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DOI: 10.1177/10983007040060020301

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What is This?
Description of a Sleep-Restricion Program to Reduce Bedtime Disturbances and Night Waking

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Abstract: The authors describe a behavioral intervention designed to reduce sleep problems without increasing disruption at bedtime or throughout the evening. Sleep restriction was used to reduce the bedtime and nighttime sleep problems of two children, a 4-year-old girl with autism and a 4-year-old girl with developmental delay. Sleep restriction involved reducing the number of hours each child slept while maintaining a consistent bedtime and awake time. Once the program was successful, the amount of sleep was faded back to an age-appropriate level. The sleep-restriction programs appeared to result in the elimination of bedtime disturbances and the reduction of nighttime awakenings. The authors discuss the effectiveness of this behavioral intervention for the treatment of sleep disturbances in children with developmental disabilities.

Sleep disturbances are common in children with developmental disabilities. The results of prevalence studies examining sleep disturbances in this group of children have suggested that the problem may be more widespread than among the general population. For example, Richdale, Gavidia-Payne, Francis, and Cotton (2000) investigated sleep patterns in 52 children with mild to profound mental retardation and compared them to a control group. The investigators found sleep disorders in 58.6% of the children overall, and between-group analyses showed that both past (66.7%) and present (57.7%) sleep disorders were more common in children with developmental disabilities than in typically developing children.

Unfortunately, sleep disorders generally do not substantially subside if left untreated. Quine (1991), for example, reported that 50% to 75% of children who displayed sleep difficulties at an initial assessment continued to have sleep problems 3 years later. Furthermore, the prevalence rates of sleep disorders in adults are similar to those found in children, suggesting that people who experience sleep disturbances as children continue to have these problems as adults (Durand, Mindell, Mapstone, & Gernert-Dott, 1995).

Sleep complications may intensify behavioral and psychological problems (Durand et al., 1995). Brylewski and Wiggs (1999) investigated the relationship between sleep disorders and daytime behavior problems and found that individuals with sleep disorders scored significantly higher on the Irritability, Stereotypy, and Hyperactivity subscales of the Aberrant Behavior Checklist (ABC; Aman, Singh, Stewart, & Field, 1985). Similarly, Wiggs and Stores (1996) found that children with sleep disorders had higher scores on all subscales of the ABC except Inappropriate Speech.

Durand, Gernert-Dott, and Mapstone (1996) found fewer behavior problems following successful treatment of sleep problems (night waking) in two children with developmental disabilities. This finding is consistent with research in the area by Kennedy and Meyer (1996), who suggested that sleep disturbances at night may contribute to daytime problem behaviors. There also appears to be a relationship between sleep disorders and self-injurious behavior (SIB). For example, Symons, Davis, and Thompson (2000) found that individuals with profound mental retardation and a history of SIB slept less than individuals in the matched control group.

Considering the adverse effects that disruptive sleep patterns have on children, it is not surprising that sleep disorders have been the focus of many different types of intervention strategies, including pharmacological use of melatonin (Jan, Espezel, & Appleton, 1994; Palm, Blennow, …
& Wetterberg, 1997), behavioral interventions (Durand, 2002) and chronotherapy (Piazza, Hagopian, Hughes, & Fisher, 1998). Regarding the treatment of sleep disturbances, Wigg and Stores (1996) reported that only 47% of the parents of 124 children (ages 5 to 16 years) with severe disabilities and sleep problems reported that their children had received any form of treatment, with medication being the most widely used form of intervention.

Pharmacological interventions are a common treatment for sleep disturbances in both adults and children (France & Hudson, 1993). Despite the frequent use of medication to treat sleep disorders, Richman (1985) reported that pharmacological treatments appear to have few long-term benefits in regards to the sleep patterns of children. In fact, Edwards and Christopher (1994) reported that few experimental investigations have shown the sustained effectiveness of medications in treating sleep disorders in children. In addition, the potential side effects and difficulties associated with chronic use and withdrawal tend to outweigh the usefulness of many medications.

An effective alternative to pharmacological treatment of sleep disorders is behavioral intervention. Numerous behavioral procedures have been successful in reducing disruptive sleep patterns in children. Behavioral techniques used in the treatment of sleep disturbances include bedtime routines (Adams & Rickert, 1989), extinction (Bramble, 1997), graduated extinction (Durand & Mindell, 1990; Mindell & Durand, 1993), scheduled awakenings (Durand, 2002; Durand & Mindell, 1999), bedtime fading (Piazza, Fisher, & Scherer, 1997), and sleep restriction (Lichstein & Morin, 2000; Spielman, Caruso, & Glovinsky, 1987).

Unfortunately, many sleep interventions result in an increase in disruption at bedtime or when the child awakens at night, which may often be a significant obstacle to the successful use of such interventions. For example, using graduated extinction typically results in hour-long tantrums that families must endure until a reduction occurs. In this article, we describe a program to reduce these sleep difficulties that has the added advantage of avoiding many of the problems associated with other interventions. Specifically, we studied the effectiveness of sleep restriction in reducing bedtime disturbances and nighttime awakenings in two children with developmental disabilities.

Method

Participants

Two children with developmental disabilities were referred for sleeping difficulties to the Albany Center for Autism and Related Disabilities. The parents of the referred children reported poor sleep habits, bedtime disturbances, nighttime awakenings, and disrupted sleep schedules in their children. They also reported dissatisfaction with their child’s sleeping patterns as well as a reluctance to attempt any intervention (e.g., graduated extinction) that would lead to even temporary nighttime disruption. Both children were seen by a pediatrician to rule out any medical conditions related to the sleep problem.

One participant, Sara, was a 4-year-old girl who had been diagnosed with autism. Sara attended a self-contained school for children with multiple disabilities, and she received special education services, speech therapy, and occupational therapy. Twice a month, on weekends, Sara also participated in a recreation program. Sara stopped initiating and maintaining sleep at 15 months of age, and she experienced frequent nighttime awakenings and bedtime disturbances. Prior to intervention, Sara exhibited approximately one nighttime awakening per night that, on average, lasted more than 1 hour per episode. Because attempts to return Sara to her bed after a nighttime awakening were often unsuccessful, Sara slept in her parents’ bed approximately four nights per week. Sara also occasionally displayed severe bedtime disturbances (temper tantrums, crying, screaming, thrashing) that lasted 2 to 4 hours. Clonidine, klonopin, tofranil, mellaril, and melatonin were all utilized in an effort to reduce Sara’s sleep difficulties.

The other participant in this program was Melissa, a 4-year-old girl with developmental delays. Melissa attended a self-contained preschool and received special education services, occupational therapy, and speech therapy. Her parents reported that Melissa had always had disrupted sleep and that she experienced nightly bedtime disturbances as well as periodic nighttime awakenings. Bedtime for Melissa included a regimented routine (1–1½ hours in length) that included taking a bath, reading books, watching television, Mom or Dad lying in bed with her, and then Mom sitting in a rocking chair or Dad exercising as Melissa drifted off to sleep. Any deviation from this lengthy routine would cause Melissa to become very upset and frequently resulted in having to begin the routine over again. Prior to intervention, Melissa displayed bedtime disturbances once per night that resulted in the parents spending between 1 and 1½ hours to settle her to sleep each night. The average duration of each bedtime disturbance was over 1 hour. In addition to the nightly bedtime disturbances, Melissa periodically woke during the night, at which time her parents would either start the routine again or, more frequently, lie in bed with her. Before the initiation of treatment, Melissa woke approximately three times per week.

Measures

At an initial interview, the investigator collected demographic information and conducted a sleep assessment interview. The parents completed the Albany Sleep Problems Scale (Durand, 1998), a 46-item questionnaire designed to assess type and severity of sleep disturbances, and the
Parental Sleep Satisfaction Questionnaire (Christodulu, 2000), which assesses parental satisfaction with the child’s current sleep pattern. The parents completed sleep charts and bedtime behavior logs daily.

PROCEDURE

Preassessment

At an initial interview (which was conducted over the phone for Sara because of distance and at home for Melissa), the nature of the sleep program was explained to the parents and parental consent to participate was obtained. At this time, parents completed the Albany Sleep Problems Scale and the Parental Sleep Satisfaction Questionnaire. The investigator conducted a sleep assessment interview to obtain information regarding the type of sleep disturbance as well as the frequency, duration, and intensity of this disturbance. In addition, data pertaining to sleep habits, bedtime routines, sleepwalking, sleep schedules, and behavior during bedtime disturbances and nighttime awakenings were obtained. Upon completion of the initial interview, parents were given daily sleep charts and bedtime behavior logs and were taught how to complete them. The parents were asked to not make any changes in the present bedtime regime and to begin collecting data.

Assessment

During the assessment, the parents recorded the following types of information: regularity/consistency of the child’s sleep schedule; variability in bedtime and wake-up time; presence of bedtime disturbances, frequency and duration of disturbances, and behavior during disturbances; presence of nighttime awakenings, frequency and duration of awakenings, time of awakenings, and behavior during awakenings; frequency and duration of naps.

At the time of assessment, Sara was receiving 3 mg of melatonin nightly, and she periodically received ½ of a teaspoon of Benadryl in conjunction with the melatonin in an effort to reduce her sleeping difficulties. Sara’s sleep schedule appeared to be relatively inconsistent. Her bedtime varied from 8:00 p.m. to 12:00 a.m., and her wake-up time ranged from 3:00 a.m. to 9:30 a.m. In addition, Sara exhibited severe bedtime disturbances (when not receiving melatonin) and numerous nighttime awakenings (even while receiving melatonin). The nighttime awakenings occurred most frequently between 2:30 a.m. and 3:45 a.m. and generally consisted of Sara walking into her parents’ room, climbing into her parents’ bed, and falling back to sleep. Sara frequently cried during night wakings, and on eight occasions she stayed awake for the remainder of the night. Information obtained from the sleep charts also revealed that Sara periodically napped in the car (10–60 min) or on the school bus (20 min).

Melissa’s sleep schedule appeared to be fairly consistent in that her bedtime was generally between 7:00 p.m. and 7:30 p.m. and her wake-up time was usually 6:45 a.m. to 7:00 a.m. Melissa displayed severe bedtime disturbances, which consisted of resisting going to bed (e.g., asking to watch more television), getting out of bed and crying at her door, calling for her parents, and engaging in tantrums that involved hitting herself, screaming, crying, and knocking over her bedroom gate. Melissa also experienced periodic nighttime awakenings that included calling/crying for Mom or Dad, screaming, and getting out of bed and turning on lights in her room. Her parents reported that some of these nighttime awakenings were triggered by a noise, such as an ambulance driving by, the wind, or Melissa’s parents’ walking up the stairs to go to bed. Videotape observation of bedtime revealed that Melissa did not appear to be tired at bedtime, as indicated by behaviors such as acting restless, fidgeting, sitting up in bed, and talking to her mother. There was a significant amount of light in Melissa’s bedroom at bedtime, due to the early hour.

Sleep Restriction

The overall goal of the intervention programs was to reduce both bedtime disturbances and nighttime awakenings through the use of sleep restriction. Sleep restriction involved restricting the amount of time the child was in bed to 90% of the total amount of time that the child slept. Each child’s sleep diary was used to estimate the average number of hours that the child slept each night. The mean number of hours actually asleep each night was then multiplied by approximately 0.9 to get 90% of the time, which was the number of hours the child would sleep with the new schedule. The child’s bedtime and/or the time the child was awakened in the morning were adjusted to approximate the new schedule. If the child remained wide awake in bed, she was removed from bed and was engaged in a relaxing activity until she appeared to be tired. If the sleep disturbances were eliminated or significantly reduced for 1 week, the bedtime was increased by 15 minutes. In addition, consistent bedtime routines were established, as were consistent practices of responding to bedtime disturbances and nighttime awakenings. Parents were instructed not to get into bed with their child or let her get into bed with them at bedtime or during a nighttime awakening. If the child did get out of bed, the parents immediately returned her to bed, told her to go to sleep, and left the child’s room.

The goal of Sara’s intervention was to reduce both bedtime disturbances and frequent nighttime awakenings through the use of sleep restriction. During baseline, Sara slept an average of 8.75 hours per night. The introduction of a sleep-restriction program reduced the number of hours Sara slept each night to 7.0. To accommodate her new sleep-restricted schedule, Sara’s plan began by moving her bedtime to midnight and holding her wake-up time constant at 7:00 a.m. Upon initiation of the sleep-restriction program, melatonin use was discontinued, and Sara’s par-
ents were instructed to avoid giving Benadryl to their daughter. Sara did not receive melatonin or Benadryl following treatment. Once the program was successful, the amount of sleep was faded back to an age-appropriate level.

The goal of Melissa’s intervention was to reduce nightly bedtime disturbances and periodic nighttime awakenings through the use of sleep restriction. During baseline, Melissa slept an average of 10.85 hours per night. The sleep-restriction program reduced the number of hours Melissa slept each night to 9.5. To accommodate her new sleep-restricted schedule, bedtime for Melissa was moved to 9:30 p.m. and her wake-up time was held constant at 7:00 a.m. Once the program was successful, the amount of sleep was faded back to an age-appropriate level.

Results

BEDTIME DISTURBANCES

During baseline, Sara was receiving 3 mg of melatonin nightly, which was effective in eliminating bedtime disturbances, hence the absence of this behavior during the baseline assessment. Without melatonin administration, however, Sara was reported to have severe bedtime disturbances (throwing temper tantrums, crying, screaming, thrashing) that lasted 2 to 4 hours. Implementation of the sleep-restriction program allowed her parents to discontinue melatonin without bedtime disturbances.

Introduction of the sleep-restriction program also resulted in the elimination of bedtime disturbances for Melissa. Prior to intervention, Melissa exhibited a mean of seven bedtime disturbances per week (range = 7) that was reduced to an average of .25 bedtime disturbances per week (range = 0–1) following intervention. Furthermore, the average duration of bedtime disturbances decreased from 1.05 hours per week (range = .79–1.35) prior to intervention to .01 hours per week (range = 0–.04) following intervention. The frequency of bedtime disturbances for each child is illustrated in Figure 1.

NIGHT WAKING

The use of the sleep-restriction program resulted in a reduction in both the frequency and duration of nighttime awakenings for Sara. Prior to intervention, Sara exhibited an average of 7.17 night wakings per week (range = 5–9), which was reduced to an average of 1.43 night wakings per week (range = 0–4) following intervention. Furthermore, the average duration of night wakings decreased from 1.27 hours per week (range = .18–2.20) prior to intervention to .18 hours per week (range = 0–1.11) following intervention. In addition, because nighttime awakenings now rarely occurred, Sara did not have to sleep in her parents’ bed.

The sleep-restriction program also resulted in a reduction in both the frequency and duration of nighttime awakenings for Melissa. Prior to intervention, Melissa exhibited an average of 2.55 night wakings per week (range = 0–6), which was reduced to an average of 1.38 night wakings per week (range = 0–3) following intervention. In addition, the average duration of night wakings decreased from .14 hours per week (range = 0–.37) prior to intervention to .07 hours per week (range = 0–.15) following intervention. Furthermore, because nighttime awakenings rarely occurred, Melissa’s parents no longer had to lie in bed with Melissa. The frequency of nighttime awakenings for each child is presented in Figure 2.

SLEEPWALKING

During the third week of the intervention, an increase in sleepwalking was observed in Sara. On average, she exhibited 2.3 sleepwalking episodes per week, with a decreasing trend as sleep time was extended. Melissa did not experience any sleepwalking episodes prior to intervention or at follow up.

SLEEP TERRORS

Sara experienced two sleep terrors during the sleep-restriction intervention. One sleep terror occurred at 6:00 a.m. during Week 12 of the intervention; the other occurred at 2:50 a.m. during Week 21 of the intervention. Melissa did not experience any sleep terrors during the intervention program.

SATISFACTION WITH SLEEP

Overall sleep satisfaction scores were calculated for each child during baseline and intervention. Total scores on the Parental Sleep Satisfaction Questionnaire, which consisted of 6 questions that could each receive a score ranging from 1 (not satisfied) to 6 (satisfied), could range from 6 to 36, with a low score indicating less satisfaction with the child’s sleep pattern. Prior to intervention, Sara’s mother indicated that she was not satisfied with the time it took to put Sara to bed at night (1), the amount of time Sara slept each night (1), her current sleep pattern (1), and Sara’s behavior at bedtime (1). Sara’s mother rated her daughter’s sleep problems as very severe (1) and reported that it was very difficult to put Sara to bed (1). Following treatment, Sara’s mother indicated an increase in satisfaction with the time it took to put Sara to bed (4 & 5), the amount of time Sara slept each night (1), Sara’s current sleep pattern (1), and Sara’s behavior at bedtime (1). Sara’s mother indicated that she was somewhat satisfied with the amount of time Melissa slept each night (3) but that she was not satisfied...
with the time it took to put Melissa to bed (1), Melissa's current sleep pattern (1), and Melissa's behavior at bedtime (1). Melissa's mother rated her daughter's sleep problems as very severe (1) and reported that it was very difficult to put Melissa to bed (1). Following treatment, Melissa's mother indicated an increase in satisfaction with the time it took to put Melissa to bed (5), the amount of time Melissa slept at night (5), Melissa's sleep pattern (5), and Melissa's behavior at bedtime (5). Melissa's mother also reported that the severity of Melissa's sleep problems had decreased (5) and that it was easier to put Melissa to bed (5).

**Figure 1.** Frequency of bedtime disturbances for Sara and Melissa at baseline and during intervention.
Discussion

The sleep-restriction intervention appeared to be successful in eliminating bedtime disturbances and in reducing nighttime awakenings in a 4-year-old child diagnosed with autism and a 4-year-old child with developmental delays. The results of this initial study support the use of behavioral interventions for the treatment of sleep disturbances in children with developmental disabilities. Sleep restriction also resulted in an improvement in parental satisfaction with the child’s behavior at bedtime, the child’s current sleep pattern, and the time it took to put the child...
to bed. Parents reported a decrease in the severity of their child’s sleep disturbance and indicated that it was easier to put their child to bed. In addition, they noted that the sleep-restriction intervention was easy to implement on a regular basis.

**ADVANTAGES OF SLEEP RESTRICTION**

As mentioned previously, numerous behavioral procedures have been successful in reducing disruptive sleep patterns in children. Sleep-restriction programs are viewed as advantageous because (a) long periods of crying are often prevented and (b) there frequently is no increase in behavior problems. Conversely, graduated extinction procedures require listening to periods of crying and can result in an increase in behavior problems (Durand, 1998). Sleep restriction was selected as an intervention for these two children because the parents of both children had previously tried extinction (per pediatrician recommendation) and found it to be unsuccessful in reducing their child’s sleeping difficulties. In addition, the irregularity of Sara’s nighttime awakenings prohibited the use of scheduled awakenings as an intervention, and Melissa’s tantrums at bedtime were so disruptive (knocking down gate at bedroom door, hitting herself) that the use of a graduated extinction procedure would not have been feasible or appropriate.

Sleep restriction appeared to be effective in eliminating bedtime disturbances and in reducing nighttime awakenings in these two children with developmental disabilities. In contrast to the present study, Piazza and Fisher (1991) utilized a faded bedtime with response-cost protocol (removing the child from bed if not asleep within 15 minutes and keeping him or her awake for 1 hour) to successfully decrease night wakings in three children with profound mental retardation. Essentially, the children could avoid the aversiveness of being removed from bed by exhibiting behaviors congruous with rapid sleep (e.g., lying in bed quietly with closed eyes). Although this procedure was effective in reducing nighttime awakenings, it contained a response-cost component that may be difficult for parents to implement and, given the present results, may not be necessary to effectively treat this problem. Eliminating unnecessary treatment components may result in interventions that are easier for parents to implement, which is likely to increase compliance with the programs. Researchers should continue to investigate the necessity of the response-cost component in behavioral strategies designed to reduce sleep disturbances in children with developmental disabilities.

It should also be noted that what Piazza and Fisher (1991) referred to as response-cost (removing the child from bed and keeping him or her awake for 1 hour if sleep was not reached within 15 min of bedtime) can also be viewed as stimulus control (Durand, 1998). Limiting the child’s activities in bed to sleeping can be viewed as controlling the stimuli (bed/bedroom) so that the child learns to associate the bed and bedroom with sleeping. Lying in bed for long periods without sleeping is avoided so that the child does not learn to associate the bed with not sleeping.

Sleep restriction appeared to result in a rapid reduction in both the frequency and duration of nighttime awakenings for Sara. The reduction in night wakings for Sara was evident the first week of treatment, and it was a welcome relief to Sara’s parents, who were considering placement outside the home for Sara because her sleep disturbances were so severe. Although the night wakings were not completely eliminated, Sara’s mother reported that Sara no longer exhibited tantrums during a night waking and generally returned to bed with little difficulty.

Sleep restriction also appeared to result in the elimination of bedtime disturbances for Sara. Prior to this program, Sara exhibited severe tantrums at bedtime when she was not receiving melatonin. Melatonin use was discontinued with the initiation of sleep restriction, and following intervention, Sara no longer exhibited bedtime disturbances. Sara did experience some bedtime disturbances during Weeks 6 and 7 of treatment. Information from the daily sleep charts indicated that Sara had had an upper respiratory infection and a stomach virus during this 2-week period, which may have been related to the difficulties experienced at bedtime. At completion of the intervention, Sara was sleeping 8.5 hours per night (from 10:30 p.m. to 7:00 a.m.), which was just .25 hours less than the average number of hours she slept each night during baseline.

Sara’s parents reported a decrease in the severity of her sleep problems and an increase in their satisfaction with her behavior at bedtime, the amount of time it took to put her to bed at night, and her current sleep pattern.

An interesting finding was the initiation of sleepwalking in Sara following introduction of the sleep-restriction program. Sleepwalking occurs during nonrapid eye movement (NREM) sleep, especially in Sleep Stages 3 and 4, and is considered to be a disorder of impaired arousal (Broughton, 1968). We believe that Sara’s sleep-restriction program produced an alteration in her sleep stages—specifically, a disruption in NREM sleep—that influenced (increased) the frequency of sleepwalking. This result is consistent with reports that sleepwalking is associated with extreme fatigue, sleep deprivation, the use of hypnotic or sedative medications, and stress (Anch, Browman, Mitler, & Walsh, 1988).

Sara also experienced two sleep terrors during the intervention program. Sleep terrors are characterized by an abrupt awakening from sleep with a panicky scream that is accompanied by intense fear and autonomic arousal (sweating, rapid heartbeat), as well as behavioral manifestations of intense fear. As with sleepwalking, sleep terrors also occur during Sleep Stages 3 and 4 of NREM sleep. Again, we believe that the sleep-restriction program produced a dis-
ruption in Sara's sleep stages—specifically, a disruption in NREM sleep—that resulted in the occurrence of two sleep terrors. Although sleep restriction creates a disturbance in these sleep stages, it is important to note that these are temporary occurrences that tend to lessen as sleep time is increased, as was the case in this investigation (Durand & Mindell, 1999).

Sleep restriction appeared to be effective in eliminating bedtime disturbances for Melissa, with results again occurring within the first week of treatment. The length of Melissa's bedtime routine was reduced from between 1 and 1½ hours to ½ hour, mainly because her parents had omitted the portion of the routine where they would lie in bed with her. Behaviors observed during baseline that appeared to indicate that Melissa was not tired at bedtime were also eliminated when Melissa's bedtime was moved to later in the evening. Furthermore, the later bedtime eliminated the issue of too much light in Melissa's bedroom at bedtime.

Sleep restriction also appeared to be effective in reducing the frequency and duration of nighttime awakenings for Melissa. At the time of assessment, Melissa's parents reported that she was a very light sleeper, and noises at night frequently woke her. It appears that the reduction in night wakings may have been a result of deeper and sounder sleep for Melissa, which tends to be an effect of sleep restriction or deprivation (Durand, 1998; Lichstein & Riedel, 1994). Initially, Melissa's parents seemed somewhat reluctant to implement a sleep-restriction program because it was their experience that Melissa's behavior was worse when she was overtired. Melissa's parents were concerned that the bedtime disturbances, which were already difficult for them, would worsen if Melissa were sleep-deprived. However, because Melissa's bedtime disturbances were so severe, her parents were willing to try the program, and they were pleased to see successful results the first evening of implementation. At completion of the intervention, the parents reported a decrease in the severity of Melissa's sleep problems and an increase in their satisfaction with Melissa's behavior at bedtime, the current sleep pattern, and the time it took to put Melissa to bed at night.

CONCLUSIONS

The results of the program discussed in this article appear to support the use of sleep restriction for the treatment of sleep disturbances in children with developmental disabilities. In addition, the parents of both children found the sleep-restriction intervention to be easy and practical to implement. Future research in this area should include replication of the present program as well as continued examination of positive behavioral interventions for the treatment of sleep disturbances in children with developmental disabilities.

ABOUT THE AUTHORS

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**Action Editor:** Robert L. Koegel