachment (Beijers, Janser, Riksen-Walraven, & de Weerth, 2011; McNamara, Belsky, & Fearon, 2003; Morrell & Steele, 2003; Zentall, Braungart-Rieker, Ekas, & Lickenbrock, 2012). Children with resistant attachment are characterized by dependency, signaling of distress, and poor soothing abilities (Ainsworth, Blehar, Waters, & Wall, 1978). Further, children identified as poor sleepers by their mothers have been hypothesized to be those who have difficulty soothing after waking and who therefore signal their awakenings, although not necessarily being bad sleepers (Anders, Halpern, & Hua, 1992). Hence, the findings suggesting more mother-reported sleep difficulties among resistant children are difficult to interpret, as they could be an artifact of these children's greater dependency on their caregivers for soothing, resulting in more parent-reported awakenings at comparable levels of actual sleep quality or duration.

Studies that have examined the links between attachment and sleep as measured objectively do not, however, settle the issue. Vaughn and colleagues (2011) found theoretically consistent links between preschoolers' actigraphy-derived sleep and attachment representations as measured by the Attachment Story Completion Task, with more secure representations found to relate to higher-quality sleep. When examining infants, however, two studies including one from our team found no relation between actigraphy-derived sleep and infant attachment as measured by the Strange Situation Procedure (Scher, 2001; Simard, Bernier, Bélanger, & Carrier, 2013). However, these two studies, conducted with low-risk community samples, observed unusual distributions of attachment patterns with a high proportion of secure children (Simard et al., 2013) or a low proportion of avoidant children (Scher, 2001). This suggests that among certain low-risk samples, the Strange Situation Procedure may not be the most suitable measure to detect fine individual differences in infant attachment. Scher and Asher (2004) used the mother-reported Attachment Q-Sort, which presents the advantage of yielding scores for both attachment security and dependency, which represents strong reliance of the child on the caregiver for soothing or assistance, a core characteristic of resistant attachment. The authors found no relation between either of these scores and actigraphy-derived sleep variables. However, they found that mothers who perceived their infants as being more dependent on them also perceived lower sleep quality in their infants, reiterating the hypothesis that child dependency may explain some of the links found in other studies between child resistant attachment and mother-reported child sleep.

In sum, the literature to date raises the possibility that a systematic, attachment-related bias may be at play with maternal reports of child sleep, with mothers of more dependent or resistant children reporting them to have more sleep difficulties. However, the studies that did use objective sleep assessments with infants, thereby overcoming possible maternal perception biases, found limited variation in infant attachment (Scher, 2001; Simard et al., 2013) or used a mother-reported attachment measure (Scher & Asher, 2004), which meta-analytic data suggest presents limited validity (Van IJzendoorn, Vereijken, Bakermans- Kranenburg, & Riksen-Walraven, 2004). These measurement issues substantially limited these studies' capacity to identify potential links between attachment and sleep. Finally, the vast majority of studies have used concurrent measures of attachment and sleep, thereby considerably undermining the capacity to ascertain direction of effects and to understand the underlying developmental process.

Aims and Hypotheses

In this study, to better understand the links between child sleep and attachment, we (a) addressed this link longitudinally; (b) used appropriate objective measures for both sleep and attachment; and (c) controlled for child dependency. We used the observer version of the Attachment Q-Sort, which represents an especially well-suited measure, as it yields both a continuous score of attachment security and a score for child dependency. The Attachment Q-Sort shows excellent variation in attachment security even in low-risk samples (e.g., Whipple, Bernier, & Mageau, 2011)

Specifically, we assessed whether mother-child attachment security, as measured at 15 months with the observer version of the Attachment Q-Sort, predicts actigraphy-derived sleep minutes and quality at 2 years, above and beyond child dependency. These two time points were chosen based on developmental considerations; 15 months is at the core of the prime period to assess mother-child attachment (12–18 months; Ainsworth et al., 1978), and some of the most pronounced developments in sleep happen during the second year of life (Acebo et al., 2005; National Sleep Foundation, 2004). The longitudinal multi-method design allowed us to (a) decrease shared method variance by assessing attachment security and child sleep at two distinct time points through objective methodologies, and thus (b) begin to clarify the direction of associations. Given the clarity and soundness of the conceptual rationale for expecting links between attachment security and sleep (Dahl, 1996; Keller, 2011; Sadeh & Anders, 1993; Schore, 1996), it was expected that infants more securely attached to their mothers would show sleep of greater duration and higher quality over time.

METHOD

Participants

Sixty-two families (30 girls) living in a large Canadian metropolitan area participated in this study. Families were recruited from birth lists randomly generated and provided by the Quebec Ministry of Health and Social Services. Criteria for participation were full-term pregnancy and the absence of any known physical or mental disability. Families were assessed twice, when children were 15 months old (W1; $M = 15.47$, $SD = .72$) and 2 years old (W2; $M = 25.12$ months, $SD = 2.08$). Most parents were Caucasian (87.1% of mothers, 75.8% of fathers). Mothers were between 20 and 44 years old at W1 ($M = 31.98$), and fathers between 21 and 47 years old ($M = 33.98$). Both mothers and fathers had 15.74 years of education on average, which varied from 8 to 18 years for mothers ($SD = 2.37$) and from 11 to 21 years for fathers ($SD = 2.42$), with 84% of mothers and fathers holding a college degree. Family income was based on categorical scores distributed as follows: 1 ($n = 3$) < \$20K; 2 ($n = 7$) = \$20–39K; 3 ($n = 10$) = \$40–59K; 4 ($n = 16$) = \$60–79K; 5 ($n = 6$) = \$80–99K; 6 ($n = 20$) = \$99K and over. Mean family income for the sample was 4.21 ($SD = 1.57$). Mean family income in Canada was \$74,600 for the years of data collection.

Procedures

At W1, child attachment security and dependency were assessed with the Attachment Q-Sort completed by an observer following a home visit. At W2, children wore an actigraph monitor for 72 hr. Mothers were instructed to complete a diary of their child's sleep during the same period. The parents of all participating children signed a consent form at the outset of the study that informed them on the nature and risks of participating, and they received financial compensation along with a toy for the child.

Measures

Attachment Security and Dependency

Mother-child attachment was assessed when children were 15 months-old (W1) with the observer version of the Attachment Q-Sort (Version 3.0; Waters, 1995), completed by an extensively trained research assistant (see below) immediately after a 1 hr home visit. Following the work of Pederson and Moran (1995), the home visit protocol was purposely designed to create a situation in which the research tasks and the infant's demands competed for maternal attention, which placed the dyad in a challenging situation, likely to activate the infant's attachment system. The visit included child-centered tasks (e.g., puzzles to solve), a brief interview with the mother, a videotaped mother-infant interactive sequence (10 minutes of free play with toys brought by the research assistant), and questionnaires that mothers had to complete while the infant was not looked after by the research assistant (with the goal of restricting maternal availability to infant demands, one of the classic triggers of the attachment system in infancy). The research assistant who administered research tasks also observed and noted child behaviors throughout the visit and rated the Attachment Q-Sort immediately upon returning to the lab, based on the entire observation period. To maximize the reliability of the observations performed during the home visits, we followed Pederson and Moran's recommendations for training our home visitors. Research assistants first attended a two-day training workshop consisting of seminars related to (1) early parent-infant interactions, (2) behavioral observation, and (3) techniques of home visiting. After the workshop, the assistants performed their first few home visits with a more experienced colleague, and they completed the Attachment Q-Sort together. When the junior home visitors were ready to lead a home visit without the assistance of a colleague, the home visits were followed by a debriefing session either with the P.I. or with an experienced graduate student, to review the salient elements of the visit before scoring the Q-Sort.

Per standard guidelines (Waters & Deane, 1985), the 90 items of the Attachment Q-Sort, each describing potential child behaviors, are first sorted into nine clusters, ranging from very similar to very unlike the observed child's behaviors. For 17% of families, two trained assistants conducted the home visit together and sorted the items independently after the visit. This allowed for verification of inter-rater reliability, which was found to be satisfactory, intra-class correlation = .73. In a second step, this sort representing the observer's description of the child's behavior during the visit is correlated with standard criterion sorts provided by Waters (1995). In the current study, two criterion sorts were used, yielded independent scores for security and dependency. Thus, a child's security score represents the degree of similarity between his/her observed behavior and that of the "prototypically secure child," whereas the score for dependency represents the degree of similarity between this child's behavior and that of the "prototypically dependent child." Security is indicated by high scores on items such as "*If held in mother's arms, child stops crying and quickly recovers after being frightened or upset*" or "*If mother reassures him, child will approach or play with things that initially made him cautious or afraid*"; and Dependency, by high scores on items such as "*Child stays closer to mother or returns to her more often than the simple task of keeping track of her requires.*" Scores can range from −1.0 (highly insecure or highly independent) to +1.0 (highly secure or highly dependent). In the current study, Security and Dependency were not significantly correlated, $r = .23$, $p = .08$.

Meta-analytic data suggest that the observer Attachment Q-Sort shows excellent construct validity, with attachment scores converging with maternal sensitivity, attachment security assessed with the Strange Situation Procedure, and child adaptation (Van IJzendoorn et al., 2004). In fact, several studies suggest that the Q-Sort is more closely related to child social and behavioral outcomes than the Strange Situation Procedure (Fearon, Bakermans-Kranenburg, Van IJzendoorn, Lapsley, Roisman, 2010; McCartney, Owen, Booth, Clarke-Stewart, & Vandell, 2004; Raikes & Thompson, 2008). The observer Attachment Q-Sort is thus now considered one of the gold-standards of attachment research, and has been used with children aged between 1 and 6 years (Van IJzendoorn et al., 2004).

Actigraphy and Sleep Diaries

Children (2 years old; W2) wore an actigraph monitor (Mini-Mitter® Actiwatch Actigraph, Respironics) for 72 hr. This brand of actigraphy, relative to polysomnography, has been reported to overestimate night awakenings in young children, thereby underestimating sleep time (e.g., Insana, Gozal, & Montgomery-Downs, 2010; Meltzer, Walsh, Traylor, & Westin, 2012), because of young children's increased motor activity during sleep (de Koninck, Lorrain, & Gagnon, 1992). Consequently, actigraphic data were analyzed initially with the automated manufacturer's scoring algorithm set at high sensitivity (more appropriate for young children's motor activity). A secondary "smoothing" algorithm, developed specifically to address the problem of overestimation of night waking (Sitnick, Goodlin-Jones, & Anders, 2008), was then applied to the nighttime data. This algorithm has been validated against videosomnography (Sitnick et al., 2008) and home-based polysomnography (Bélanger, Bernier, Simard, Paquet, & Carrier, 2013). Young children often feel uncomfortable wearing an actigraph on their wrist, particularly at night. Therefore, mothers were informed that the child could wear the actigraph either on the wrist or the ankle and were asked to report this information to the research assistant (81% of the children wore the actigraph on the ankle). Location of the actigraph does not influence the data, or the correspondence with polysomnography, among toddlers and preschoolers: this model of actigraph shows good to high agreement (77–98% across parameters) with polysomnography for this age group, regardless of the location of the monitor (Bélanger et al., 2013).

Because sleep diaries are necessary to corroborate the validity of actigraphy data, mothers were instructed to complete a sleep diary for the 72 hr during which their child was wearing the actigraph. Data of four families (out of an original sample of 66) for whom actigraphic data showed poor correspondence with diaries were discarded, resulting in the current sample of 62 families.

Five children refused to wear the actigraph during the day, resulting in missing data related to daytime sleep. These children did not differ from others on sociodemographics, attachment security and dependency, or nighttime sleep (all t's < 2.33, *ns*). Given this absence of differences, the data were considered missing at random, and therefore handled with multiple imputation (as recommended by Schlomer, Bauman, & Card, 2010) to have equivalent sample sizes ($N = 62$) for all sleep parameters (see below for details). Sleep data were available for three nights for 48 participants, two nights for 9 participants, and only one night for 5 participants. In nearly all cases, sleep data were missing because children refused to wear the actigraph for a second or third day, or had to be discarded because the diary indicated that the child had been asleep in a moving object (car, stroller). In one case, actigraphy data was available but unusable because the sleep diary had not been completed for that night.

Actigraphy-derived sleep parameters were: (a) sleep minutes at night (total number of minutes between sleep onset and offset that were scored as sleep); (b) sleep efficiency (sleep minutes at night/(sleep minutes at night + wake minutes at night) * 100); and (c) sleep minutes over the 24 hr-period (sleep minutes at night + minutes of daytime naps). These sleep parameters were chosen based on their demonstrated correspondence to polysomnography estimates when using this model of actigraph at the same developmental period (Bélanger et al., 2013). We chose to examine total sleep minutes over the 24 hr-period given that most children still nap at age 2 years (Acebo et al., 2005). There was no significant difference according to the number of nights with available actigraphic data on nighttime sleep minutes, sleep efficiency, or sleep minutes over the 24 hr-period.

Plan of Analysis

Missing data were first imputed, followed by descriptive analyses to verify proper variable distribution. Correlations were then run among the dependent variables (sleep parameters) and potentially confounding variables, so as to identify relevant covariates for the main analyses. Finally, hierarchical regression analyses were conducted to estimate the unique contribution of attachment security to the prediction of the variance in child sleep, after accounting for the influence of child dependency and covariates.

RESULTS

Preliminary Analyses

To maximize the sample size, cases with missing values (for the five children who refused to wear the actigraph during the day) were included in the analyses by estimating the missing data. The multiple imputation procedure available in SPSS 20.0 was used to impute data for 24-hr sleep minutes (note that multiple imputation works well even on smaller samples, $N = 50$, and with far more [50%] missing data; Graham, 2009). Five imputations were used, with missing data estimated from all other data available. All subsequent analyses were performed on each of the imputed data sets, and results for each were then averaged (Schafer, 1997). Table 1 presents the descriptive statistics for the key study variables. All main variables presented satisfactory variability, comparable to that observed in other studies. Table 1 also presents the zero-order correlations between the central variables. The moderate inter-correlations among the three sleep parameters considered suggest that they assess related yet distinct aspects of children's sleep, which will preclude redundancy in the final regression analyses.

Sleep parameters were also analyzed for relations to many potential biological (child gender, weeks of gestation, birth weight and length, APGAR scores at 1, 5, and 10 minutes, duration of breastfeeding) or sociodemographic confounds (presence of siblings, birth order, parental work hours, family yearly income, ethnicity, paternal and maternal education). Only two of these variables were found to relate to sleep, specifically to the 24-hr sleep minutes variable, which was associated with maternal education ($r = .37$, $p = .003$) and duration of breastfeeding during infancy (assessed in weeks; $r = .36$, $p = .004$). To run uniform models, they were both included as covariates in all subsequent analyses.

Main Analyses

A series of hierarchical regression analyses were conducted to investigate whether security of attachment predicted unique variance in sleep outcomes

TABLE 1

RANGE, MEANS, STANDARD DEVIATIONS, AND CORRELATIONS BETWEEN STUDY VARIABLES

	1.	2.	3.	4.	5.
1. Nighttime sleep minutes	—	.67**	.56**	.26*	−.17
2. Nighttime sleep efficiency (%)		—	.45**	.29*	−.06
3. 24-hr sleep minutes			—	.15	−.05
4. AQS Security				—	.23
5. AQS Dependency					—
Range	389–678	67–99	549–888	−.27–.79	−.42–.33
Mean	564	90.17	719	.47	−.01
(*SD*)	(59)	(7.11)	(83)	(.25)	(.16)

Note. AQS = Attachment Q-Sort.
*$p < .05$.
**$p < .01$.

TABLE 2

HIERARCHICAL REGRESSION MODELS PREDICTING SLEEP PARAMETERS FROM INFANT ATTACHMENT

	R^2	ΔR^2	F Change	β
Child 24-hr sleep minutes				
1. Maternal education	.22		8.29**	.30*
Duration of breastfeeding				.38*
2. Infant dependency	.25	.03	2.11	−.23
3. Infant attachment security	.29	.04	3.41	.21
Child nighttime sleep minutes				
1. Maternal education	.00		.09	.01
Duration of breastfeeding				.16
2. Infant dependency	.04	.04	2.39	−.30*
3. Infant attachment security	.14	.10	6.49*	.32*
Child nighttime sleep efficiency				
1. Maternal education	.03		.77	.13
Duration of breastfeeding				.14
2. Infant dependency	.03	.01	.51	−.18
3. Infant attachment security	.14	.11	6.93*	.33*

*$p < .05$.
**$p < .01$.

after controlling for the two covariates (maternal education and duration of breastfeeding, block 1 in each equation) and for child dependency (block 2). A summary of these analyses is presented in Table 2. The regression coefficients shown are those in the final models, while accounting for all other predictors.

Results were more compelling with the nighttime than with the 24-hr sleep parameters. Hence, after accounting for maternal education, duration of breastfeeding, and dependency, mother-child attachment security (block 3) made significant additional contributions to the prediction of variance in both nighttime sleep minutes (10%) and nighttime sleep efficiency (11%). Higher attachment security was uniquely related to more nighttime sleep minutes ($\beta = .32$, $p = .01$) and greater sleep efficiency ($\beta = .33$, $p = .01$) above all other factors considered. In both cases, this resulted in a significant increment in overall model significance (see Table 2). Finally, only one significant result was found with child dependency, which was uniquely related to *fewer* sleep minutes at night ($\beta = -.30$, $p = .04$). The overall models explained between 14% and 29% of variance in the three sleep parameters.

DISCUSSION

There is a need for longitudinal research relying on well validated objective assessments of both child sleep and attachment. The central aim of this study was to investigate the relations between early mother-child attachment security and subsequent child sleep, while controlling for child dependency and relying on robust measures of attachment and sleep. The results showed that after accounting for sociodemographic and biological covariates and for child dependency, mother-child attachment security made significant unique contributions to the prediction of children's subsequent nighttime sleep. Children more securely attached to their mothers slept more at night nine months later and their sleep was more efficient. These predictions were not confounded by child dependency. Of note, given the nature of our design, prediction is used in the statistical versus causal sense.

These findings contribute to the suggestion of a specific role of attachment security in the development of young children's sleep. They are consistent with the notion that bedtime, constituting a clear-cut separation from caregivers, may induce anxiety, and that a defining feature of securely attached children is their enhanced capacity to self-regulate in such emotionally taxing circumstances. In fact, scholars adopting the frameworks of attachment (Sroufe, 2005), emotion regulation (Cole, Martin, & Dennis, 2004), and psychobiological development (Calkins & Hill, 2007) agree that young children's self-regulatory capacities develop in the context of attachment relationships, mainly through joint experiences of dyadic regulation. Through repeated experiences of successful regulation supported by a caregiver, securely attached children are thought to gradually integrate the skills acquired in their own repertoire of independent self-regulation skills, which can then be used in the absence of the caregiver when needed (Calkins, 2004). When applied to the sleep context, these increased self-regulatory capacities may translate into more efficient self-soothing at sleep onset or during night waking, and thus enhanced capacity to fall asleep rapidly without intervention by a caregiver.

Furthermore, joint experiences of dyadic regulation might influence infants' neural pathways. It is increasingly documented that the quality of parent-child relationships is related to child neuroendocrine regulation (Bernard & Dozier, 2010; Luijk et al., 2010) and other indices of sympathetic and parasympathetic system functioning (Oosterman, De Schipper, Fisher, Dozier, & Schuengel, 2010), which in turn are related to children's sleep (El-Sheikh, Buckhalt, Keller, & Granger, 2008; Watamura, Donzella, Kertes, & Gunnar, 2004; see also El-Sheikh et al., Chapter VI, in this volume). Hence, part of the regulatory function that secure attachment is thought to have on children's sleep might perhaps be accounted for by its intermediate impact on children's psychophysiological regulatory systems.

Alternatively, parents of securely attached children may be more adept at responding to their children's nighttime signals in a way that promotes a rapid return to sleep. Indeed, bedtime and nighttime parental behaviors relate to young children's sleep (see for instance Staples et al., Chapter IX, in this volume). Higley and Dozier (2009) found that mothers of securely attached infants had nighttime interactions with them that were generally more consistent, sensitive, and responsive than those of insecurely attached infants. In fact, a more general hypothesis is that both secure attachment and enhanced sleep duration and efficiency could be the result of the common underlying influence of certain parental behaviors without a causal link between sleep and attachment (Keller, 2011). Notably, we previously reported that daytime behaviors such as maternal sensitivity or support of the child's autonomy were related to both child attachment security (Whipple et al., 2011) and subsequent sleep duration (Bordeleau, Bernier, & Carrier, 2012). Overall, we would argue that each of these mechanisms (enhanced behavioral and psychophysiological regulation, more competent nighttime parenting, and common underlying effects of daytime parenting) may well account for a portion of the links we found between attachment and sleep, and that the relative prominence of these mechanisms could vary across children. However, these are tentative explanations pending empirical testing.

A secondary finding was that child dependency was negatively related to nighttime sleep minutes. Although we considered dependency mainly as a control because it can obscure or inflate relations between attachment security and outcomes in young children (Tarabulsy, Avgoustis, Phillips, Pederson, & Moran, 1997), especially sleep (Scher & Asher, 2004), this finding may merit attention. From a theoretical standpoint, high dependency on the caregiver as measured by the Attachment Q-Sort in this study, and characteristic of infants with resistant attachment patterns, is presumed to result from inconsistent (rather than constantly low) parental availability and responsiveness (Ainsworth et al., 1978; Cassidy & Berlin, 1994). Thus, parents of dependent or resistant children are thought to be unpredictable, sometimes responding to their child's signals and sometimes not. Such unpredictability might play a reinforcing role for child signaling or even amplification of distress during nighttime separations. This would not only translate into concurrent maternal reports of poorer sleep quality among dependent (Scher & Asher, 2004) or resistant infants (Beijers et al., 2011; McNamara et al., 2003; Zentall et al., 2012), as often observed, but also, as suggested by the current results, could play a causal role in the unfolding of real sleep difficulties among these children, who may become increasingly less able to self-regulate at night without the intervention of a caregiver (Sadeh et al., 2010). Hence, although our findings are clearest in the suggestion of a role for secure parent-child attachment in the development of adequate sleep regulation among toddlers, we would tentatively suggest that child dependency generally, or resistant attachment specifically, may deserve further attention. This would be of importance as the field works toward identifying how parent-child attachment relationships come to play a role in children's sleep.

Limitations

This study presents limitations that need to be considered in interpreting the results. First, the modest sample size limited the statistical power. Additionally, the design was longitudinal but not fully cross-lagged, thereby limiting the strength of the inferences that can be made about directionality or processes. The fact that most participants were college-educated and Caucasian also constitutes a limitation, especially in light of evidence suggesting that certain family factors relate to child sleep to a greater degree among ethnic minority or lower-SES families (Kelly & El-Sheikh, 2011). Finally, although we have often found theoretically consistent links between attachment security assessed with a one-hour observation period and numerous developmental antecedents and outcomes (e.g., Bernier, Carlson, Deschênes, & Matte-Gagné, 2012; Bernier, Matte-Gagné, Bélanger, & Whipple, 2014), it is deemed ideal to use two hours or more of observation (Waters, 1995); therefore, a longer observation period may have enhanced the validity of the attachment assessment.

Future Directions

An exciting avenue for future research lies in the use of polysomnographic sleep estimates to investigate the links between different aspects of parent-child relationships and finer aspects of children's sleep. Furthermore, future studies with higher-risk or more diverse populations will be invaluable in testing the generalizability of the links uncovered here. Finally, although we chose to assess mother-child attachment, attachment researchers demonstrated decades ago that fathers can and do constitute attachment figures for their children (e.g., Lamb, 1977; Sagi, Lamb, Shoham, Dvir, & Lewkovicz, 1985), and emerging evidence suggests that the quality of father-child relationships relates to both subjective and objective measures of child sleep (Bordeleau et al., 2012; Keller & El-Sheikh, 2011; Tikotzky, Sadeh, & Glickman-Gavrieli, 2011; see also Tikotzky et al., Chapter VII, in this volume).

CONCLUSION

This study indicates that children more securely attached to their mothers at 15 months had higher nighttime sleep duration and efficiency when they reached 2 years of age. To our knowledge, the only other study that investigated the sleep-attachment links with objective measures of both while finding sufficient variation in child attachment is that by Vaughn and colleagues (2011), who also found theoretically sound links between preschoolers' attachment representations and actigraphy-derived sleep. Although that was a cross-sectional study, the convergence of results with those of the current report, based on a longitudinal study of younger children and focusing on attachment at a behavioral rather than representational level, appears to suggest that the often-proposed links between child sleep and attachment are beginning to stand the test of empirical scrutiny.

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