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Chapter IX. Bedtime Routines in Toddlerhood: Prevalence, Consistency, and Associations with Nighttime Sleep

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Abstract

The ability to transition from wakefulness to sleep is one of the most important tasks in the development of sleep during early childhood. Although establishing regular bedtime routines for children with sleep problems can be clinically effective in reducing the number of signaled night awakenings and increasing amounts of sleep, it is unclear whether a regular bedtime routine would be associated with either the frequency of signaled night awakenings or nightly sleep minutes in a non-clinical sample of children. This study examined the role of a regular bedtime routine on the development of sleep regulation and consolidation in a community sample of young children. Adherence to a bedtime routine was concurrently associated with a greater amount of nightly sleep at 36 and 42 months. In addition, adherence to a bedtime routine predicted an increase in nightly sleep minutes over a six-month period. Finally, this study demonstrated that adherence to a bedtime routine was particularly supportive of developmental gains for children of mothers who used consistent parenting practices during the day.

Pediatricians often hear complaints about child difficulties in initiating and maintaining sleep (Sadeh, Tikotzky, & Scher, 2010). Approximately 30% of children under the age of five show some form of sleep disruption. Longitudinal studies have shown that approximately 40% of infants with a sleep problem continue to have sleep problems through early childhood (Touchette et al., 2005). Research is needed on possible explanations of sleep problems, and ultimately on prevention efforts. The present paper focuses on a particular explanation of high interest in the field—regularity of the bedtime routine.

Two aspects of sleep—regulation and consolidation—undergo large developmental changes from birth through age five years (Sadeh & Anders, 1993; see also El-Sheikh & Sadeh, Chapter I, in this volume). Regulation refers to the ability to transition from wakefulness to sleep. Consolidation refers to the establishment of a single episode of nighttime sleep during a 24-hour period. Children develop sleep-wake regulation and sleep consolidation as part of

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a transactional system (Bronfenbrenner & Morris, 2006; Sadeh & Anders, 1993; see also Teti et al., Chapter X, in this volume). This system includes factors related to the child (e.g., temperament, health), the subsystem undergoing development (e.g., neurological, physiological), the family (e.g., parenting practices), and the culture (e.g., location and schedule of sleep). As illustrated in Figure 1, Chapter 1, each element of the system influences and is influenced by other elements of the system. Sadeh and colleagues (2010) recently concluded that there is a robust relation between parental involvement and night awakenings in infancy. Greater parental involvement (e.g., feeding, rocking) while infants fall asleep is associated with more frequent and longer night awakenings (see also Tikotzky et al., Chapter VII, in this volume). More interactive settling activities (e.g., cuddling, carrying) in toddlerhood have also been associated with more night waking problems (Hall, Scher, Zaidman-Zait, Espezel, & Warnock, 2011). High levels of parental involvement during the wake-sleep transition appear to impede growth of infants' and young children's abilities to self-regulate back to sleep should they awaken during the night.

Beyond possible effects of active parent-child involvement prior to bedtime, lack of regularity in pre-bedtime activities has also been associated with difficulty in sleep regulation (Sadeh, Mindell, Luedtke, & Wiegand, 2009). Sadeh and colleagues found that greater irregularity of the bedtime routine was predictive of more frequent night awakenings. Irregular bedtime routines are likely to be related to irregular timing and amounts of child sleep, which have been found to be associated with child difficulties at preschool, even controlling for family stress and parenting practices (Bates, Viken, Alexander, Beyers, & Stockton, 2002). Augmenting the bedtime routine has shown promise in intervention studies, for example, the recent study showing that implementation of a regular bedtime routine with toddlers for two weeks reduced the number and duration of night awakenings and increased the duration of the longest sleep period, and control group toddlers did not show these changes (Mindell, Telofski, Wiegand, & Kurtz, 2009).

Although regular bedtime routines can be clinically effective in reducing the number of night awakenings resulting in increased amounts of nightly sleep for children with sleep problems, it is unclear whether a regular bedtime routine would be associated with either the frequency of night awakenings or the duration of nightly sleep in a community sample of children. For example, the samples in the studies by Mindell and colleagues (2009, 2011) included only mothers identifying problems related to their children's sleep and not already regularly using a major bedtime routine. Research has shown that family routines in general are associated with better child outcomes (Fiese, Tomcho, Douglas, Josephs, Poltrock, & Baker, 2002), which raises the possibility that adherence to a bedtime routine may reflect a generally organized parenting style. Parents who set clear limits and expectations for a child's behavior during the day may also set clear expectations for their child's behavior at night. Consequently, a regular bedtime routine may not be specifically associated with either the frequency of night awakenings or the duration of nightly sleep after factoring in parenting style of consistent responding more generally. In other words, the effects of a regular bedtime routine may be particularly beneficial for children who experience inconsistent parenting throughout the day. Consistent bedtime routines may provide a sense of security and safety (Dahl, 1996) that would support the child's ability to self-regulate their sleep/wake states, despite inconsistent parenting during the day.

In addition to development of sleep-wake regulation, children also typically consolidate their sleep into a single nighttime period by age five (Iglowstein, Jenni, Molinari, & Largo, 2003). Research suggests this transition into a single period does not occur with the gradual shortening of the amount of sleep during the day, but rather through a reduction in the frequency of naps (Iglowstein et al., 2003; Koch, Soussignan, & Montagner, 1984). Indeed, when the amount of sleep is considered over a 24-hour period, children who nap tend to get as much sleep as their same-aged peers who do not nap (Ward, Gay, Anders, Alkon, & Lee, 2007). Because regular bedtime routines are associated with fewer night awakenings as well as an increase in the amount of sleep, it is unclear whether these effects would remain if the amount of sleep per day were considered as opposed to just the amount of nightly sleep. Thus, the lack of a bedtime routine may not alter the total amount of sleep a child experiences in a 24-hour period.

Another question about bedtime routines is whether they affect the development of sleep in childhood. Mindell et al. (2011) found that parents who were led to implement better sleep hygiene practices and followed a specific routine saw benefits in child sleep, parent sleep, and parent feelings of efficacy. These effects were seen within weeks and endured for at least one year. However, control group parents, who did not necessarily implement a bedtime routine, also saw some improvements in their child's sleep over one year. So, it is not clear whether the inclusion of a bedtime routine resulted in *gains* in the amount of sleep over and above the gains in nighttime sleep that typically occur during this developmental period. Also, given the general tendency of parents to underestimate the amount of time children are awake during the night (Sitnick, Goodlin-Jones, & Anders, 2008), the gains in nighttime sleep in Mindell et al. (2011) could be due to fewer signaled awakenings and not necessarily gains in time asleep. Thus, past studies of the effects of bedtime routines using parental report measures of sleep may not show whether longitudinal changes in the amount of nighttime sleep are a due to a reduction in signaled awakenings, actual increases in the duration of nighttime sleep, or a combination of both.

Little is known about the role of parenting practices at bedtime in relation to the developmental changes in children's sleep. Much of the research to date has either included a single assessment, which does not permit questions of development, or has been conducted with families who have expressed concern about their child's sleep, which does not squarely address questions about typical development. The development of children's sleep occurs within a larger transactional system. The present study considers the role of bedtime routines and parenting practices in developmental changes in sleep in early childhood at the level of the *immediate context* in the systems perspective model presented in Figure 1 (Chapter 1, in this volume). Parents' sleep practices at one point in time may not only lead to good results at the time but also support development at a later point in time. A regular bedtime routine may be beneficial for the *development* of sleep regulation and consolidation. This kind of process is supported by the Mindell et al. (2011) aforementioned pattern of longitudinal changes in child sleep being somewhat more prevalent in the intervention group than in the control group.

The primary purpose of this study was to examine the role of a regular bedtime routine on the development of sleep in a community sample of young children. The choice to focus on

children beginning at 30 months of age arose from emerging findings suggesting relations between sleep and the rapid neurological development between ages 2 to 4 years related to a range of regulatory processes (Dahl & Conway, 2009; Kochanska, Murray, & Harlan, 2000; Molfese, Beswich, Molnar, Jacobi-Vessels, & Gozal, 2009; Rothbart, Ellis, Rueda, Posner, 2003). This study focused on three aspects of children's sleep related to the development of sleep-wake regulation: signaled (nighttime) awakenings reported by mothers, amount of nighttime sleep minutes (actigraphy-based), and sleep minutes per 24-hour period (actigraphy-based). Children's sleep/wake regulation – particularly returning to sleep following a nighttime awakening – is developing between 30 and 42 months, and we used maternal reports of nighttime awakenings to index the frequency with which children are soliciting parental involvement in returning to sleep.

Aims and Hypotheses

We examined the role of adherence to a bedtime routine as a correlate and predictor of children's sleep. Based on past research, we hypothesized that increased adherence to a bedtime routine would be concurrently and longitudinally associated with a decrease in the frequency of parent-reported signaled awakenings as well as an increase in actigraphy-based nightly sleep minutes after accounting for parenting practices more generally. Past research has shown that sleep per 24-hour period did not differ between children who napped and those who did not nap. Therefore, we also tested whether adherence to a bedtime routine would be associated with longitudinal changes in sleep minutes per 24-hour period with expectations similar to the aforementioned hypotheses. Finally, based on a tentative assumption that children with parents who rated themselves as inconsistent in their parenting behaviors could be at risk for delays in child sleep regulation, we expected that a solid bedtime routine would matter more for sleep regulation for children who experienced inconsistent parenting than for children who experienced more consistent parenting.

Method

Participants

The participants for this study, $N = 87$, come from a community sample of children followed longitudinally at ages 30, 36, and 42 months. The majority were girls ($n = 50$, boys = 37) from two-parent households (93% married, 5% single, 2% other) in which the mothers were college educated (73%, some college = 18%, high school diploma or equivalent = 9%), and European American (82%, Hispanic = 7%, African American = 4%, mixed/other = 7%). All procedures were approved by the Institutional Review Board at Indiana University, Bloomington. Mothers provided written informed consent.

Procedures

At each of the assessments, at ages 30, 36, and 42 months, a research assistant went to the home on the first day of the assessment and provided mothers with questionnaires, diary forms, and seven wrapped gifts (each less than $1) to give to the child if they awoke in the morning wearing the actigraph. Mothers were not required to use the gifts nor were the

children told about the gifts, however, anecdotally, most mothers did use them. Mothers returned the daily diaries and actigraph to the lab on the eighth day.

Measures

Actigraphy—Children wore an actigraph (MicroMini-Motionlogger from Ambulatory Monitoring, Inc.) on their wrist continuously for eight days and seven nights (M = 6.84, 7.04, 6.88, SD = 1.26, 1.12, 1.24 nights at 30, 36, and 42 months, respectively). Actigraphy data were unavailable at each wave because of actigraph failure (n_{30} = 11, n_{36} = 7, n_{42} = 12) or unavailability to participate (n_{30} = 0, n_{36} = 10, n_{42} = 7). Actigraph data were scored with the Sadeh algorithm (Sadeh, Alster, Urbach, & Lavie, 1989) using the Motionlogger Analysis Software Package Action W-2 software (version 2.6.92). Information from the daily diaries (see below) was used to mark when the child was in bed or to note any periods that should not be scored. All bad data epochs (e.g., the child did not wear the actigraph or was asleep in a car) were excluded from the analyses.

Actigraph-derived sleep measures included: (1) the number of nighttime sleep minutes, which was the average total number of minutes asleep between nighttime sleep onset and morning rise time; (2) sleep minutes while napping, which was the total number of daytime minutes asleep between daytime sleep onset and daytime sleep offset; and (3) sleep minutes per 24-hour period, defined as the average total number of minutes asleep between sleep onset and sleep offset for both night and naps. Nighttime and 24-hr sleep minutes were the two actigraphy measures used in analyses.

Sleep diary—Mothers recorded their child's bedtime routine, bedtime, nighttime awakenings, and rise time for seven consecutive nights at each assessment. Information from the daily diaries was used to mark when the child was in bed or to note any periods that should not be scored. Sleep diary information was used to validate actigraphic assessments; when discrepancies were found, actigraphy data were not considered valid and were not included in analyses. Signaled awakenings, the average numbers of awakenings per week, derived from diary reports were used in analyses. The average numbers of awakenings per week were 3.27 (SD = 3.65), 3.53 (SD = 3.59), and 2.78 (SD = 2.57) at 30, 36, and 42 months, respectively.

Inconsistent parenting—Mothers completed the 30-item Parenting Scale (Arnold, O'Leary, Wolff, & Acker, 1993) about discipline strategies. Items were rated on a 7-point scale for which parents indicated whether they would use various parenting strategies in response to child behaviors. This study addressed consistency of the bedtime routine, so we focused on the 11-item "Laxness" subscale for which higher scores indicated endorsement of a more inconsistent approach to discipline. For example, "I am the kind of parent who… 'Sets limits on what my child is allowed to do' (low laxness) or 'Lets my child do whatever he or she wants' (high laxness)" and "When my child does something I don't like…'I do something about it every time it happens' (low laxness) or 'I often let it go' (high laxness)". Mothers' ratings of lax, or inconsistent, parenting were significantly correlated across all assessments ($r_{30–36m}$ = .73, $r_{30–42m}$ =.64, $r_{36–42m}$ = .82, all p < .001). Thus, the ratings were averaged into a single measure of inconsistent parenting (M = 2.34, SD = .71).

Bedtime routines—Before beginning the study, mothers were asked to describe what typically happened prior to their child going to bed. The specific steps provided by the mother were then used to create a checklist for each night of the daily diary, with space for additional steps. Thus, the checklist allowed for the distinction between what mothers stated their child's bedtime routine was compared to how that bedtime routine was actually implemented over the course of a week. All but one mother at 30 months indicated their child had a bedtime routine. For the purpose of this study, adherence to a bedtime routine was defined as the average proportion of steps completed over seven nights. The average number of steps was quite similar at each age (M_{30} = 5.36, SD_{30} = 2.00; M_{36} = 5.42, SD_{36} = 1.65; M_{42} = 5.06, SD_{42} = 1.51). There were no significant associations between the number of steps in the routine and adherence to the routine ($r_{30–36m}$ = .19, $r_{30–42m}$ =.13, $r_{36–42m}$ = .22, all p = *ns*). However, there was considerable continuity in the number of steps a family used across time ($r_{30–36m}$ = .62, $r_{30–42m}$ =.46, $r_{36–42m}$ = .57, all p < .001).

Plan of Analysis

All analyses were performed with R v. 2.14 (R Development Core Team, 2011) with the psych (Revelle, 2011) package. First, we examined descriptive statistics of the different activities in children's bedtime routines. Second, we tested whether there were developmental changes in the activities during the bedtime routine. Third, we examined the associations among different aspects of sleep within and across time, and whether there were developmental changes in sleep. Fourth, we examined whether regular adherence to bedtime routines and inconsistent parenting were independently associated with child sleep within and across time. Finally we tested whether regular adherence to bedtime routines interacted with inconsistent parenting in the development of child sleep.

Results

Table 1 contains the proportion of mothers who indicated whether each of a set of possible activities was a regular part of their child's bedtime routine or happened only on some nights. A regular activity was when the mother stated the activity was part of the routine prior to the study or when the activity was added to the diary on all seven nights. An activity was an irregular part of the routine if it was recorded on the diary at least once, but not every night. The four most common steps in the bedtime routine, each of which was regular for about half to three-quarters of the families, were reading a story, taking a bath/shower, putting on pajamas, and brushing teeth. The least common steps, listed by only a few families, were prayers, cuddling, lying down with the child until s/he fell asleep, and turning on a nightlight.

Activities during the Bedtime Routine

A series of repeated measures ANOVAs tested for age-related changes in the regular use of each of the activities listed in Table 1. Of the 14 activities, three differed significantly by age with alpha = .01. Toys were more often a part of the regular bedtime routine at 30 months than at 36 and 42 months, $F(1, 255) = 6.97$, p = .01. Using the bathroom was more often a part of the regular bedtime routine at 36 and 42 months than at 30 months, $F(1, 255)$ =

12.18, p =.001. Finally, play was reported to be part of the regular bedtime routine at 36 and 42 months, but not at 30 months, $F(1, 255) = 17.67$, $p < .001$.

Correlates of Sleep Variables within and Across Time

Nightly sleep minutes showed modest rank-order stability between 30 and 36 months and between 36 and 42 months (Table 2). Sleep minutes per 24-hour period also showed modest rank-order stability between 30 and 36 months as well as between 30 and 42 months. Whereas the number of mother-reported, signaled night awakenings showed strong stability from 30 to 36, 36 to 42, and 30 to 42 months, the number of signaled awakenings was generally not associated with actigraphy assessments of nightly or 24-hr sleep minutes.

A series of repeated measures ANOVAs tested for age-related changes in children's sleep. There was essentially no change over this year in the average child's nightly sleep minutes, $F(1, 208) = .03$, $p = ns.$ There was, however, evidence of an age-related decline in sleep minutes per 24-hour period, $F(1, 208) = 19.17$, $p < .001$. The model-predicted decline was approximately 17 minutes between each assessment. Because there was no significant decline in nighttime sleep minutes, post-hoc analyses examined if the decline in sleep minutes per 24-hour period was attributable to changes in sleep during the day. There were age-related declines in both the number and duration of naps, F_{num} (1, 192) = 14.37, $p < .001$; F_{dur} (1, 190) = 3.91, p =.049. The model-predicted decline in the number of days per week with naps went from 5.94 days at 30 months to 4.50 days at 42 months. The model-predicted decline in sleep minutes per nap went from 110.81 minutes at 30 months to 98.73 minutes at 42 months.

Correlates of Adherence to Routine within and Across Time

At each of the three ages, about three-fourths of families, on average, adhered to a regular bedtime routine (Table 2). There was modest rank-order stability in adherence to a bedtime routine across all three assessments, especially between 36 and 42 months of age. Greater adherence to a bedtime routine was concurrently associated with more nightly sleep minutes at 36 and 42 months, but not significantly associated with other sleep measures. Inconsistent parenting in response to misbehavior was associated with fewer nightly sleep minutes at 36 months and less adherence to a bedtime routine at 30 and 36 months. Neither adherence to a bedtime routine nor inconsistent parenting was statistically associated with 24-hour sleep minutes or signaled awakenings at any age.

A series of multiple regression analyses tested whether, concurrently (Table 3) and longitudinally (Table 4), consistent parenting and adherence to bedtime routines independently predicted nightly sleep minutes, 24-hour sleep minutes, or frequency of night awakenings. In each analysis, the two predictors were simultaneously entered into the equation. Preliminary analyses tested for child gender differences; none were found. The frequency of mother-reported (signaled) night awakenings was not predicted either concurrently or longitudinally by either predictor, and so was not included in the tables.

Neither adherence to a bedtime routine nor inconsistent parenting significantly predicted children's sleep at 30 months (see Table 3). At 36 months both adherence to bedtime routine and inconsistent parenting independently predicted nightly sleep minutes, whereas only

inconsistent parenting predicted 24-hour sleep minutes. In addition, at 36 months, there was also an interaction effect between adherence to a bedtime routine and inconsistent parenting in predicting nighttime sleep minutes. Greater adherence to the bedtime routine predicted more nightly sleep minutes for children whose mothers responded more consistently to misbehavior (−1 *SD* on the inconsistent parenting scale), $t(62) = 2.90$, $p = .01$. Adherence to the bedtime routine was not related to the amount of nightly sleep minutes for children whose mothers were inconsistent in their response to misbehavior (+1 *SD*); for brevity, this interaction is not depicted in a Figure yet it is very similar to the interaction pertaining to longitudinal findings shown in Figure 1. Yet a third pattern emerged at 42 months: Greater adherence to a bedtime routine predicted more nightly sleep minutes, but neither adherence to bedtime routines nor inconsistent parenting significantly predicted sleep minutes per 24-hour period, and there were no significant interactions between bedtime routines and parenting for either sleep variable.

We also asked whether adherence to bedtime routine, parenting, and their interaction could have effects on child sleep over and beyond continuity of child sleep, a somewhat more stringent test of the concurrent predictiveness of routines and parenting. As shown in Table 4, at both 36 and 42 months of age, the patterns were identical to those in Table 3. Figure 1 depicts the interaction between adherence to the bedtime routine and inconsistent parenting in predicting the amount of nightly sleep minutes at 36 months controlling for the sleep minutes at 30 months. Children of mothers who reported more inconsistent parenting tended to have the fewest number of nightly sleep minutes, irrespective of high versus low adherence to a bedtime routine (predicted means were 547 and 556 minutes, respectively). Similarly, children of mothers who reported consistent parenting and who also showed low levels of adherence to the bedtime routine were predicted to sleep 560 minutes at night. In contrast, children of mothers who reported consistent parenting and *high* adherence to a bedtime routine were predicted to sleep 617 minutes at night, about 1 hour more than the other groups.

Figure 2 depicts the significant interaction between adherence to the bedtime routine and inconsistent parenting in predicting sleep minutes per 24-hours at 36 months controlling for sleep minutes per 24-hours at 30 months. Children of mothers who reported more inconsistent parenting tended to have the fewest number of 24-hour sleep minutes, irrespective of adherence to a bedtime routine (predicted means conditional on adherence at low = 660, high = 653 values). Similarly, children of mothers who reported consistent parenting and who also showed low levels of adherence to the bedtime routine were predicted to sleep 678 minutes per 24-hours. In contrast, children of mothers who reported consistent parenting and *high* adherence to a bedtime routine were predicted to sleep 716 minutes at night, roughly 1 hour more than children of mothers reporting more inconsistent parenting.

Discussion

This study represents a unique contribution in understanding the developmental implications of adherence to a bedtime routine. The hypothesis that greater adherence to a bedtime routine would be *concurrently* associated with greater minutes of actigraphy-based nightly

sleep minutes was supported at 36 and 42 months, but not 30 months. The relation between adherence to a bedtime routine and nightly sleep minutes was qualified by an interaction with daytime parenting practices at 36 months. Contrary to our hypothesis, it was children whose parents that were more consistent in their daytime parenting practices *and* whose parents showed greater adherence to a bedtime routine that had the greatest amount of nightly sleep. There was also no support for the hypothesis that greater adherence to a bedtime routine would be associated with fewer parent-reported signaled awakenings. Based on past research (Hall, et al., 2011), it may be that the types of activities that parents engage in either as part of the bedtime routine or in response to nighttime awakenings matter more for the frequency of nighttime awakenings than consistency of the bedtime routine itself.

To our knowledge, this study is the first to examine the longitudinal associations between bedtime routines and children's sleep in early childhood. The hypothesis that greater adherence to the bedtime routine would be associated with gains in the number of nightly sleep minutes was partially supported at 36 months, but not at 42 months. Adherence to a bedtime routine predicted an increase in the number of nightly sleep minutes from 30 to 36 months (controlling for 30 month nighttime sleep), even after considering mother-reported consistency of parenting practices more generally. These gains in nightly sleep minutes at 36 months were associated most strongly for children of parents who reported being more generally consistent in their parenting practices *and* who showed stronger adherence to a bedtime routine. Contrary to our hypothesis, this suggests that a consistent routine at bedtime is not sufficient to promote the development of increased sleep at night—and hence, perhaps, consolidation of sleep—in the absence of consistent parenting practices during the day. Children with more regular bedtime routines and more consistent parenting slept approximately one hour longer per night, on average, than did children with less regular bedtime routines or less consistent parents. Given that there was no change on average in nightly sleep minutes and there was, on average, a slight decrease in napping, we speculate that families who strongly adhered to a bedtime routine may have facilitated growth in their children's consolidation of sleep from 30 to 36 months such that a greater proportion was occurring at night.

There were declines in both the number and duration of naps between 30 and 42 months. This is somewhat contrary to studies that have suggested that consolidation of sleep into a single nighttime period occurs with a decline in the frequency of naps as opposed to a gradual decrease in the duration of naps (Iglowstein et al., 2003; Koch et al., 1984). Additionally, past research has shown that the amount of sleep per 24-hour period is similar for children who nap and those of the same age who do not nap (Ward et al., 2007), suggesting that on days that children do not nap, they sleep more at night and vice versa, thus resulting in stable amounts of sleep when considered on a 24-hour period. The present study, in contrast, found small age-related declines in sleep minutes per 24-hour period, which suggests children during this particular one-year period in early childhood may be experiencing inconsistent amounts of sleep from one day to another. This possibility should be addressed in future research. There is a need for additional longitudinal research to understand the development of sleep consolidation that would further our understanding of *how* age-related differences in napping that have been found in cross-sectional studies could have occurred.

The current study has several strengths. First, mothers were asked prior to beginning the study to describe their child's bedtime routine, and there was no association between the number of reported steps in the bedtime routine collected before participation and adherence to the routine collected daily. Therefore, the experience of participating in a study about sleep did not influence the number of steps that mothers reported. Second, mothers recorded information about the bedtime routine over seven consecutive nights, providing a clearer picture about the stability of the bedtime routine in addition to the specific steps actually used in the routine. Third, child sleep was measured with a combination of daily diary information and actigraphy, which provides a more accurate estimate of how much time the child slept at night compared to parental rating scales or diaries by themselves.

Limitations

There were several limitations to this study. First, this study used a fairly modest sample size that was predominantly middle class, thus limiting the generalizability of the findings. Second, information about the bedtime routine and daytime parenting practices was only obtained from mothers. Since 93% of mothers were married, it is likely that many children had more than one parent involved in the bedtime routine. Third, this study was correlational and therefore, causal inferences about the relation between adherence to the bedtime routine and children's nighttime sleep cannot be made. Finally, the relatively small sample did not permit direct tests of whether adherence to the bedtime routine was predictive of both gains in nightly sleep minutes *and* a reduction in either the frequency or duration of daytime sleep minutes.

Future Directions

Future studies should include a larger, more diverse sample than participated in this study. Second, more research is needed to discern whether the effectiveness of adhering to a bedtime routine depends upon the specific activities. Third, the lack of association between the frequency of signaled night awakenings and adherence to a bedtime routine requires more research. This non-association could suggest that how parents respond to their children seeking them following a night awakening during this year may have a greater impact on how frequently children signal their nighttime awakenings than the bedtime routine per se. Fourth, future research should include information about fathers, particularly in light of the findings by Tikotzky et al. (Chapter VII, in this volume) that demonstrated that father's involvement both in daytime caregiving and in response to night awakenings in infancy was predictive of a decline in the frequency of awakenings from 3 to 6 months of age. Finally, given the unexpected decline in the duration of naps during this period, future research is required to understand the developmental changes in both daytime and nighttime sleep. The results of this study highlight the complexity of linking behaviors over time during a rapid period of development where longitudinal associations are not present at all ages. To better see the development of sleep in early childhood, there is need for additional longitudinal research with more frequent measurement occasions than the six-month intervals we have used (Staples & Bates, 2013).

Conclusion

This study provides needed information about what parents do before bedtime and how daytime parenting practices may affect young children's sleep at night. Although intervention studies have employed specific activities at night to promote good sleep (Mindell et al., 2009; 2011), no such requirement was placed on the bedtime routine in this study. Interestingly, in the present study the three most commonly mentioned steps in the bedtime routine at each age were to read a story, take a bath, and put on pajamas, which were included by Mindell et al. (2009) in the intervention for children with sleep problems. Of those activities that prior research has linked to less optimal nighttime sleep such as providing a snack or watching TV (Sadeh et al., 2009), mothers in this study were less likely to include those activities than others, such as reading a story. This study is the first to examine the longitudinal associations between bedtime routines and sleep over the course of one year in early childhood. The longitudinal design of the study allowed testing whether adherence to the bedtime routine predicted *change* in sleep minutes, making it less likely that the association owed to the opposite direction of effect (sleep influencing later bedtime routine adherence). The effects, however, were not uniform across ages. This complexity calls for more research on how sleep changes between 30 and 42 months as well as on how parenting practices at bedtime and other family factors may support or hinder the development of sleep consolidation within a larger transactional system.

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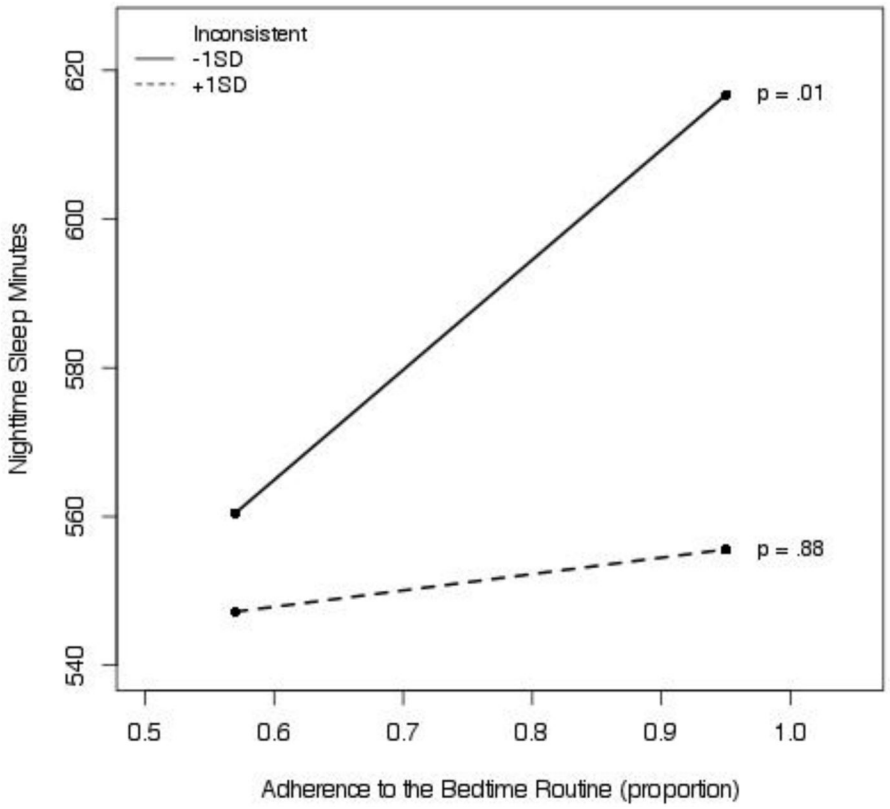

Figure 1.

Predicted sleep minutes at 36 months controlling for sleep minutes at 30 months according to adherence to the bedtime routine. The lines represent a more (+1 *SD*) or less (−1 *SD*) inconsistent parenting in response to misbehavior.

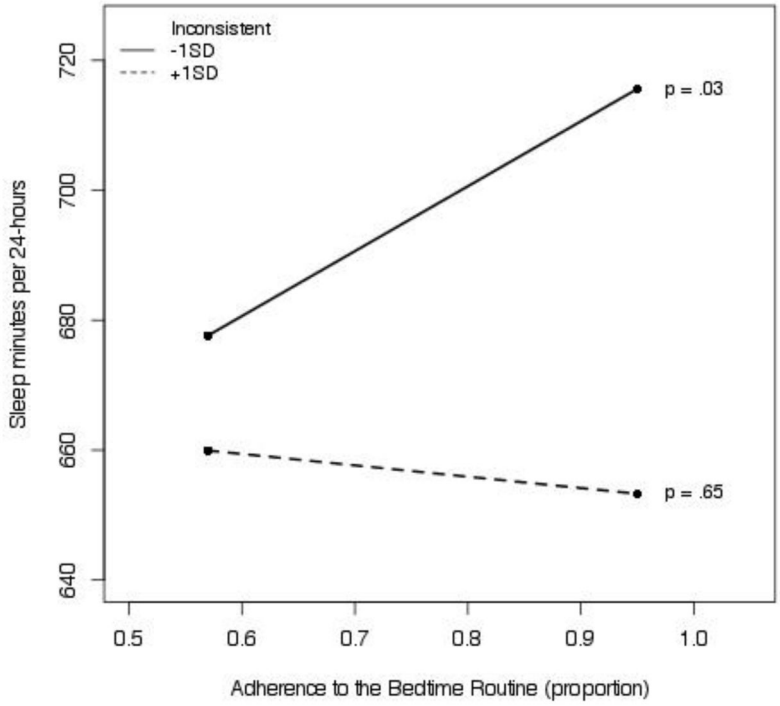

Figure 2.

Predicted sleep minutes per 24-hour period at 36 months controlling for sleep minute4s per 24-hour period at 30 months according to adherence to the bedtime routine. The lines represent a more (+1 SD) or less (−1 SD) inconsistent parenting in response to misbehavior.

Table 1

Proportion of Mothers who Indicated Whether the Specific Activity was a Regular or Irregular Part of the Bedtime Routine

	30 months (*n* = 85)		36 months (*n* = 77)		42 months (*n* =78)	
Step	**Regular**	**Irregular**	**Regular**	**Irregular**	**Regular**	**Irregular**
Story	.62	.25	.79	.12	.74	.19
Bath	.55	.27	.65	.16	.62	.24
Pajamas	.46	.18	.64	.06	.53	.10
Teeth	.46	.22	.61	.06	.50	.15
Music	.28	.12	.29	.03	.18	.08
Snack	.19	.27	.32	.09	.35	.05
TV	.14	.29	.19	.23	.22	.21
Toy	.12	.05	.04	.01	.03	.00
Pray	.09	.07	.17	.01	.15	.05
Cuddle	.09	.06	.12	.03	.12	.06
Laying with	.07	.11	.13	.01	.10	.03
Nightlight	.05	.02	.04	.00	.05	.01
Bathroom	.00	.21	.23	.04	.26	.03
Play	.00	.24	.31	.05	.26	.03

Note. Percentages are less than 100% because some mothers did not report the activity on any night as part of the bedtime routine recorded on the daily dairy.

Table 2

Correlations between Study Variables

Variable	*M* (*SD*)	2	3	4	5	6	7	8	9	10	11	12	13
1. Nightly Sleep – 30	586.01(38.87)	.30*	.22	.33**	.15	.08	.05	.16	−.05	.02	−.02	.22	−.18
2. Nightly Sleep – 36	579.74 (50.22)	--	.46***	−.02	.47***	−.03	.12	.26*	.13	.12	.30*	.31*	−.32**
3. Nightly Sleep – 42	587.54 (45.63)		--	.00	−.09	.22	−.07	.03	−.10	−.05	.13	.29*	.00
4. 24hr Sleep – 30	704.32 (47.51)			--	.34*	.35**	−.13	−.12	−.05	−.03	.24	. 21	−.18
5. 24hr Sleep – 36	685.33 (55.38)				--	.19	−.10	.04	.05	.16	.22	.16	−.23
6. 24hr Sleep – 42	669.33 (37.36)					--	−.34**	−.24	−.06	.16	.16	.16	−.11
7. Awakenings - 30	3.27 (3.65)						--	.58***	.57***	.01	.07	.02	−.01
8. Awakenings - 36	3.53 (3.59)							--	.46***	.06	.10	.03	−.03
9. Awakenings - 42	2.78 (2.57)								--	.14	.21	.13	−.01
10. Adherence – 30	0.76 (0.16)									--	.34*	.28*	−.32**
11. Adherence – 36	0.76 (0.19)										--	.55***	−.26*
12. Adherence – 42	0.75 (0.20)											--	−.19
13. Parenting	2.34 (0.71)												--

Note. Nightly Sleep = average nighttime sleep minutes (actigraphy); 24hr Sleep = average sleep minutes per 24 hour period (actigraphy); Awakenings = average frequency of parent reported nighttime awakenings. Samples sizes range from 57 to 81.

* $p < .05$.

** $p < .01$.

*** $p < .001$ (two-tail).

Table 3

Multiple Regression Models Concurrently Predicting the Amount of Nighttime Sleep and Sleep per 24-hour Period from Adherence to the Bedtime Routine and Inconsistent Parenting

	β	*SE*	*F*(*df*)	adj. R^2
Nighttime Sleep Minutes				
30 months - Intercept	.00	.11	1.25 (2, 70)	.01
Adherence – 30m	−.06	.13		
Parenting	−.20	.13		
36 months - Intercept	−.08	.11	5.56 (3, 65) *	.17
Adherence – 36m	.24 *	.11		
Parenting	−.36 **	.13		
Adherence X Parenting	−.19 *	.09		
42 months - Intercept	.01	.12	3.17 (2, 65) *	.06
Adherence – 42m	.30 *	.12		
Parenting	.06	.12		
Sleep Minutes per 24hr Period				
30 months - Intercept	.00	.12	1.61 (2, 69)	.02
Adherence – 30m	−.11	.13		
Parenting	−.23	.13		
36 months - Intercept	−.06	.12	3.17 (3, 65) *	.09
Adherence – 36m	.18	.12		
Parenting	−.29 *	.13		
Adherence X Parenting	−.17	.09		
42 months - Intercept	.01	.12	1.08 (2, 65)	.01
Adherence – 42m	.14	.12		
Parenting	−.07	.12		

* $p < .05$.

** $p < .01$.

Table 4

Multiple Regression Models Predicting the Amount of Nighttime Sleep and Sleep per 24-hour Period Separately at 36 and 42 Months Controlling for Longitudinal Stability

	β	*SE*	*F*(*df*)	adj. R^2
Nighttime Sleep Minutes				
36 months - Intercept	−.19	.11	8.07 (4, 52) ***	.34
Nightly Sleep – 30m	.19	.10		
Adherence – 36m	.33 **	.11		
Parenting	−.37 **	.13		
Adherence X Parenting	−.24 **	.08		
42 months - Intercept	−.02	.11	6.32 (3, 54) ***	.22
Nightly Sleep – 36m	.45 **	.14		
Adherence – 42m	.22	.11		
Parenting	.13	.11		
Sleep Minutes per 24hr period				
36 months - Intercept	−.16	.13	4.04 (4, 51) ***	.18
24hr Sleep – 30m	.22	.14		
Adherence – 36m	.14	.13		
Parenting	−.36 *	.16		
Adherence X Parenting	−.20 *	.09		
42 months - Intercept	.06	.13	1.10 (3, 54)	.01
24hr Sleep – 36m	.17	.14		
Adherence – 42m	.12	.13		
Parenting	−.04	.13		

* $p < .05$.

** $p < .01$.

*** $p < .001$.