Benefits of a bedtime routine in young children: Sleep, development, and beyond

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SUMMARY

This paper presents a conceptual model and reviews the empirical evidence to support a nightly bedtime routine as a key factor in the promotion of not only healthy sleep, but also of broad development and wellbeing in early childhood. A bedtime routine embodies the characteristics of nurturing care and early child stimulation, which are deemed to be essential for positive outcomes, especially for at-risk children. Furthermore, common, adaptive components of a bedtime routine can contribute to an array of positive developmental outcomes beyond improved sleep, inclusive of language development, literacy, child emotional and behavioral regulation, parent–child attachment, and family functioning, among other outcomes. These bedtime routine components include activities in the broad domains of nutrition (e.g., feeding, healthy snack), hygiene (e.g., bathing, oral care), communication (e.g., reading, singing/lullabies) and physical contact (e.g., massage, cuddling/rocking). A bedtime routine can provide multiple benefits to child and family functioning at a time of day that many parents are present with their children. Although additional research on hypothesized routine-related child outcomes and mechanisms of action are needed, promoting a bedtime routine may be a feasible and cost-effective method to promote positive early childhood development worldwide, particularly for socioeconomically disadvantaged and other at-risk young children.

Keywords

Investing in the health and wellbeing of young children is critical for promoting positive outcomes throughout the lifespan—from the development of long-term health practices to literacy and school readiness to psychological wellbeing [1,2]. The Lancet Early Childhood Series Steering Committee [1] recently emphasized the need for nurturing care, which

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includes adequate health, nutrition, security and safety, responsive caregiving, and early learning opportunities, to help young children (ages 0–5 y) reach their full developmental potential, and to build a strong foundation for subsequent development, health, and wellbeing. Similarly, the United Nations International Children's Emergency Fund (UNICEF) and the World Bank Group recently established an alliance to prioritize action and investments in early childhood development (ECD), noting the importance of early child stimulation on long-term outcomes and how early childhood experiences can have a significant impact on brain development and subsequent learning and health [3].

Sleep is a salient feature of health and wellbeing that impacts multiple aspects of early childhood development. Indeed, early childhood sleep problems are associated with a number of poor developmental outcomes across neurocognitive [4,5], social-emotional [6-9], physical health [10,11], and family functioning domains [12-15], underscoring the importance of preventing sleep difficulties in early development. Furthermore, early childhood sleep problems, such as difficulty falling/staying asleep and obstructive sleep apnea, are highly prevalent [16,17], resulting in the American Academy of Pediatrics (AAP) recommendation that sleep health be included as part of anticipatory guidance at well-child visits throughout development [18]. One of these sleep health recommendations is the implementation of a consistent bedtime routine, given the evidence of its sleep benefits [19], as well as the importance of childhood routines in general as a method to promote positive child development and family functioning [20].

The purpose of this paper is to highlight the concept of a bedtime routine as a key factor in the promotion of not only healthy sleep, but also of broad development and wellbeing in early childhood. A bedtime routine, in and of itself, embodies the characteristics of nurturing care and early child stimulation [1,3]. We first present global data on the prevalence and common components of a bedtime routine among children ages 0–5 y. We then introduce a conceptual model (Fig. 1) and review the extant literature to demonstrate how common, adaptive components of a bedtime routine can contribute to an array of positive developmental outcomes beyond improved sleep, inclusive of language development, literacy, child emotional and behavioral regulation, parent–child attachment, and family functioning, among other outcomes. Following a review of the literature for each recommended bedtime routine component and a discussion of potential mechanisms linking a bedtime routine to positive outcomes, we identify implications for public health policy and clinical practice. We propose that a bedtime routine provides multiple benefits to child and family functioning at a time of day that most parents are present with their children.

Definition, prevalence, and components of a bedtime routine

Childhood routines refer to observable, predictable, and repetitive behaviors that occur daily or weekly in the context of care-giver–child interactions in the home environment [21,22]. For the purposes of this paper, a bedtime routine is defined as the predictable activities that occur in the hour or so before lights out, and before the child falls asleep [23]. Activities that occur as the child is falling asleep, such as rocking or feeding to sleep, are not conceptualized as part of the bedtime routine. Caregiver presence and related activities at

child sleep onset, as opposed to prior to lights out, can create problematic sleep onset associations that negatively impact sleep [19,24].

Large-scale studies of children within the United States (US) have demonstrated that between 81% [25] and nearly 95% [17] of parents of infants, toddlers, and preschoolers report having a bedtime routine. Despite the high prevalence of young children with bedtime routines, there is variation in the extent to which bedtime routines are actually implemented on a nightly basis. For example, Hale et al. found in a study of 3217 families of preschoolers that although 81% indicated having a bedtime routine, 71% of the families reported implementing their bedtime routine on four of the past five weeknights [25].

Socio-demographic factors including race/ethnicity and socioeconomic status (SES) are also associated with variation in the presence and implementation of a bedtime routine in United States (US) samples [23,25-27]. In the Hale et al. study mentioned earlier, preschoolers of African American or Hispanic/Latino racial/ethnic background, as well as those whose mothers had lower levels of educational attainment, were significantly less likely to follow a regular bedtime routine [25]. Another study of children ages 2–8 y found that both African American racial background and lower SES were associated with less consistent bedtime routines [26]. In addition, in a largely lower-income sample of US children ages 1–7 y, less than half (44%) of caregivers reported that their child followed a bedtime routine on a nightly basis [28].

Differences in the implementation of bedtime routines are also apparent in global samples. In a large cross-cultural sample [29,30], caregivers of 29,287 infants and toddlers (ages 0–3 y) from 17 different countries/regions, the prevalence of having a consistent (implemented five or more nights per week) bedtime routine varied substantially, from 40% in India to 80% in the United Kingdom. These differences in implementation of a consistent bedtime routine may reflect other cross-cultural differences, such as bed-sharing and room-sharing [30]. Overall, children from predominantly Asian countries/regions (China, Hong Kong, India, Indonesia, Korea, Japan, Malaysia, Philippines, Singapore, Taiwan, Thailand, Vietnam) were significantly less likely than those from predominantly Caucasian countries (Australia, Canada, New Zealand, United Kingdom, US) to have a consistent bedtime routine.

Few studies have reported on common activities included in young children's bedtime routines and whether these activities vary cross-culturally. Within the US, two studies have identified common components and examined variation by racial/ethnic background and SES [25,26]. In the study referenced above, Hale et al. [25] asked caregivers to identify whether their child's routine was characterized by five different non-mutually exclusive activity categories: interactive activities (parent–child reading, singing, or other interactions), non-interactive activities (giving the child a toy or other object), television-related activities, eating/having a snack, or hygiene-related (bathing and/or brushing teeth). Interactive and hygiene-related routines were the most common, with 60% of families reporting interactive routines and 58% with hygiene-related routines. African American families, as well as families of lower SES, were less likely than Caucasian families and those of more advantaged backgrounds to engage in interactive and hygiene-related routines.

In another study [26], responses about bedtime routines activities from caregivers of children ages 2–8 y were categorized into adaptive (e.g., brushing teeth, praying, reading a story, bathing) and maladaptive (e.g., watching television, using other electronics, engaging in high-activity play) indexes. The proportion of caregivers who responded to each type of bedtime routine activity was not reported. However, there were socio-demographic differences found for bedtime routine activities, with Caucasian children demonstrating significantly more adaptive activities and fewer maladaptive activities relative to African American children. Increased SES was also positively associated with an increased number of adaptive bedtime routine activities.

Given the limited data available on common bedtime routine activities for young children in the US and globally, for the purposes of this paper we examined descriptive data drawn from the Mindell et al. [29,30] cross-cultural research on infants and toddlers in 17 different countries/regions. As shown in Fig. 2, there are salient commonalities and differences across countries/regions with regard to endorsed bedtime routine activities. Feeding (breast or bottle feeding) is highly common across all areas, with 73% of families reporting it as part of their child's bedtime routine. Bathing is also highly common (45% overall) but ranges from 6% in Indonesia to 81% in the United Kingdom. Other activities are also common in some countries, such as reading in New Zealand (59%) or singing songs in Indonesia (36%), but relatively rare in others. When examined by infant and toddler age groups (Fig. 3), feeding and bathing are the most common activities in both age groups, but in line with expectations bedtime routine activities change across child age and development. For example, a much smaller proportion of toddlers are rocked at bedtime whereas a larger proportion are engaging in more active behaviors. Similar to previous studies, both adaptive and maladaptive behaviors are occurring at bedtime. For example, 32% of toddlers and 12% of infants are watching television as part of their bedtime routine, which has been found to negatively impact early childhood sleep duration and quality [31,32].

A conceptual model for the benefits of a bedtime routine for broad child development

Research demonstrates that increased engagement in general, everyday routines is associated with positive child outcomes, including enhanced language development, academic achievement, and social-emotional and behavioral functioning [21,33,34]. Everyday routines can also benefit family functioning, with some research indicating that routines are associated with higher levels of marital satisfaction [35] and lower levels of maternal distress [36]. Additionally, engaging in regular routines can buffer against the effects of family stress [37] and individual child risk factors [28,38,39] on child wellbeing.

Drawing on this literature, and the research reviewed in the following sections, we propose that a bedtime routine is a vehicle for promoting an array of healthy developmental outcomes during early childhood. Given that everyday routines are thought to provide a clear framework for child development and health promotion, with rich opportunities for parent–child communication and child skill acquisition [35], it stands to reason that a bedtime routine in particular, with its multiple steps and discrete family engagement and health-

related activities, could promote far-reaching positive child developmental outcomes. While following a bedtime routine appears to be beneficial throughout childhood and adolescence [17,19,34], we hypothesize that instituting a healthy bedtime routine may have the largest effects during early childhood, given increased neural plasticity and rapid growth and skill acquisition during this developmental period [1]. In addition, early implementation of a bedtime routine provides the opportunity to establish long-term positive habits. We have developed a conceptual model (Fig. 1) to illustrate the hypothesized benefits of a bedtime routine for children ages 0–5 y, with each adaptive bedtime routine activity uniquely contributing to positive functioning across multiple outcome domains.

Within this model, increased bedtime routine consistency [23,40] and engagement in positive, healthy bedtime routine activities [19,25,26] are critical in conferring improved developmental outcomes. Broad activity domains included in this model were selected on the basis of commonalities in bedtime routine components across cultural contexts (Figs. 2 and 3), and available early childhood research showing the benefits of various bedtime-related activities [19,26,40-42]. In addition, "maladaptive activities," such as watching television, using electronics before bedtime, or excessive stimulation (e.g., running around), were excluded given that these types of bedtime behaviors have been linked to poor sleep [19,26,31,32] as well as worse psychosocial and physical health functioning (e.g., television-viewing; [43]). Apart from the literature cited here on watching television, using electronics, and excessive stimulation/physical activity prior to bedtime, there is scant research on other potentially maladaptive bedtime routine activities. Conceptually, a bedtime routine that is longer than 30–40 min may also be viewed as maladaptive, as a prolonged bedtime routine may result in a later child bedtime and, in turn, a shorter sleep duration. However, it should be noted that there are likely substantial individual child differences in which activities are adaptive versus maladaptive at bedtime. For instance, although studies in this area are needed, children with neuro-developmental disabilities may do better with the inclusion of electronics use as part of the bedtime process to effectively relax [44]. Similarly, a seemingly "adaptive" activity such as singing songs may be too stimulating for some children. Thus, the defined "maladaptive" and positive bedtime routine activities described in this paper may not apply to all children in the same way. Rather, bedtime routine activities should be tailored to the individual child and family, especially as bedtime routine activities that do not fit well with the child or family may result in unanticipated negative consequences, such as caregiver–child conflict that prolongs bedtime and results in family stress.

In this conceptual model, we identified the positive bedtime routine outcomes related to sleep, child mood/emotional–behavioral regulation, parent and family stress and functioning, and child language development/literacy/cognition, based on the literature reviewed in the following sections (see also Table 1). We additionally hypothesize that child self-care/health and parent–child bonding/attachment are potential bedtime routine-related outcomes, as activities such as adequate nutrition, hygiene, and positive physical contact (cuddling/rocking) may contribute to gains in these areas. In the sections that follow, we review available literature in this regard among children ages 0–5 y, and discuss how each of the common bedtime routine components is hypothesized to contribute to the positive developmental outcomes as outlined in Fig. 1.

As with other everyday routines and child development more generally, it is important to note that involvement in a bedtime routine occurs within a larger social-ecological framework [45] in which there are multiple and interrelated child, family, neighborhood, and broader cultural and societal influences operating simultaneously. As such, our conceptual model includes additional child (e.g., biological predispositions, health status, temperament), familial (e.g., parenting behaviors, relationships, stress, psychopathology), and contextual (e.g., socio-cultural) factors that may contribute to the prevalence, consistency, and components of an early childhood bedtime routine, as well as to the effects of a bedtime routine on positive child and family outcomes. Although we do not review the literature on these factors, these contributing influences are directions for future research. Additionally, in line with transactional models of child development and behavior [15], the outcome domains in this conceptual model represent a series of interactive processes that occur over the course of early child development, with potential bidirectional effects. For instance, improvements in child sleep can improve parent mood and family stress levels, with resulting improvements in parent mood and family stress enabling improved management of problematic bedtime behaviors, leading to a more consistent routine and better child sleep [40]. Similarly, parent–child attachment, child mood and emotional–behavioral regulation, and family stress levels are interrelated outcomes [1].

In the more general everyday routine literature, research on the mechanisms of action by which engagement in routines confer positive child and family effects is limited [35]. We do not include specific mechanisms in our conceptual model. Although the components in the model are thought to contribute to positive outcomes, it is unlikely that these components all serve as mechanisms of action, particularly as it could be that the presence of a positive, family-based routine and the cumulative effects of a consistent routine provide benefits above and beyond the discrete bedtime behaviors and activities [35,40]. Furthermore, this model is likely not exhaustive in regards to outcomes, and the benefits of a bedtime routine are likely more than the sum of its parts.

Benefits of a bedtime routine on sleep

Although simply following the same general daily routines in early childhood has been associated with increased sleep duration [46], research has demonstrated that engaging in a regular bedtime routine is particularly beneficial for multiple aspects of early childhood sleep [19]. Cross-sectional, longitudinal, and intervention studies (Table 1), have provided robust evidence that following a bedtime routine is associated with a number of positive sleep outcomes, including an earlier bedtime, decreased sleep onset latency, reduced nighttime awakenings, increased sleep duration, and enhanced caregiver-reported sleep quality [19]. Cross-sectional associations have been found within the United States [17,26,47] and internationally [23,30,48,49]. Findings from the national Sleep in America poll, for example, indicate that children who follow a bedtime routine evidence significantly longer caregiver-reported sleep duration [17]. Other cross-sectional research has also shown that having a bedtime routine is concurrently associated with better caregiver-reported sleep quality [26] and longer nighttime sleep duration [30], whereas the absence [48,49] or disruption [47] of a bedtime routine is correlated with increased night awakenings.

A global study of 10,085 children ages 0–5 y from 14 different countries/regions also showed that having a bedtime routine is associated with an earlier bedtime, shorter sleep onset latency, longer nighttime sleep duration, fewer night awakenings, and decreased caregiver-perceived child sleep problems [23]. In addition, a dose-dependent relationship emerged between a bedtime routine and these sleep benefits. As the number of nights per week that a child followed the same bedtime routine increased, there were linear improvements across the sleep outcomes, underscoring the importance of bedtime routine consistency in conferring sleep benefits. Furthermore, a dose-dependent relationship was also found for preschoolers in the sample who had a current bedtime routine as well as a retrospectively reported routine as an infant. That is, preschoolers with both a current and a history of a consistent bedtime routine showed the best sleep outcomes. Of note, the results of this study held in both the infant/toddler and preschool age groups, in both predominantly Asian and predominantly Caucasian cultural regions, and when controlling for maternal education, suggesting that bedtime routines are beneficial across socio-demographically diverse groups of young children.

Several prospective studies have examined early childhood bedtime routines longitudinally in relation to sleep patterns [42,50] and other child outcomes [51]. In one study, Hale et al. [42] examined the use of a language-based bedtime routine (i.e., a routine involving reading, story-telling, singing) in a sample of 4274 predominantly lower SES children in the United States. Even after controlling for a number of child, maternal, and household characteristics, including race/ethnicity and SES, having a language-based bedtime routine at age 3 y was predictive of increased nighttime sleep duration at age 5, by about 0.2 h. No other sleep outcomes were assessed.

One prospective study [50] and one intervention study [52] focused on bedtime routines for children ages 0–5 y have included an objective assessment of child sleep. In the prospective study, Staples, Bates, and Peterson [50] collected actigraphy and maternal reports of parenting practices and their child's bedtime routine longitudinally in 87 young children at child ages 30, 36, and 42 mo. Greater weekly adherence to a bedtime routine was concurrently associated with increased nightly child sleep at 36 and 42 mo, but not at age 30 mo. Furthermore, greater adherence to a bedtime routine at age 30 mo predicted an increase in nighttime sleep duration from 30 to 36 mo, although this pattern was not found for the period of time between 36 and 42 mo. Concurrently and over time, mother-reported child awakenings were not associated with bedtime routine adherence. Interestingly, this study also showed interaction effects between bedtime routine adherence and parenting behaviors. Children whose mothers indicated more consistent self-reported daytime discipline and limit-setting practices and a more consistent bedtime routine had the largest gains in nighttime sleep duration between 30 and 36 mo, by about 1 h.

The recommendation to follow a consistent bedtime routine is also frequently included in the context of broader behavioral sleep interventions for early childhood sleep problems [24,53]. These multicomponent behavioral sleep interventions generally include caregiver psychoeducation about child sleep needs and sleep onset associations, implementation of a consistent bedtime routine, positive reinforcement for desired child bedtime behaviors, and standard or graduated extinction procedures [24]. In both within-subjects studies [54-60] and

controlled trials [61-64], broader behavioral sleep interventions that include a bedtime routine have largely resulted in improved child sleep outcomes, including diminished bedtime resistance, decreased sleep onset latency and nighttime awakenings, and longer nighttime sleep duration [19,24].

Studies that have examined the use of a bedtime routine [40,65,66] or particular pre-bedtime activities [41,67] in isolation or in comparison to other behavioral sleep treatment approaches [68,69] provide more direct evidence for the sleep benefits of a bedtime routine in young children with sleep problems. Studies that focus explicitly on implementing a bedtime routine have consistently shown positive effects on early childhood sleep [40,41,65,66,68,69]. For example, one study [40] randomly assigned 405 mothers of infants and toddlers (ages 7–36 mo) with mother-reported sleep problems to either an age-appropriate bedtime routine or to a control condition. Mothers in the bedtime routine condition were asked to follow a 30-min, three-step routine that included bathing, a massage for infants or lotion for toddlers, and quiet activities such as cuddling or reading. From baseline to study week three, caregivers in the bedtime routine condition reported significant improvements in child sleep onset latency, the frequency and duration of night awakenings, and sleep consolidation, while mothers in the control condition reported no changes in child sleep. Relative to the control condition, there were also improvements in maternal-perceived child sleep quality, as well as reductions in maternal-perceived child bedtime resistance and broad sleep problems.

Three studies on massage have compared the effects of a bedtime routine that incorporates this pre-bedtime activity on nighttime sleep during early childhood [67,41]. In one study, 23 infants and toddlers with sleep onset problems were assigned to either nightly 15-min massages from their parents or to reading a bedtime story. Parents in both groups were asked to implement these activities as the last step of their child's typical bedtime routine. Relative to those in the bedtime story condition, after one month of intervention, children in the massage group had less bedtime resistance and shorter sleep onset latencies [41]. A more recent study [67] randomly assigned 76 mothers of newborns to nighttime massage with lotion, nighttime massage without lotion, and no massage control conditions, and assessed newborn sleep from birth until infant age 1 mo. Infants in the lotion massage condition evidenced fewer mother-reported nighttime awakenings and longer nighttime sleep durations relative to infants in the other two study conditions. Further, frequency of nighttime massages was positively correlated with total infant sleep time, and negatively correlated with night awakenings.

Another study [52] examined the effects of massage on the development of infant circadian rhythms from the first 2 wk of life to 12 wk of age. Infant–mother dyads were randomly assigned to a control (8 dyads) or intervention (13 dyads) conditions, with mothers in the intervention condition directed to provide 30 min of massage therapy nightly before bedtime for 2 wk when infants were 10–14 d old. Actigraphic recordings of infant sleep for one day pre-treatment, one day post-treatment, and at 6 and 8 wk of age showed that compared to control infants, infants who received massage showed peak activity levels in the morning hours. In addition, at 12 wk of age, infants in the treatment condition showed significantly higher levels of nocturnal melatonin (6-sulphatoxymelatonin) secretion. The authors

indicated that these changes together suggested an earlier adjustment of intervention infants' circadian rhythm to a nocturnal sleep period.

Two other intervention studies have directly compared a bedtime routine to another behavioral sleep intervention [68,69]. Adams and Rickert [68] randomly assigned 36 toddlers and preschoolers who exhibited bedtime tantrums to positive bedtime routine, graduated extinction, or control conditions. Parents in the bedtime routine condition were asked to engage in 4–7 quiet activities for 20 min prior to bedtime. Children in both intervention groups showed similar decreases in bedtime tantrums relative to the control condition. Despite similar levels of improvement at study follow-up, those in the bedtime routine condition evidenced a more rapid reduction in tantrums over the 6-wk course of treatment than those in the graduated extinction condition.

Mindell et al. [69] compared the effects of adding the 3-step bedtime routine described above [40] to the customized sleep profile (CSP), a tailored internet-based behavioral sleep intervention, by randomly assigning 264 mothers and their infant or toddler to receive the CSP, the CSP plus the prescribed bedtime routine, or no treatment. The CSP provides customized, empirically-supported behavioral strategies based on caregiver report of child sleep problems [69]. For example, caregivers who indicate that they rock their child to sleep are provided with recommendations about promoting independent sleep onset. Both of the CSP conditions resulted in improved sleep onset latency, reduced number and duration of night awakenings, improved maternal perceptions of sleep quality, and reduced maternal perceptions of child sleep problems relative to the control condition. Although the two intervention conditions did not significantly differ in their effectiveness, effect sizes for the condition that included the bedtime routine were larger for some sleep outcomes. Of note, effects for both intervention conditions were maintained relative to controls in a one-year follow-up study, with 87% of mothers in bedtime routine condition continuing to use this specific routine at least half of the time [70].

One intervention study with 151 children (ages 12–38 mo) has shown null findings for the effects of a bedtime routine on sleep outcomes [71]. However, this study's intervention was primarily focused on encouraging parent–child book sharing at bedtime, as opposed to promoting parent–child engagement in a specific bedtime routine. In addition, the study intervention and control condition participants reported no difference in the information they received on bedtime routines, which likely contributed to the lack of effects on sleep in the intervention condition.

All of the studies reported above have focused on implementation of a routine at bedtime. Two additional studies have reported on the use of massage [72] and music [73] as being beneficial pre-nap activities for promoting early childhood sleep. In one nap-related study, children who received a 20-min massage twice per week immediately before naptime for 5 wk at their preschool had shorter naptime sleep onset latencies than children in a wait-list control condition [72]. Another study examined whether background classical guitar music at school naptime was beneficial for toddlers and preschoolers [73]. Using a within-subjects design, the study found that compared to days when no music was played, when naptime

music was played children in both age groups evidenced shorter sleep onset latencies, based on behavioral coding conducted by coders who were blinded to the study hypotheses.

Benefits of a bedtime routine beyond improved sleep

As noted above, we hypothesize that having a bedtime routine has benefits beyond improved sleep, including the broad domains of child mood and emotional–behavioral regulation, parent and family stress/functioning, and child literacy-related outcomes (see Fig. 1 and Table 1). To our knowledge, the conceptual model outcomes of child self-care/health and parent–child bonding/attachment have yet to be examined in the context of bedtime routine research.

Several studies have shown that a bedtime routine is associated with positive child mood and enhanced emotional–behavioral regulation. In a cross-sectional study of infant and toddler sleep patterns in the Middle East, children who had a consistent bedtime routine had more positive maternal-rated daily mood [48]. Two of the intervention studies referenced above also demonstrated that the institution of a bedtime routine results in more positive maternal-rated child morning mood [40,69]. In a longitudinal study that examined bedtime schedules at child ages 3, 5, and 7 y, Kelly et al. [74] found that children who did not have a regular bedtime or changed from a regular to a non-regular bedtime had increased emotional and behavioral difficulties, with a dose-dependent relationship between non-regular bedtimes and child difficulties. While bedtime routines were not explicitly examined, children with non-regular bedtimes were less likely to engage in parent–child reading activities and regular mealtimes, suggesting that regular bedtime routines were unlikely for those without a set bedtime.

The two bedtime routine intervention studies additionally found improvements in intervention mothers' self-reported mood compared to control mothers [40,69]. Maternal confidence in managing child sleep problems also increased, suggesting benefits for caregiver self-efficacy [69]. One of the studies examining massage as a bedtime routine activity similarly found that mothers who engaged in massage reported child behavioral improvements at bedtime as well as decreased maternal anxiety about bedtime [41]. With regard to family functioning in particular, Adams and Rickert [68] found that families who implemented a bedtime routine to reduce bedtime tantrums reported significant improvements in marital satisfaction, whereas those in the comparison intervention and control conditions did not.

Related to multiple domains of child development and family functioning, Zajicek-Farber et al. [51] tested a model of interrelations among parenting stress, involvement in a bedtime routine, and child emotional–behavioral regulation and school readiness in a sample of 2977 low-income families surveyed at child ages 14, 36, and 60 mo. Having a consistent bedtime routine (4 nights per week) at age 36 mo was concurrently associated with increased child emotional and behavioral regulation. Increased child self-regulation at 36 mo was in turn predictive of better school readiness, including early numeracy and literacy development, at age 60 mo. Bedtime routines at 36 mo also buffered against the effects of early parenting stress.

As previously noted, a bedtime routine is expected to positively impact literacy outcomes. In their study of language-based bedtime routines, Hale et al. [42] found a direct linkage between a bedtime routine and child literacy outcomes. Even after controlling for child and family socio-demographic characteristics, having a language-based bedtime routine at age three years significantly predicted higher language abilities and receptive vocabulary at age five years. These results were attenuated when age three years language and vocabulary scores were included in the model. In another study of language-based bedtime routines, High et al. [71] found that parents who were provided with an intervention that emphasized parent–child book sharing at bedtime reported significant improvements in their child's literacy orientation, including that their child enjoyed sharing books, that they enjoyed sharing books with their child, and that books were shared at bedtime six or seven nights per week.

Benefits of bedtime routine activities

In the following sections, we present evidence from the broader literature on early child development to identify how each bedtime routine activity within the broader domains of 1) nutrition, 2) hygiene, 3) communication, and 4) physical contact can contribute to positive developmental outcomes. While we provide examples of common activities and related literature within each domain (e.g., reading in the communication domain), we acknowledge that activities may vary across cultures and contexts (e.g., story-telling as opposed to reading books) and the list of bedtime routine activities is not exhaustive but focuses on areas in which studies have been conducted. Furthermore, we generally limit our discussion to research conducted with children ages 0–5 y, and focus primarily on meta-analytic and review papers when possible. Although some of these bedtime routine activities in particular have been shown to promote sleep, based on the principles of behavioral reinforcement, we propose that each activity benefits sleep when used as part of a consistent bedtime routine. From a behavioral perspective, following a predictive set of behaviors consistently before sleep onset can lead to increased compliance with a set bedtime, decreased arousal prior to bedtime, and positive sleep onset associations, all of which contribute to increased total sleep time, greater sleep consolidation, and better quality sleep [19,24].

Nutrition

We hypothesize that when included as part of a bedtime routine, nutrition-related activities (e.g., breast- or bottle-feeding, healthy snack) can promote aspects of child health, cognitive development, parent–child bonding/attachment, and sleep. A large body of research indicates that proper nutrition during early childhood is necessary for physical health, including adequate growth and the prevention of illness [1]. Proper nutrition during early childhood also helps to support brain growth [1], whereas protein malnutrition and micronutrient deficiencies inhibit cognitive development and increase childhood risk for poor neuro-behavioral outcomes [75,76]. As such, including feeding as part of a bedtime routine can help to supplement early childhood nutrition, and in turn promote positive effects.

The AAP [77], UNICEF, and the World Health Organization (WHO) [78] recommend breastfeeding in particular for early childhood nutrition due to its comprehensive short- and long-term health and psychosocial benefits for both infants and mothers. Several meta-analytic reviews have demonstrated that breastfeeding during infancy protects against infant infections and infection-related mortalities as well as the development of malocclusion [78-80]. There is emerging evidence that breastfeeding may reduce the likelihood of child overweight status and diabetes [80]. Breastfeeding has also been associated with an average increase in child intelligence of about three intelligence quotient (IQ) points [80]. For mothers, in addition to health benefits, breastfeeding has been associated with decreased likelihood of postpartum depression [79], which may allow for more sensitive and responsive caregiving.

Breastfeeding may also facilitate increased parent–child bonding and attachment, although there is less available research on this topic. Breastfeeding mothers tend to spend more time soothing and cuddling their infants compared to formula-fed babies [81], and also engage in more skin to skin contact (SSC), which has been associated with increased levels of mother–infant cortisol concordance and heightened maternal levels of oxytocin [82,83], an attachment-related hormone [84]. Taken together, physiological co-regulation (or synchrony) through mother–child interactions increases maternal responsiveness to infant signals and broad maternal sensitivity [84], which are key factors in the development of secure infant–mother attachment [85-88]. For instance, in a longitudinal study of 152 mothers, Britton et al. [87] found that mothers who chose to breastfeed their infants showed increased sensitivity during infant–mother interactions at infant age 3 mo. Sensitivity during these early dyadic interactions was in turn related to secure attachment when infants were 12 mo of age. Direct links between breastfeeding and attachment were not found, suggesting that it is the quality of the mother–infant interactions, with breastfeeding providing a context that can facilitate positive interactions, that leads to better attachment outcomes.

In addition to working as part of a behavioral reinforcement chain linking bedtime routine activities to sleep onset, feeding as part of the nighttime routine may promote sleep through increasing child satiety. Hunger and sleep both play a role in homeostatic regulation and are interrelated processes [89,90]. Animal research has shown that just as disruption of circadian rhythms and sleep deprivation can impact energy and hunger cues, malnutrition and appetite suppression are associated with dysregulated sleep [90]. Thus, given that satiety contributes to somnolence [89], it could be that feeding prior to bedtime promotes sleep, particularly during early infancy when nutritional needs and feeding frequency are increased. It should be noted, however, that typical recommendations are to feed at the start of the bedtime routine to avoid negative sleep associations with sleep onset.

There is little research on inclusion of other types of nutrition, such as a snack or a drink, as part of a bedtime routine. One study of 1278 children from the Gemini twin cohort found that those who had a shorter sleep duration at 16 mo of age consumed more nighttime calories from milk at 21 mo of age, suggesting that shortened sleep duration is linked with increased calorie intake in young children [91]. These findings are similar to research on older children and adolescents that links short sleep duration with obesity [10]. Another study of older children and adolescents showed that overall snacking behavior was

associated with a healthier diet in elementary school children, but a less healthy diet in adolescents [92]. While it could be that nighttime snacking leads to increased caloric intake and, in turn, risk for obesity in young children, a recent review of snacking across ages and countries/regions suggests that it is not snacking per se, but the nutritional content of the snack and purpose of the snack (i.e., in response to hunger cues versus in response to boredom) that pose risks for overweight and obesity [93]. Thus, a healthy snack in response to child hunger or nutritional needs in children under age five may be an adaptive component of a bedtime routine. It is recommended that caregivers provide age-appropriate portions, to avoid excessive calorie intake. Furthermore, inclusion of too much fluid at bedtime may result in a need for nighttime voiding, which could disrupt sleep. Given the importance of oral hygiene (discussed next) for healthy child development, any snacking at nighttime should be followed by teeth brushing as part of the bedtime routine.

Hygiene

Hygiene-related activities such as bathing and brushing teeth have direct effects on children's health by preventing illness and disease [1,94-97]. Adequate skin care and regular bathing promote skin barrier functions, including thermoregulation, gas exchange, hydration, and protection against infection [94,95]. Bathing is especially important in early development, given that infant skin is more susceptible to infection.

In a similar fashion, practicing regular oral hygiene from an early age is critical for supporting child health [96,97]. Oral health care is one of the most prevalent unmet health needs among infants and toddlers, both in the United States and developing countries [98]. Early dental caries are highly prevalent worldwide, and disproportionately impact lower SES children. Dental caries in early childhood can inhibit weight gain and growth [96]. Such effects are thought to occur as a result of dental pain, which can limit food intake, and chronic inflammation, which has negative metabolic consequences [96]. In addition, poor oral hygiene in early childhood leads to the development of dental caries in childhood and adolescence [97,99]. For example, a longitudinal study of oral hygiene at ages 1, 3, and 6 y and dental health at age 15 y in a sample of 671 children showed that infrequent tooth-brushing at age 3 y was a significant predictor of adolescent caries [99].

Including bathing and teeth brushing as part of a consistent bedtime routine may facilitate early learning of proper self-care and health-related habits, which are important for subsequent child health-related quality of life and psychosocial functioning. In particular, studies have shown that health-related quality of life is higher among children who engage in regular dental hygiene and who have healthy teeth, both during the preschool years and during later development [28,96,100,101]. Levels of parent distress are also lower with fewer early childhood dental problems [100]. Although few studies have examined more specific psychosocial effects of poor oral hygiene during early childhood, studies of children and adolescents suggest that dental problems contribute to school absences and, in turn, to academic achievement [96,102]. Therefore, the prevention of dental problems via early childhood oral hygiene may benefit long term child health and psychosocial outcomes, as well as aspects of family functioning, given the parental stress associated with child dental concerns and multiple dental appointments.

It is also possible that bathing and engaging in regular oral hygiene can promote healthy sleep beyond just being part of a routine. As in adulthood, bathing prior to bedtime in childhood may increase core body temperature, with a subsequent decrease in core temperature promoting sleep onset [40]. Oral hygiene likely has an indirect effect on sleep through the prevention of dental caries and related oral pain, as studies have shown that untreated dental caries are associated with pain-related sleep disruption [96,97].

Communication

Communication activities during the bedtime routine include such activities as reading and singing/lullabies. We focus on these activities in the following sections given the extant research.

Reading

Reading aloud to or reading with children (hereafter referred to as parent–child book sharing) has been linked to language development, literacy, and positive cognitive outcomes. Recommendations to promote early literacy and cognitive development have emphasized the need for frequent, high-quality interactions around reading or singing that begin early in development [18], in order to capitalize on increased neuroplasticity between ages 0 and 3 y [1,103,104]. Intervention research further supports the importance of frequent and early parent–child book sharing to promote literacy and cognitive outcomes. For instance, the Reach out and Read (ROR) program, in which pediatricians and other health professionals provide free books and anticipatory guidance related to parent–child book sharing, has shown that these efforts can increase parent–child reading frequency and improve child language development [103,104]. Meta-analytic reviews on 33 studies conducted between 1951 and 1993 [105] and 29 studies conducted between 1994 and 2009 [106] have also demonstrated that parent–child book sharing in early childhood positively impacts oral language abilities and emergent reading skills, which are necessary for school readiness and subsequent academic achievement.

In this way, early parent–child book sharing and positive literacy outcomes are thought to be reciprocally related, with a "snowballing" effect in which benefits accumulate and gain momentum throughout child development [106,107]. Book sharing facilitates interest in reading and advanced language skills, which, in turn, influence continued engagement in reading activities, enhanced school readiness, and childhood academic achievement [106,107]. A study of 19 2–5-y-olds also found that increased home literacy exposure can impact the developing brain [108]. While listening to stories, children who had greater exposure to reading at home showed higher levels of brain activation in areas related to semantic processing, suggesting a neurobiological mechanism linking early reading activities to positive child literacy outcomes.

Collectively, these studies, as well as the two bedtime routine studies that have shown a link between reading activities before bedtime and child literacy-related outcomes [42,71] highlight the benefits of including parent–child book sharing as a bedtime routine component for child language, literacy, and cognitive development. We additionally hypothesize that reading as part of the bedtime routine could promote parent–child

attachment and child emotional–behavioral functioning. Parent–child book sharing is a rich and interactive activity that can facilitate parent–child communication and increase parent sensitivity to child learning and broad developmental progress [103,106]. At the same time, children may acquire a sense of mastery and self-confidence related to reading and to learning more generally through these positive parent–child interactions around educational materials [103].

In regards to benefits upon sleep, as noted above, at least one previous study has found an association found between reading at bedtime and increased sleep duration [17]. In this case, it is not clear whether reading itself promotes sleep, or rather whether those families who read at bedtime are also likely to engage in other behaviors that positively impact sleep, such as set bedtimes. Thus, additional studies of parent–child book reading during the bedtime routine are needed to elucidate whether there are direct benefits to child sleep. Finally, although speculative in nature, it is also likely that reading at bedtime may decrease engagement in maladaptive activities, such as television viewing and electronics use, which have been associated with negative sleep outcomes [26,31,32].

Singing/lullabies

Similar to reading, we hypothesize that singing songs or lullabies as part of the bedtime routine can benefit child language, literacy, and cognitive development, as well as parent–child attachment and sleep. Recommendations for early literacy often reference singing songs or nursery rhymes to promote language and emergent literacy skills [103], particularly for increasing phonological awareness [109-112]. Meta-analytic research indicates that engaging in musical activities, including singing, is correlated with enhanced cognitive skills, likely via gains in visual-spatial reasoning [113,114], although to our knowledge there is no available research on singing or lullabies and such outcomes in the context of a bedtime routine.

Engaging in interactive singing/lullabies at bedtime may also contribute to positive parent–child attachment, as well as to positive child and family psychosocial functioning. Drawing on research related to mother–infant relationships, infant speech and sound preferences, and music-making, Creighton [115] theorized that singing and lullabies could enhance mother–infant emotional communication and maternal emotional availability, leading to more secure attachment relationships. A recent study provided some evidence on singing/lullabies and infant–mother attachment [116]. After participating in a music and movement program, which included the teaching of songs and lullabies, mothers of 2–6 mo-old infants showed increased mother–infant reciprocity and duration of infant directed speech, as well as more positive maternal perceptions of mother–infant attachment, compared to mothers in the control condition [116].

Pasiali [117] has also recently offered a conceptual model of the benefits of music on parent–child attachment and family functioning. Within this model, musical engagement and music therapy interventions foster attachment by providing a context for coregulation and parental responsiveness, positive parent–child communication, and stress reduction. Although additional research on these outcomes and potential mechanisms is needed, some initial studies have provided evidence for effects of musical engagement on family

functioning and child psychosocial outcomes, including decreased levels of parental distress [118], as well as improved positive parent–child interactions, parenting-related irritability, and mental health [119].

Music is also thought to promote prosocial skills through engagement in synchronous, music-related behaviors (e.g., moving rhythmically, singing with others) [120-122]. One experimental study provided support for synchrony as a mechanism linking music with prosocial behavior. In this study, 14-mo-old infants who were bounced synchronously while listening to music were more likely to exhibit prosocial and altruistic behavior compared to infants who were bounced asynchronously or were not bounced at all [123]. Thus, singing songs or lullabies as part of the bedtime routine, especially those that include synchronous actions, could promote development of synchronous behaviors in young children.

In addition to acting as a part of a behavioral chain linked to sleep onset, singing songs or lullabies to children may decrease child arousal and increase relaxation, thereby promoting sleep onset. In the Field et al. [73] study (see also Table 1) on pre-nap music and sleep in young children, those exposed to background music fell asleep faster at naptime. Other available studies of music and sleep in early childhood are limited to those with premature infants, and these have shown mixed results. For instance, some studies of premature infants show benefits of background music [124] or parent singing/lullabies [125] on infant sleep, whereas others do not [126,127].

Physical contact

Massage and other forms of physical contact, such as cuddling or rocking, are often included in a bedtime routine. Broadly, we hypothesize that physical contact is associated with positive child mood and emotional–behavioral regulation, parent–child bonding/attachment, and better sleep.

Massage

Across outcomes, there are more studies of massage with infants as opposed to with toddlers and preschoolers, and more evidence for the benefits of massage in high-risk groups, such as preterm infants [128,129] and infants of depressed mothers [130]. There is a possibility that massage is associated with health-related outcomes. Two recent reviews of studies with preterm infants demonstrated that moderate (but not gentle) pressure massage can increase infant growth and reduce length of stay in the neonatal intensive care unit (NICU) [128,129], although effect sizes were small. In addition, Bennett et al. [131] did not find support for these effects in their meta-analytic review of 34 studies on massage for full-term infants, although the review was limited to research conducted with infants ages 0–6 mo.

In a review on the effects of massage therapy on child and adult biochemistry, Field et al. [132] found evidence that massage therapy can decrease cortisol and increase serotonin and dopamine, suggesting that massage therapy could reduce stress and promote positive mood. It is therefore possible that massage practices at bedtime could improve child mood as well as parental stress, although more research is needed to support these hypotheses, as few studies have shown linkages between massage and child and parent mood/emotional– behavioral regulation. The Bennett et al. review of massage in full-term infants did find

some small effects for massage on infant personal and social behavior, but high risk of bias may have impacted study findings [131]. Finally, one of the bedtime routine studies that included a massage component also reported positive effects on child bedtime behavior as well as parental mood [41].

Engaging in infant massage may also benefit parent–child attachment by providing opportunities for positive parent–child interactions and increased maternal sensitivity. For example, in meta-analysis of 13 preventive interventions for promoting positive parent–child interactions in mothers with depression, the inclusion of infant massage emerged as the most robust predictor of intervention-related increases in maternal sensitivity [130]. Similar to SSC [82,133], it could be that massage provides mothers with more opportunities to understand and respond to their infants' signals, thereby increasing maternal responsiveness to infant cues [130] and strengthening the mother–infant attachment relationship [85,86,88]. However, research on these potential mechanisms is lacking, and more studies are needed regarding the benefits for non-depressed mothers and healthy infants, which have not been the focus of previous research.

Finally, evidence linking massage with better early childhood sleep is mixed. Bennett et al. [131] did not find evidence of any positive associations between massage and sleep when examining studies conducted with infants ages 0–6 mo. In contrast, as described earlier (see also Table 1), several small-scale studies with older infant, toddler, and preschooler samples have demonstrated some positive effects of massage on sleep [41,52,67,72]. It could be that massage is more beneficial for sleep once sleep is more regulated, or when massage is included as part of a specific bedtime routine-related behavioral sequence.

Cuddling/rocking

Cuddling, rocking, and snuggling before bedtime may help to promote child health, mood and emotional–behavioral regulation, parent–child attachment, and child sleep. Although not the same as SSC or Kangaroo Mother Care (KMC), which primarily involves breastfeeding and SSC [134], cuddling and rocking during early childhood likely involves some SSC. A recent review of 21 studies of KMC with low birthweight infants showed that this practice can benefit infant health and wellbeing, with positive impacts on infant weight, length, and head circumference, as well as selected measures of parent attachment [134]. As discussed with regard to both breastfeeding and massage, SSC may provide opportunities for enhancing co-regulation, maternal sensitivity [82,84] and, by extension, the emerging parent–child attachment relationship [85,88].

We hypothesize that in the same way, parent–child physical closeness at bedtime provides opportunities that may facilitate co-regulation, maternal sensitivity, responsiveness, and emotional availability, with benefits to both the parent–child attachment relationship and to child mood and emotional–behavioral regulation. This type of physical closeness may also provide an explicit demonstration of parent affection and warmth, which are facets of responsive caregiving and maternal sensitivity [85,86]. Parental affection and a secure parent–child relationship additionally are associated with enhanced child psychological functioning, with meta-analytic data providing long-term evidence of the importance of early parent–child bonds for subsequent psychological wellbeing and adjustment [135,136].

One study of bedtime practices and maternal emotional availability, which was assessed by coding videos of maternal behaviors (sensitivity, scaffolding, intrusiveness and hostility) at bedtime in 44 mother–infant dyads, showed that increased maternal emotional availability was associated with decreased night awakenings [137], although close physical contact was not. This finding suggests that cuddling and rocking can benefit sleep when these behaviors are enacted in the context of high parental sensitivity and responsiveness. Similar to the effects of massage described above, cuddling and rocking before bedtime may also decrease bedtime arousal and facilitate stress reduction through changes in biochemistry [132], which could in turn improve child mood and positively impact sleep onset. However, studies have yet to specifically examine cuddling, rocking, and related behaviors at bedtime and their relation to child developmental outcomes.

Implications

Bedtime is a time when most caregivers are present and can engage interactively with their children. An adaptive bedtime routine generates rich opportunities to support positive early childhood developmental outcomes, and is a clear framework for promoting nurturing care (adequate health, nutrition, security and safety, responsive caregiving, and early learning opportunities) and early child stimulation [1,3]. A bedtime routine provides the seemingly obvious benefits to sleep and to reduction of sleep problems, as well the indirect links to improved wellbeing through better sleep. But just as important, and what we are proposing, is that the components of a bedtime routine in and of themselves are associated with broader positive outcomes. For example, adequate health is supported by inclusion of nutrition- and hygiene-related activities (e.g., bathing, brushing teeth). Physical contact, such as cuddling, rocking, and massage are linked to increased feelings of security. Communicative activities, including reading and singing/lullabies, incorporate responsive caregiving and early learning opportunities. Furthermore, all of these activities support early child stimulation.

Implementation of a nightly bedtime routine can support positive developmental outcomes for all children, worldwide. Importantly, instituting a healthy bedtime routine may be particularly beneficial for promoting healthy outcomes in at-risk populations, such as socioeconomically disadvantaged young children and their families [25,138], as developing positive routines can act as a buffer against family stress and promote better outcomes. A bedtime routine that includes appropriate nutrition, hygiene, and communication-related activities may be critical in health promotion for these children, given that studies have shown increased risk for dental caries, other health concerns, and lower levels of school readiness and academic achievement in lower SES children and families [1,97,107]. In addition, investing early in the health and wellbeing of all children, but especially those who are at increased risk for poor outcomes, has been shown to be a robust and cost-effective method for conferring positive short- and longterm developmental outcomes [1,2]. It should be noted, however, that children and families of lower SES may face increased challenges implementing a consistent bedtime routine due to social and contextual issues. For example, children living in lower SES households may be more likely to have single caregivers and/or caregivers who engage in evening or shift work, as well experience increased household crowding, noise, and light exposure [139,140], all of which can impact bedtime routine implementation and consistency. Thus, future research and clinical efforts should prioritize

bedtime routine recommendations that are feasible and can be tailored to the individual child and family, as discussed below.

Future directions for research

There are a number of areas for future empirical focus. For example, more intervention studies on both typically developing children and those with neurodevelopmental conditions are needed to examine causal effects and potential mechanisms of a bedtime routine in general, and for specific bedtime routine activities, on broader outcomes. These studies are particularly important given that observational studies cannot disentangle the effects of a bedtime routine on child outcomes from the effects of more broad household routines and structure. Potential overall mechanisms linking a positive bedtime routine to enhanced childhood outcomes, in addition to those discussed above regarding each specific component, may include increased parenting self-efficacy, behavioral reinforcement/ chaining, as well as positive parent-child interactions/communication [35,50]. These are in addition to the mechanisms described above with regard to bedtime routine components. Additionally, more bedtime routine research that utilizes objective (e.g., actigraphic) measures of child sleep is necessary to expand evidence for sleep-related bedtime routine outcomes. Future bedtime routine research should also assess for broader developmental outcomes beyond sleep to further support the hypothesized child development outcomes presented in the bedtime routine conceptual model. Similarly, conclusions about some bedtime routine components, such as massage, and outcomes, such as child emotional– behavioral regulation and family functioning, are limited by small sample sizes and a prior focus on special populations (e.g., premature infants, mothers with depression), and thus require further study. Studies that examine the use of a bedtime routine concurrently and longitudinally, in the context of intervention for clinically significant child sleep problems, and as a preventive intervention for typically developing children, are also needed.

Finally, future research should examine moderation of the proposed relationships between a bedtime routine and positive outcomes by racial/ethnic background, SES, and other sociodemographic factors. In particular, a number of individual child and parent/family factors, such as child temperament, parenting practices, and family processes, warrant further examination as potential moderators of—or contributors to—the bedtime routine conceptual model's putative processes and outcomes. Cultural beliefs about family rituals and routines are also important to assess in future work. Given that the prevalence of and activities included in a bedtime routine may vary both within and across cultural contexts, more research is needed on specific bedtime activities in relation to child sleep and other outcomes, and in socio- demographically diverse populations.

Future directions for practice

We propose that the implementation of a consistent bedtime routine is beneficial for many aspects of sleep in early childhood, including sleep onset latency, sleep duration, and sleep quality and consolidation, and has benefits that are just as important for overall child development and wellbeing, including health, emotional–behavioral development, literacy, parent–child interactions, and family functioning, to name just a few. Thus, our hope is that

a nightly bedtime routine that includes multiple adaptive components becomes typical practice for all young children around the world. Psychoeducation about the importance of such a bedtime routine should be provided during early infancy to promote subsequent bedtime routine engagement, to support the development of positive, lifelong healthy habits, and to elicit the dose-dependent bedtime routine-outcome response relationship. Tailoring the duration and components of a bedtime routine to individual child needs and family context is especially important. For instance, caregivers who work late into the evening or engage in shift work may benefit from implementing an abbreviated bedtime routine. Children with neurodevelopmental or other medical or mental health conditions may benefit from different bedtime routine activities than those described here, as activities that are typically considered negative may promote sleep for some children (e.g., electronics use) and some positive activities may be too stimulating or aversive (e.g., singing songs). Development of an education campaign about the importance of bedtime routines crosses many stakeholders, including pediatric primary care providers, lactation consultants, oral health care providers, child development specialists, early childhood home visitors, literacy advocates, and other educational providers. The recommendation for a bedtime routine that incorporates brief, adaptive components is straightforward and simple, making it for feasible and potentially cost-effective to integrate into existing health promotion practices. Integration can occur with other ongoing campaigns, such as ROR [103,104] and the Brush, Book, Bed campaign of the AAP to promote oral health, or with early childhood programming, such as home visiting or Head Start. Our goal through promotion of a nightly bedtime routine for young children is not only a good night's sleep but also a chance at the best long-term developmental outcomes possible.

Acknowledgments

Abbreviations

AAP	American Academy of Pediatrics
ECD	Early childhood development
IQ	Intelligence quotient
KMC	Kangaroo mother care
NICU	Neonatal intensive care unit
ROR	Reach out and read
SES	Socioeconomic status
SSC	Skin to skin contact
UNICEF	United Nations International Children's Emergency Fund
US	United States

WHO   World Health Organization

Glossary of terms

Bedtime routine

the predictable activities that occur in the hour or so before lights out

Parent–child book sharing

reading aloud to or reading with children

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* The most important references are denoted by an asterisk.

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Practice points

Instituting a consistent bedtime routine in early childhood can benefit multiple aspects of child sleep. A bedtime routine should:

1. Include the same steps each night, as many nights of the week as possible

2. Include two to four adaptive activities, such as a feeding, bathing/brushing teeth, and reading

3. Include positive parent–child interactions prior to child sleep onset

4. Last no longer than 30–40 min, depending on activities (e.g., inclusion of bath)

5. Avoid maladaptive activities at bedtime, including use of television and other electronic devices, but take individual child and family differences and needs into account

Research agenda

Future research on the use of a bedtime routine in early childhood is necessary to better understand:

1. Impacts on objectively measured childhood sleep domains, both concurrently and longitudinally

2. Influence on broader child development and wellbeing, within the framework of child, family, socio-cultural, and other contextual factors

3. Putative mechanisms, both direct and indirect, between a bedtime routine, its specific components, and outcomes

4. Variation in bedtime routine consistency, components, and outcomes according to racial/ethnic background, SES, child and family characteristics, and other socio-demographic and socio-cultural factors

5. Impacts on sleep and other child development outcomes in the context of a) intervention for young children with clinically significant sleep problems, and b) preventive intervention for typically developing and at-risk young children and their families
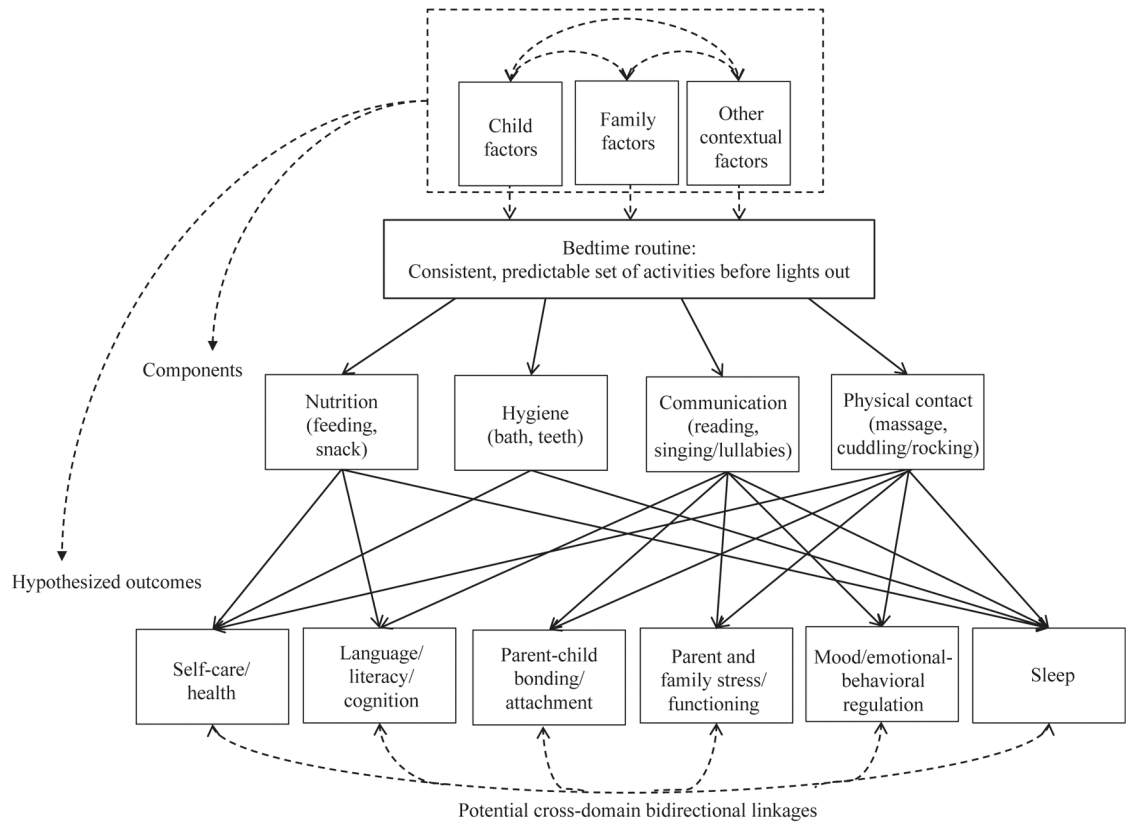
Fig. 1.
Conceptual model of hypothesized benefits of a bedtime routine.
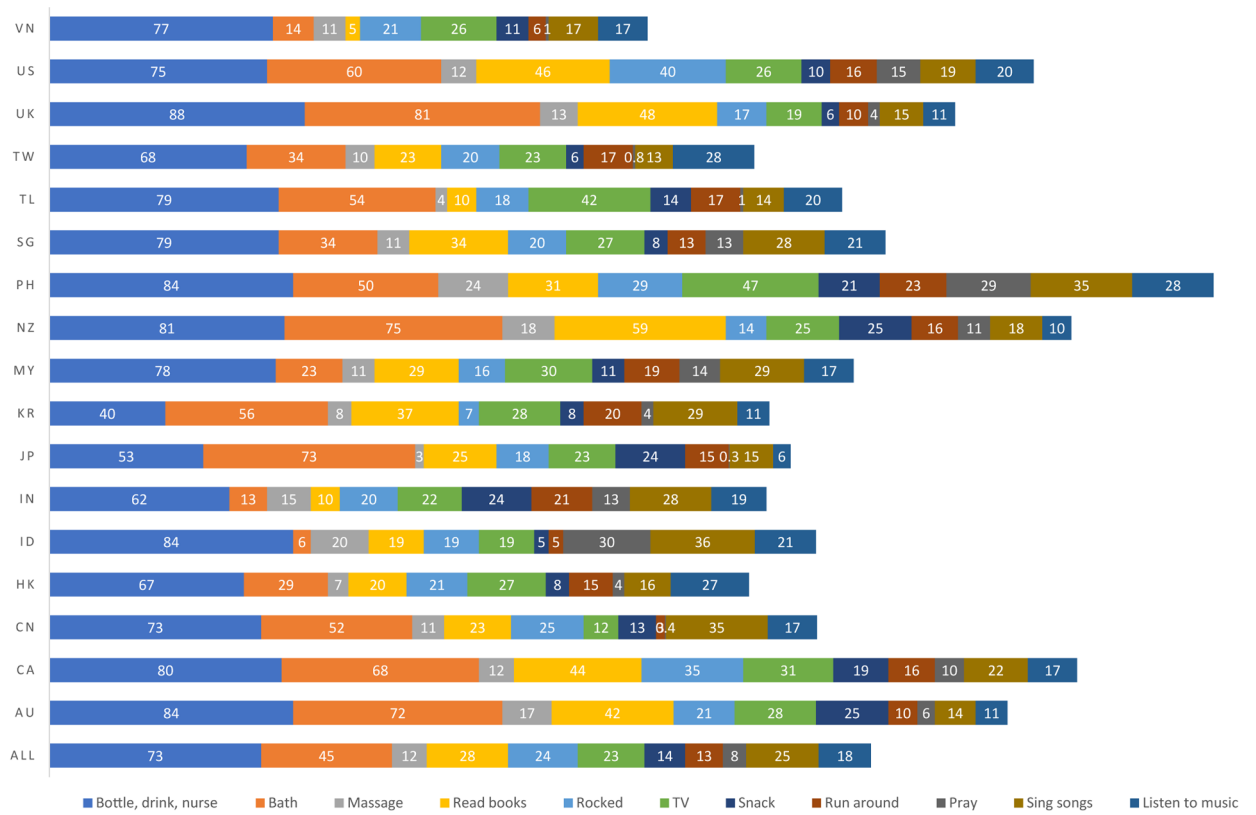
Fig. 2.

Cross-cultural prevalence of bedtime routine activities. Note. ALL = total for all countries/
regions; AU = Australia; CA = Canada; CN = China; HK = Hong Kong; ID = Indonesia; IN
= India; JP = Japan; KR = South Korea; MY = Malaysia; NZ = New Zealand; PH =
Philippines; SG = Singapore; TL = Thailand; TW = Taiwan; UK = United Kingdom; US =
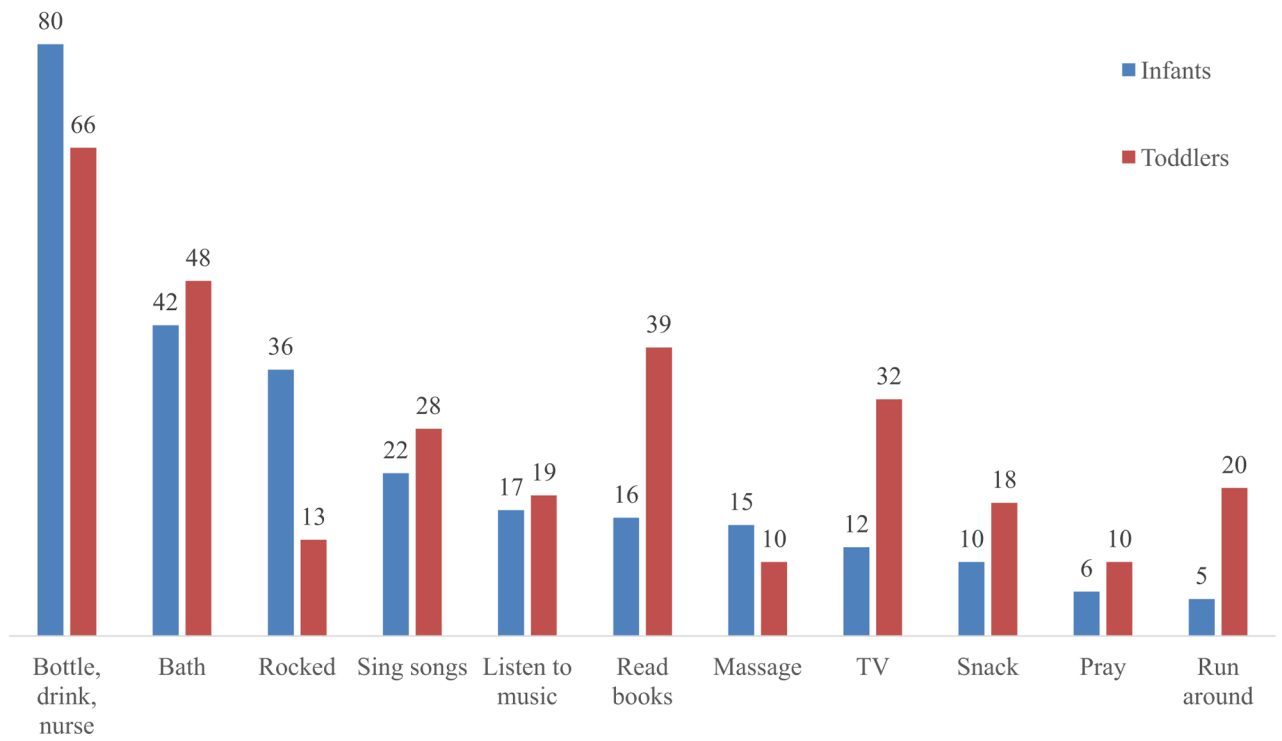United States; VN = Vietnam.

Fig. 3.
Overall percentages of bedtime routine activities by age.

Table 1

Summary of studies assessing sleep and other outcomes of a bedtime routine.

Study	N	Age	Bedtime routine (BR)/ component	BR benefits for sleep	Other BR benefit(s)
Cross-sectional studies					
Fiese, 2007 [47]	47	5–7 y	• BR presence • BR timing (on time, early, late)	• Disrupted BR timing associated with increased night awakenings	• Not assessed
Henderson & Jordan 2010 [26]	226	2–8 y	• BR presence • BR type (coded as adaptive or maladaptive)	• Adaptive BR and more consistent BR associated with better quality sleep • Maladaptive BR and less consistent BR associated with poorer quality sleep	• Not assessed
Mindell et al., 2009 [17]	1473	0–10 y	• BR presence • BR consistency • BR type (inclusion of reading versus no reading)	• Increased BR consistency associated with longer nighttime sleep duration for infants, preschoolers, and school-age children (trend for toddlers) • BR that included reading associated with longer sleep duration for toddlers (trend for other ages)	• Not assessed
Mindell et al., 2010 [30]	29,287	0–3 y	• BR presence • BR consistency	• Increased BR consistency associated with longer nighttime sleep duration	• Not assessed
Mindell et al., 2015 [23]	10,085	0–5 y	• BR presence • BR consistency	• BR associated with earlier bedtime, shorter SOL, longer nighttime sleep duration, fewer night awakenings, and decreased caregiver-reported sleep problems • BR as an infant associated with better sleep as a preschooler • Dose-dependent relationship found	• Not assessed
Mindell et al., 2017 [48]	669	0–3 y	• BR presence • BR consistency	• Increased BR consistency associated with earlier bedtime, shorter SOL, decreased frequency and duration of night awakenings, increased nighttime sleep and total sleep • Increased BR consistency associated with decreased maternal perception of child sleep problem	• More consistent BR associated with more positive maternal-rated child daily mood • Dose-dependent relationship found

Study	N	Age	Bedtime routine (BR)/ component	BR benefits for sleep	Other BR benefit(s)
Sadeh et al., 2009 [49]	5,006	0–3 y	• BR presence • BR consistency	• BR associated with increased total nighttime sleep duration, longer continuous sleep episodes, and decreased night awakenings	• Not assessed
Longitudinal studies					
Hale et al., 2011 [42]	4,274	3–5 y	• BR presence • Type of BR (language based or not)	• Language-based BR at age 3 y associated with increased nighttime sleep duration at age 5 y	• Language-based BR at age 3y associated with higher language abilities and receptive vocabulary at age 5 y
Staples et al., 2015 [50]	87	30–42 mo	• BR presence • BR consistency	• Greater weekly BR adherence associated with increased nighttime sleep concurrently at 36 and 42 mo; not at 30 mo • Greater weekly BR adherence at 30 mo predicted increased nighttime sleep duration from 30 to 36 mo; not for 36–42 mo • No associations with night awakenings • Interaction effects found for bedtime routine adherence and parenting practices on nighttime sleep	• Not assessed
Zajicek-Farber et al., 2013 [51]	2,977	14–60 mo	• BR presence • BR consistency	• Sleep outcomes not assessed	• BR consistency at 36 mo associated with better child social-emotional and behavioral regulation • BR buffered against family stress
Intervention studies[a]					
Adams & Rickert, 1989 [68]	36	18–48 mo	• Random assignment to BR, graduated extinction, or control condition	• Similar decreases in bedtime tantrums for BR and graduated extinction conditions • Those in BR condition evidenced more rapid tantrum reductions	• Increased marital satisfaction for caregivers in BR condition
Ferber et al., 2002 [52]	21	0–3 mo	• Random assignment to pre-sleep massage therapy or to control condition	• Higher levels of nocturnal melatonin secretion and daytime peak activity level shift for massage therapy condition	• Not assessed

Study	N	Age	Bedtime routine (BR)/ component	BR benefits for sleep	Other BR benefits(s)
Field et al., 2001 [41]	23	8–36 mo	• Random assignment to BR with massage or to BR with story	• Improved SOL and decreased bedtime resistance for BR with massage condition	• Decreased maternal anxiety about bedtime for BR with massage condition
Field et al., 2016 [67]	76	0–1 mo	• Random assignment to nighttime lotion massage, massage without lotion, and no massage control condition	• Decreased night awakenings and longer sleep duration for nighttime lotion massage condition • Frequency of massage positively correlated with total infant sleep time, and negatively correlated with night awakenings	• Not assessed
Galbraith & Hewitt 1993 [65]	45	5–72 mo	• Within-subjects comparison at pre- and post-treatment following use of BR to treat sleep problems	• Decreased SOL and night awakenings from pre- to post-treatment • 62% of children maintained sleep gains at follow-up period (2–18 mo) after post-treatment	• Not assessed
Highet al., 1998 [71]	151	12 – 38 mo	• Comparison of two cross-sectional groups: parent–child book sharing at bedtime group or historical control group	• No effects on sleep	• Increased child enjoyment in book sharing and book activities for booksharing condition
Milan et al., 1982 [66]	3	2 y, 4 y, 15 y	• Case report on use of positive BR	• All three children exposed to positive BR showed decreased bedtime resistance/ tantrums and were more likely to get to bed on time	• Not assessed
Mindell et al., 2009 [40]	405	7–36 mo	• Random assignment to age-appropriate BR (bath, massage/lotion, quiet activities) or control condition	• Improved SOL, frequency and duration of night awakenings, and sleep consolidation for BR condition • Improvements in maternal perceptions of child sleep quality and broad sleep problems, and reductions in bedtime resistance for BR condition	• More positive maternal-rated child morning mood for BR condition • Improved maternal self-reported mood for BR condition
Mindell et al., 2011 [69] & Mindell et al., 2011 [70]	264	6–36 mo	• Random assignment to internet behavioral sleep intervention, internet intervention + BR, or control conditions	• Improved SOL, number and duration of night awakenings for internet and internet + BR conditions • Improved maternal perceptions of child sleep quality and sleep problems for internet and internet + BR conditions	• More positive maternal-rated child morning mood for internet and internet + BR conditions • Improved maternal self-reported mood and confidence

Study	N	Age	Bedtime routine (BR)/ component	BR benefits for sleep	Other BR benefits(s)
				• Larger effect sizes for internet + BR condition for some outcomes • Effects maintained for internet and internet + BR conditions at 1-y follow-up	managing child sleep for internet and internet + BR conditions

Note. Studies included are those that explicitly focused on a bedtime routine and assessed sleep or other outcomes; BR = bedtime routine; BR presence = absence/presence of bedtime routine assessed; BR adherence = frequency of bedtime routine implementation; SOL = sleep onset latency.

[a] Intervention studies that included a bedtime routine as part of a broader behavioral sleep intervention are not included.