



Full length article

## Implementation of a nightly bedtime routine: How quickly do things improve?



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### ABSTRACT

**Background:** Institution of a consistent bedtime routine has been demonstrated to improve sleep in young children within two weeks. However, no studies have investigated the rate of this change and when most change occurs. The purpose of this study was to examine the nightly change in infant sleep and maternal perceptions after implementing a bedtime routine.

**Methods:** Mothers ( $n = 134$ ) and their infant (8–18 months) were randomly assigned to implementation of a bedtime routine intervention for a two-week period.

**Results:** Two-level piecewise linear growth models showed that the intervention resulted in the most rapid change in the first three nights of the intervention across sleep outcomes, including sleep onset latency, the frequency and duration of nighttime awakenings, sleep consolidation, and maternal perceptions of bedtime ease, sleep quality, and infant mood. No significant additional improvement in sleep onset latency emerged after these first three nights, whereas small additional improvements occurred for all other outcomes throughout the remainder of the intervention period.

**Conclusions:** These results indicate that sleep disturbances in infants and toddlers can be quickly ameliorated within just a few nights after implementation of a consistent bedtime routine, including a bath, massage, and quiet activities. Future research should consider the potential mechanisms behind these relatively fast improvements in sleep, such as reduced household chaos or physiological changes (e.g. core body temperature, cortisol).

### 1. Introduction

A bedtime routine is considered a key component of healthy sleep and is typically integrated into behavioral interventions for sleep problems in young children (Mindell et al., 2006). A bedtime routine involves a consistent set of activities (e.g., bath, pajamas, stories) that occur in the same order on a nightly basis before lights out. A recent review of pediatric sleep practice recommendations found evidence across multiple studies for the efficacy of inclusion of a bedtime routine to promote positive sleep outcomes (Allen, Howlett, Coulombe, & Corkum, 2016).

As indicated, a number of studies, both cross-sectional and longitudinal, have found that the presence of a bedtime routine is associated with positive sleep outcomes (e.g., Hale, Berger, LeBourgeois, & Brooks-Gunn, 2011; Henderson & Sytsma, 2010; Mindell,

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Telofski, Wiegand, & Kurtz, 2009). A recent study of over 10,000 young children (ages birth to 6 years) found a dose-dependent relationship between integration of a bedtime routine and sleep outcomes (Mindell, Li, Sadeh, Kwon, & Goh, 2015). That is, the more regularly a family implemented a bedtime routine, the more improvement was observed in child sleep. In one study of over 3000 preschool aged children, the use of a language-based bedtime routine at 3 years of age was associated with greater overnight sleep duration and stronger verbal scores at 5 years of age (Hale et al., 2011). In another study examining the role of bedtime routine adherence in toddlers and preschool aged children, Staples, Bates, and Petersen (2015) evaluated bedtime routine regularity in a non-clinical sample of 87 youth. In this study, the number of parent-reported awakenings, as well as actigraphy-based nighttime and total sleep time, were examined in terms of adherence to a bedtime routine and self-reported parenting consistency. Overall, they found that adherence to a bedtime routine was associated with nighttime sleep at 36 and 42 months but not at 30 months; no associations were found among routine adherence, parenting, and signaled night wakings. Further, controlling for longitudinal stability, nighttime and total sleep at 36 months were predicted by an interaction between parenting consistency and adherence to a bedtime routine.

Bedtime routines are commonly recommended for infant and toddler sleep disturbances and are often included as a component in the efficacious treatment of sleep disturbances in young children (Allen et al., 2016; Mindell et al., 2006). Furthermore, prior studies assessing the efficacy of the daily implementation of the bedtime routine prescribed in this study were found to be efficacious on its own and in conjunction with a broader intervention at two-weeks (Mindell et al., 2011a, 2009) and one year follow-up (Mindell et al., 2011b). Our previous study (Mindell et al., 2009) found improvement in sleep onset latency, longest stretch asleep, and number/duration of night wakings for infants and toddlers following implementation of a standardized bedtime routine over two weeks of intervention. No significant changes were observed in a comparison control group. In addition, bedtime routine implementation was associated with improvement in parent perceived ease of bedtime, perception of how well the baby slept, as well as rating of baby morning mood as tested after two weeks of intervention implementation. However, how quickly those changes occurred were not examined within the two-week intervention period. In a second study (2011a; 2011b), we found that implementing an internet-based behavioral intervention that incorporated the same bedtime routine for bedtime problems and night wakings in young children resulted in improvements in child (e.g., sleep onset latency, night wakings, sleep consolidation, morning mood) and parent (e.g., parent efficacy, maternal sleep) variables.

Although there is ample support for use of a bedtime routine within a treatment package and emerging support for use of a bedtime routine alone to improve sleep in young children, little is known about how quickly changes in sleep can be observed once a bedtime routine is implemented. The rate of improvement of the child's sleep and equally the parent's perception is likely an important factor in the parent's adherence to behavioral sleep interventions. Similarly, no large-scale studies of behavioral interventions for infant and toddler sleep disturbances have analyzed change on a night-to-night basis. Instead, all studies assess change across a longer time period, such as one week or one month post-implementation. Thus, using data from the aforementioned study (Mindell et al., 2009), the objective of the current investigation was to examine the change in child sleep and maternal perception on a nightly basis after implementing a prescribed bedtime routine. Specifically, we examined the overall nightly rate of change in sleep outcomes over the two-week prescribed bedtime routine period, and whether there was a greater rate of change at the start of bedtime routine implementation relative to the rest of the intervention period.

## 2. Methods

### 2.1. Participants

Data from 134 mothers and their young child (ages 8–18 months; 44.8% boys) were analyzed. Infant ages were distributed across the age range, with 17.3% ages 7.0–9.9 months, 33.1% ages 10–12.9 months, 25.5% ages 13.0–15.9 months, and 21.8% ages 16.0–18.5 months. Participants were recruited through an independent market research firm and were screened by telephone. Table 1 presents complete demographic information. Inclusion criteria for the study included that all children must have an identified sleep problem as noted by the mother, with all mothers endorsing that their child had a sleep problem that ranged from “small” to “severe.” However, families were excluded if the child's sleep issues were extreme and thus may be indicative of an underlying medical or developmental concern, as defined as (1) more than 3 night wakings per night, (2) awake more than 60 minutes per night, or (3) total daily sleep duration of less than 9 hours.

### 2.2. Procedure

This study was approved by the Institutional Review Boards at Allendale and Saint Joseph's University. Informed consent was obtained from all participants. Complete information on the sample and behavioral intervention has been previously published (Mindell et al., 2009). Of the total 206 families in the original study, 134 (65%) families were assigned to the intervention (i.e., routine) group. Following a one-week baseline period in which the mothers followed their child's usual bedtime practices, the mothers were verbally instructed in-person by a research assistant at a site visit, as well as provided with written documentation, to institute a nightly three-step bedtime routine for a two-week period that included a bath (minimum duration of 5 min, using a provided wash product), a massage (minimum duration of 3 min with suggested massage techniques, using a provided massage product), and quiet activities (e.g., cuddling, singing lullaby) with lights out within 30 min of the end of the bath. All mothers were provided with the same products in unmarked containers. Following the bedtime routine, mothers continued to put their child to bed as they normally did, whether they put their child to bed awake or stayed with their child until asleep (e.g., rocked to sleep). Thus, the only recommended change was the institution of the prescribed bedtime routine.

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