



Behavioral insomnia in infants and young children

Eun Kyeong Kang, MD, PhD¹, Seung Soo Kim, MD, PhD²

¹Department of Pediatrics, Dongguk University Ilsan Hospital, Goyang, Korea; ²Department of Pediatrics, Soonchunhyang University Cheonan Hospital, Cheonan, Korea

In infants and young children, bedtime problems and night waking are common and the main presentations of insomnia. Poor sleep may critically impact the daytime functioning and mood of the child and their caregivers. A comprehensive sleep history, a sleep diary/log, and the BEARS (Bedtime problems, Excessive daytime sleepiness, Awakenings during the night, Regularity and duration of sleep, and Sleep-disordered breathing) sleep screen are useful for diagnosing sleep problems in young children. Behavioral therapies for this type of insomnia include extinction, bedtime fading with positive routines, and scheduled awakening. Previous studies of behavioral interventions for young children showed significant improvements in sleep-onset latency, night waking frequency, and night waking duration. Parent education about their child's sleep, bedtime routines, and sleep hygiene is essential for treatment.

Key words: Sleep, Insomnia, Pediatric, Behavioral intervention

Key message

- Behavioral insomnia is common and affects a child's daytime functioning and emotions.
- Diagnosing insomnia using the child's sleep history, a sleep diary/log, and sleep questionnaires is important.
- Behavioral intervention, the main treatment, involves creating positive associations with sleep, establishing a consistent sleep schedule and bedtime routines, and the development of self-soothing skills.

Introduction

Nocturnal wakefulness is normal during early infancy and usually decreases substantially over the first few months of life. Thus, the majority of children sleep through the night by 6 months of age.¹⁾ Differentiating sleep problems from normal physiologic changes in development can be challenging for clinicians. Sleep problems are commonly referred to as “bedtime problems and night waking” in infants and young children and

insomnia in older children and adolescents.²⁾

Insomnia affects both sleep duration and quality. Total mean sleep duration is 14.2 hours (standard deviation [SD], 1.9 hours) at 6 months of age versus a mean 8.1 hours (SD, 0.8 hours) at 16 years of age.³⁾ The American Academy of Sleep Medicine recommends the amount of sleep per 24 hours for pediatric populations to promote optimal health⁴⁾ (Table 1). Chronic insufficient sleep quantity and inadequate sleep quality can impact a child's daytime functioning, causing daytime behavior problems, cognitive impairment, and mood disturbances.⁵⁾ Sleep problems in young children disrupt their parents' sleep, affecting their mood and daytime functioning as well.^{6,7)}

Chronic health problems (e.g., asthma, epilepsy, or atopic dermatitis) and developmental disorders will also adversely affect sleep.⁸⁾ This review describes behavioral insomnia of infants and young children and details its common interventions.

Definition and subtypes of childhood insomnia

Considering its characteristic features, the International Classification of Sleep Disorders (ICSD) 2nd edition classified pediatric insomnia independently as “behavioral insomnia of childhood (BIC)”.⁹⁾ In the ICSD 3rd edition, pediatric insomnia was integrated into “chronic insomnia.”^{9,10)} Considering the distinctive characteristics of pediatric insomnia, the text mentions three subtypes of pediatric insomnia: (1) sleep-onset association type, a “child's dependency on specific stimulation, objects, or setting for initiating sleep or returning sleep following

Table 1. Sleep amounts recommended by the American Academy of Sleep Medicine for pediatric populations

Age	Recommended total sleep time (hr)
4-12 Months	12-16
1-2 Years	11-14
3-5 Years	10-13
6-12 Years	9-12
13-18 Years	8-10

Corresponding author: Eun Kyeong Kang, MD, PhD. Department of Pediatrics, Dongguk University Ilsan Hospital, 27, Dongguk-ro, Ilsandong-gu, Goyang 10326, Korea
 ✉ Email: silbear@hanmail.net, <https://orcid.org/0000-0003-4226-0700>

Received: 7 January, 2020, Revised: 11 June, 2020, Accepted: 17 June, 2020

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an awakening; in the absence of these conditions, sleep-onset is significantly delayed;” (2) limit-setting type, “bedtime stalling or bedtime refusal that is met with and reinforced by inadequate limit-setting by a caregiver;” and (3) mixed type, “sleep-onset association difficulties and bedtime resistance.”^{9,10}

Sleep associations are certain behaviors or environments that customarily appear at the time of sleep-onset that the child learns to need to fall asleep.⁵ In the presence of a negative or inappropriate sleep-onset association, parental interventions (e.g., rocking, nursing, swinging) are required for the child to initiate sleep or return to sleep after a night awakening.^{5,9-11} Therefore, frequent night awakenings are the presenting symptom of the sleep-onset association type.^{9,11}

The BIC limit-setting type, which usually begins after 2 years of age, occurs when the child refuses to go to bed.^{5,10} Bedtime refusal and delaying tactics include attempts to delay bedtime (e.g., watching additional television) and the bedtime routine (e.g., requesting another story) or “curtain calls” after lights out (e.g., needing another story, hug, drink).^{5,11} It occurs when there are few or no limits instituted by parents around sleep behaviors (e.g., allowing the child to fall asleep while watching television or to play games until lights out).¹¹ Parents may also institute limits in an inconsistent way (e.g., allowing the child to stay up late on weekends).^{5,11}

Using a latent class analysis, Bruni et al.¹² recently suggested three pediatric insomnia subtypes and advocated different therapeutic approaches for each as follows: (1) presence of restless legs syndrome in dopaminergic dysfunction; (2) frequent depression and/or mood disorders in serotonergic dysfunction; and (3) common allergies and/or food intolerance in histaminergic dysfunction.

Prevalence

The prevalence of pediatric insomnia is reportedly 5%–20%, affecting up to 75% of children with neurodevelopmental comorbidities.¹³⁻¹⁵ In Korea, a study of patients visiting secondary and primary pediatric outpatient clinics reported a 13.2% prevalence of pediatric insomnia in children and adolescents: 21% at age 0–1 year, 13% at age 2–5 years, 7% at age 6–12 years, and 6% at age 13–18 years.¹⁶ Similar to the prevalence of general pediatric insomnia, bedtime problems and frequent night waking occur in 20%–30% of infants and young children.¹⁷

The prevalence of sleep problems including insomnia may vary depending on cultural and regional factors.^{18,19} Children from predominantly Asian (P-A) countries (China, Hong Kong, India, Japan, Korea, Malaysia, Philippines, Singapore, Thailand) had significantly increased parental perception of sleep problems than those from predominantly Caucasian (P-C) countries (Australia-New Zealand, Canada, United Kingdom, United States) (Table 2).¹⁸

Co-sleeping, broadly defined as room-sharing and bed-sharing, has generated a considerable amount of controversy. It is considered a factor that increases the chronic nature of sleep problems in P-C countries.¹¹ Co-sleeping is common in P-A countries, with no change across the preschool years.^{11,18,19} However, when analyses of variance covarying with cosleeping were calculated that compared the predictors of sleep problems (night waking, sleep-onset latency, bedtime, nighttime sleep duration) between P-C and P-A countries, a significant difference was seen only in sleep-onset latency.¹⁸

Table 2. Prevalence of sleep problems in infants and young children.

Study	Country	Prevalence (%)	Sample size (n)	Age (yr)	Case definition	Questionnaire
Richman et al. ⁴¹ (1975)	UK	12.5	705	3	Sleep problem	BSQ ⁴²
Camhi et al. ⁴³ (2000)	US	15.9	138	3–6	DIMS	Author defined
Archbold et al. ⁴⁴ (2002)	US	20.6	399	2.0–4.9	Insomnia	PSQ ⁴⁵
Jiang et al. ⁴⁶ (2007)	CN	66.0	764	0.5–1.9	Sleep problem	Author defined
Mindell et al. ⁴⁷ (2009)	US	9.3	836	0–6	Sleep problem	Author defined
Zhang et al. ⁴⁸ (2009)	HK	3.3	793	6	Insomnia	Author defined
Mindell et al. ⁴⁹ (2010)	P-C: AU, CA, NZ, UK, US	26.3	7,960	0–3	Sleep problem	BISQ ²¹
	P-A: CN, HK, IN, ID, KR, JP, MY, PH, SG, TW, TH, VN	51.9	21,327			
	KR	46.9	1,036			
Simola et al. ⁵⁰ (2012)	Finland	12.1	481	3–6	DIMS	SDSC ⁵¹
Mindell et al. ¹⁸ (2013)	P-C: AU-NZ, CA, UK, US	18.4	1,139	3–6	Sleep problem	BCSQ ²¹
	P-A: CN, HK, ID, KR, JP, MY, PH, SG, TH	24.2	1,447			
	KR	15.1	312			
Kim et al. ¹⁶ (2017)	KR	15.2	678	0–5	Insomnia	PSQ ⁴⁵

DIMS, disorders initiating and maintaining sleep; BSQ, behavioral screening questionnaire; PSQ, pediatric sleep questionnaire; BISQ, brief infant sleep questionnaire; SDSC, sleep disturbance scale for children; BCSQ, brief child sleep questionnaire.

Countries: AU, Australia; CA, Canada; CN, China; HK, Hong Kong; ID, India; IN, Indonesia; JP, Japan; KR, South Korea; MY, Malaysia; NZ, New Zealand; P-A, predominantly Asian; P-C, predominantly Caucasian; PH, Philippines; SG, Singapore; TH, Thailand; TW, Taiwan; VN, Vietnam.

Evaluation

1. Comprehensive sleep history

The child's documented sleep history should include a detailed assessment of the sleep schedule on weekdays and weekends, the child's sleep environment (e.g., lighting, noise level, room-sharing with parents or siblings, bed type), sleep habits (e.g., parental involvement at bedtime and at awakening, frequency of night feeding), and bedtime routines.⁵⁾

2. Sleep diary/log

When a child's sleep history is unclear, the use of sleep diaries or sleep logs can be helpful in providing a more accurate overview of sleep patterns.⁵⁾ Asking parents to keep a diary of their child's sleep for at least a week is needed. Sleep diary information includes bedtime, time the child falls asleep, time and duration of night waking, morning waking time, and daytime nap times and durations.⁸⁾ Parents can use a sleep diary application for smartphones (e.g., Kids Sleep Dr) to capture the data. A sample sleep log that was written for a 13-month-old baby with behavioral insomnia is shown in Fig. 1.

3. BEARS sleep screen and sleep questionnaire

The BEARS (Bedtime problems, Excessive daytime sleepiness, Awakenings during the night, Regularity and duration of sleep, and Sleep-disordered breathing) sleep screen is a useful tool that can be easily implemented during the well-child examination across the pediatric age spectrum.^{5,20)} (Table 3) The Brief Infant Sleep Questionnaire (BISQ), a sleep questionnaire for infants/toddlers (0–29 months),²¹⁾ consists of 13 items with three main categories (nocturnal sleep duration, night waking, and method of falling asleep). There is a Korean version of the BISQ (Appendix 1).

4. Objective assessments: actigraphy and videosomnography

Actigraphy is a popular sleep assessment tool that detects movement using a watch-like monitor positioned on the wrist or

ankle. However, it carries the issue of interdevice reliability and a high false positivity for scoring wakefulness in infants.²²⁾ A recent longitudinal study of infant nocturnal wakefulness showed weak agreement rates between actigraphy and parental reports (sleep diaries and BISQ).²³⁾

Videosomnography captures the infant's overnight sleep using time-lapse recording. Despite its accuracy, it is expensive and labor-intensive.

Treatment

1. Behavioral interventions

A recent meta-analysis and studies of behavioral interventions for pediatric insomnia concluded that behavioral treatments for young children result in significant improvements in sleep-onset latency, night waking frequency, and night waking duration.^{2,17,24,25)} The goals of most behavioral interventions include some combination of creating positive associations with sleep, establishing a consistent sleep schedule and bedtime routine, and the development of relaxation or self-soothing skills.²⁶⁾ (Table 4) Although behavioral interventions for pediatric insomnia are beneficial, they must be personalized according to the child's

Table 3. BEARS sleep screen

Sleep domain	Trigger questions for young children (2–5 years)
Bedtime problems	Does your child have any problems going to bed or falling asleep?
Excessive daytime sleepiness	Does your child seem overly tired or sleepy during the day? Does your child still take naps?
Awakenings during the night	Does your child frequently awaken at night?
Regularity and duration of sleep	Does your child have a regular bedtime and wake time?
Sleep-disordered breathing	Does your child snore or have difficulty breathing at night?

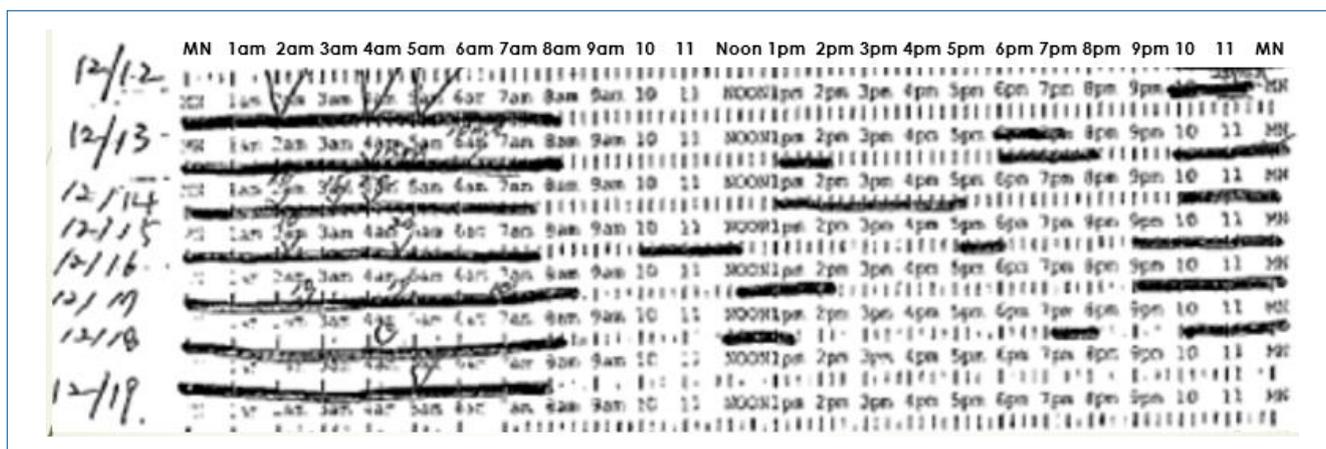


Fig. 1. This is a sample sleep log that was recorded for a 13-month-old baby with behavioral insomnia. The thick lines indicate the time of sleep, and check mark shows the time when the baby awakened during sleep. Note the irregular napping from 10 AM to 8 PM. (Courtesy of Professor Kyu Young Chae/CHA Bundang Medical Center, CHA University)

Table 4. Summary of interventions for behavioral insomnia

Behavioral intervention	Useful conditions	Characteristics	Cues for success
Unmodified extinction	Sleep-onset BIC, for infants	Faster effect Distressing to parents	Consistent ignoring of crying
Graduated extinction	Sleep-onset BIC, for infants	Less distressing than unmodified extinction	Consistent ignoring of crying
Positive routines/faded bedtime	Limit-setting BIC, mainly for school-aged child	Optimally, should avoid daytime nap	Successful bedtime routines
Scheduled awakenings	Frequent night waking, for infants	Increase sleep consolidation	Wake at relatively fixed hours

BIC, behavioral insomnia of childhood.

separation anxiety.²⁷⁾

1) Extinction

The primary goal for the child is to learn to self-soothe. A study from 1988 showed that systematic ignoring (extinction) produced faster improvement than scheduled awakening and was equally effective at reducing nocturnal awakening and crying in infants and young children.²⁸⁾ Unmodified extinction (the “cry it out” approach) procedures involve having the parents put the child to bed and then ignoring the child’s crying until the next morning except to check for their physical well-being.¹⁷⁾ In this approach, parents should consistently ignore the child’s cries. Many studies have reported that this method is effective at treating sleep settling and night waking.^{2,29)} However, unmodified extinction procedures are stressful for some parents. Disturbing neighbors with the noise are a practical concern in densely occupied buildings,³⁰⁾ like those in Korea. Thus, “extinction with parental presence” or “gradual extinction” is more acceptable in such situations.¹⁷⁾

2) Graduated extinction

Graduated extinction techniques gradually limit parental intervention in sleep initiation. Parents are instructed to ignore bedtime crying for specified periods by employing a fixed schedule (e.g., every 5 minutes) or waiting for progressively longer intervals (e.g., 5 minutes, then 10 minutes, then 15 minutes) before checking on their child.^{17,31)} The parents should minimize interactions during brief check-ins (15 seconds to 1 minute). The efficacy of such methods has been shown in clinical studies.^{2,17)} A recent randomized controlled trial of behavioral interventions for infant sleep problems demonstrated large decreases in sleep latency for the graduated extinction and bedtime fading groups and significant decreases in awakenings for the graduated extinction group.²⁵⁾

3) Positive routines and faded bedtime with response cost

Bedtime fading³²⁾ is helpful when the child’s sleep-onset is delayed beyond the parent-set bedtime⁵⁾ and for older children for whom extinction may not be appropriate. The idea behind this method is to create pressure to sleep by delaying the bedtime to a time that fits the child’s natural tendency.²⁹⁾ Positive routines involve the parents developing enjoyable bedtime activities. When the association between positive bedtime events and falling asleep is established, the bedtime is moved earlier by 15 min-

utes over successive nights until the bedtime goal is reached.¹⁷⁾ A modified version of this method, faded bedtime with response cost, involves taking the child out of bed (response cost) when unable to fall asleep to decrease the negative association between being in bed and being awake.^{17,26)} After a predetermined time (usually about 30 minutes) of a nonarousing activity, the child returns to bed. This procedure is repeated until the child falls asleep. It is essential to maintain a consistent morning wake-up time.¹⁷⁾

4) Scheduled awakenings

Scheduled awakenings involve parents awakening and typically consoling their child (e.g., feeding, rocking, soothing) approximately 15–30 minutes before a typical spontaneous awakening.^{17,28)} Scheduled awakenings are then faded out by systematic increasing of the time span between awakenings. Scheduled awakening is a treatment option for frequent nighttime awakenings when the child awakens at relatively fixed hours that appears to increase the duration of consolidated sleep.¹⁶⁾

5) Sleep hygiene

“Sleep hygiene” refers to modifiable environmental and behavioral factors that promote good sleep.⁸⁾ Parent education on sleep and/or sleep hygiene is important in all behavioral interventions. A systemic review of the evidence behind pediatric sleep practice recommendations showed a strong evidence base for: (1) consistent bedtime routines, (2) no electronics in the bedroom or before bed, and (3) independence when falling asleep, i.e., the child is not dependent on parental presence to fall asleep at bedtime or after night waking.^{8,33)} The avoidance of caffeine (e.g., chocolate, soft drinks, etc.) in the late afternoon is another recommendation with moderate-strength evidence.^{8,33)}

6) Parent education

There is a gap between a baby’s actual sleep and the parental expectations about it. Therefore, parents should first recognize whether their child actually has a sleep problem.²⁶⁾ Unfortunately, parents often do not discuss their child’s sleep issues with health care professionals because they lack knowledge about pediatric sleep and sleep problems.^{26,34)} Furthermore, health care providers often do not ask about the child’s sleep due to a lack of training and knowledge.^{26,34)}

It is recommended that parents put the babies to bed “drowsy but awake” to help them learn to initiate sleep independently

and return to sleep without requiring intervention, the so-called self-soothing skills.¹⁷⁾ Consistent bedtime routines and sleep schedules are critical targets for parent education programs.

2. Pharmacologic therapy

Behavioral interventions are the first choice for the treatment of pediatric insomnia, and medication should be used in combination with nonpharmacological strategies, especially in typically developing young children.³⁵⁾ Specific pharmacological agents are classified into antihistamines, melatonin, melatonin receptor agonists, benzodiazepines, nonbenzodiazepines, alpha-agonists, and atypical antidepressants. Melatonin is mainly used in patients with attention-deficit/hyperactivity disorder (ADHD), autism spectrum disorders (ASD), and other neurodevelopmental disabilities. Studies have shown that melatonin reduces the sleep-onset delay and increases total sleep duration in these patients (reported doses for melatonin: 3–6 mg per night for ADHD group, 1–3 mg for children with ASD, and a dose range of 0.5–10 mg for children with special needs).³⁶⁻³⁸⁾

Outcomes and long-term effects of behavioral interventions

Many parents worry about the harmful effects of ignoring their child's nighttime crying on their emotion and development. It is important to emphasize to parents that most behavioral sleep interventions involve some level of infant protest and that no published studies show such adverse effects.²⁹⁾ Several randomized studies showed that behavioral sleep treatments do not lead to later emotional and behavioral problems or negative impacts on the parent-child relationship²⁵⁾ at 5-year follow-up.³⁹⁾ To the contrary, a longitudinal study showed that, in the condition of no sleep intervention, sleep problems (short sleep duration [≤ 10 hours], and frequent nocturnal awakenings [≥ 3 times]) at 18 months predicted a later incidence of emotional and behavioral problems at 5 years.⁴⁰⁾

Conclusions

Behavioral treatments for young children result in significant improvements in sleep-onset latency and night waking without later causing emotional problems or negatively affecting the parent-child relationship. Parent education about a child's sleep and sleep hygiene is essential for treatment. Teaching parents within busy clinic time is challenging. Consultation with a clinical psychologist or trained nurse practitioner is needed to educate and support parents in this area.

Conflicts of interest

No potential conflicts of interest relevant to this article are reported.

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How to cite this article: Kang EK, Kim SS. Behavioral insomnia in infants and young children. *Clin Exp Pediatr* 2021;64:111-6. <https://doi.org/10.3345/cep.2020.00052>