The Use of Scheduled Awakenings to Eliminate Childhood Sleepwalking

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Evaluated the use of scheduled awakenings to eliminate sleepwalking using a noncurrent multiple baseline design across three subjects with persistent sleepwalking. Treatment procedure involves having parents awaken children several hours after they go to sleep and just before the typical time of the sleepwalking episode. This intervention proved immediately successful in eliminating sleepwalking in all three children. Treatment effects were maintained at 3 and 6 months posttreatment. Implications for intervention and future research are discussed.

KEY WORDS: sleepwalking; children; behavioral treatment; scheduled awakenings; multiple baseline.

It has been estimated that up to 40% of children suffer from sleep problems at some time during their childhood (Beltramini & Hertzig, 1983; Richman, 1981). Of the various sleep disorders, one of the most disturbing for parents is sleepwalking. Sleepwalking is a partial arousal parasomnia defined as a series of complex behaviors that are initiated during slow wave sleep (Stage III or Stage IV) and which result in walking during sleep (International Classification of Sleep Disorders [ICSD], 1990, p. 145). Sleepwalking most often occurs in the first third of the night. During this transition from slow wave sleep, individuals may move to full arousal, on to the next sleep cycle, or become caught between

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sleeping and wakefulness in a partial arousal state. In children who display
sleepwalking, this partial arousal state is manifested by behaviors characteristic
of both sleeping (eyes closed, incoherent speech) and walking (getting out of
bed, unlocking doors). Because it originates from slow wave sleep, sleep depriv-
ation may precipitate sleepwalking episodes because it typically increases slow
wave sleep (ICSD, 1990). Sleepwalking episodes range from calmly sitting up in
bed and then walking to agitated walking, seemingly frantic efforts to escape a
threatening situation, or inappropriate behavior such as urinating. Sleepwalking
may be accompanied by other parasomnias, especially sleep terrors and sleep
talking. The next morning, there is typically amnesia for the episode. In one
study of children 6 to 16 years old (Klackenberg, 1987), lifetime prevalence of
sleepwalking was 40%, with monthly episodes occurring in 2 to 3% of the
children. The peak incidence is between 4 and 8 years of age.

The most common treatment for sleepwalking is advising parents to provide
a safe environment for their child, but otherwise not to intervene during a
sleepwalking episode (Adair & Bauchner, 1993). Even in more extreme cases,
such as when the child leaves the house or is in danger of becoming injured, the
focus is more on preventing harm than eliminating the sleepwalking behavior. In
cases where the child is at extreme risk of harm or when sleepwalking occurs
more than once per night, medication may be used (Dahl, 1992).

Because most cases of sleepwalking involve transitioning from slow wave
sleep, treatments have focused on altering or changing sleep staging (Cooper,
1987; Kales & Scharf, 1973). Medications used with adults and children attempt
to suppress Stage IV sleep. These medications include clonazepam, car-
bamazepam, flurazepam, imipramine, and diazepam (Berlin & Quyyum, 1986;
Cooper, 1987; Dahl, 1992; Kavey, Whyte, Resor, & Gidro-Frank, 1990). These
drugs have been used with mixed success in adults (Fisher, Kahn, Edwards, &
Davis, 1973). However, because of the chronic course of sleepwalking in chil-
dren, many physicians are reluctant to prescribe them in children due to possible
side effects (Kales, Soldatos, & Kales, 1987), and particularly with the tricyclic
antidepressants, the risk of accidental overdose and cardiotoxicity (Ryan, 1990).
The high relapse rate after drug withdrawal also argues against medication as
standard pediatric treatment for most parasomnias (Weissbluth, 1984).

Due to its potential long-term course, the high level of parental concern,
potential harm to the sleepwalking child, and reluctance of physicians to pre-
scribe medications for young children, safe, effective, noninvasive interventions
are needed. Behavioral interventions may satisfy that need. Behavioral interven-
tions that target changes in the sleep pattern have been hypothesized to impact
the transition from slow wave sleep. For example, Dahl (1992) hypothesized that
the introduction of daytime naps could successfully ease the transition from slow
wave sleep to other stages. He suggested that naps would lead to decreased
length of sustained daytime wakefulness, resulting in decreased depth of night-
time sleep and a reduction in the number of partial arousals. However, there have
been no published reports of the effectiveness of this treatment. Furthermore, this treatment could be difficult to implement with older children who do not nap.

An alternative behavioral intervention for sleepwalking is the use of scheduled awakenings. This technique has been used successfully to treat night terrors, which are also thought to involve difficulty transitioning from slow wave sleep (Lask, 1988). Scheduled awakening involves waking children approximately one-half hour before they are most likely to experience a primary partial arousal parasomnia, either a sleep terror or sleepwalking episode, as a means of disrupting sleep staging. In the only published study of this treatment, Tobin (1993) reported a case study in which sleepwalking was successfully eliminated in an 8-year-old boy who had been sleepwalking for 6 years. Treatment gains were shown to be maintained at the 3-month follow-up.

The use of scheduled awakenings appears to be a promising alternative to drug therapy for eliminating sleepwalking in children. However, aside from the single nonexperimental case report cited above, the effectiveness of this intervention has not been documented. The purpose of the present study was to evaluate the effectiveness of scheduled awakenings for sleepwalking in children using a multiple baseline design.

**METHOD**

**Participants**

Participants were three children presenting consecutively with recurrent somnambulism (sleepwalking) at a Pediatric Sleep Disorders clinic. The clinic provides assessment and treatment of children with a variety of sleep disorders, such as obstructive sleep apnea, delayed sleep onset, night terrors, and sleepwalking. A psychologist and pediatrician evaluated each case and arrived at the diagnosis of Sleepwalking Disorder (307.46) using the criteria established by both the DSM-IV (American Psychiatric Association, 1994) and the International Classification of Sleep Disorders Diagnostic and Coding Manual (ICSD, 1990) and by ruling out other disorders of arousal such as sleep terrors, nocturnal seizures, and confusional arousals. The children were two boys and one girl, John, Jason, and Milly. All children had a history of sleepwalking at least 3 times a week over a minimum of 12 weeks. All three children met all criteria for the diagnosis of sleepwalking, for the ICSD severity rating of "severe" and duration rating of "chronic."

_John, a 6-Year-Old Caucasian Male._ Upon presentation to the clinic, his mother reported that John had sleepwalking episodes nightly over the preceding 6 months. These episodes would occur approximately 90 minutes after falling asleep and would typically involve John walking around the house. However, during one episode, his mother reported that she found him trying to climb out a
second-story window. Thus, John’s mother was concerned because of the frequency of the sleepwalking behavior and the potential danger John posed to himself. Mother attempted to interrupt the sleepwalking by waking John during these episodes but was never successful. In addition to sleepwalking, John’s mother reported that John would sweat excessively during sleep, was a restless sleeper, and talked in his sleep nightly. John reported no memory of any of the sleepwalking episodes or other sleep behavior.

Jason, a 12-Year-Old Portuguese Male. Upon presentation to the clinic, his father reported that Jason had a 3-year history of sleepwalking every night, sometimes several times nightly. Typically, Jason would be found walking around the house or asleep in various rooms of the house other than his bedroom. These episodes usually occurred within 2 hours of Jason falling asleep. In addition to sleepwalking, Jason would talk and sit up in bed, look very frightened, and scream in his sleep every night, and sometimes several times a night. During episodes of sleepwalking or screaming, Jason’s father would place Jason back in his bed without attempting to wake him. Jason reported no memory of these episodes.

Milly, a 7-Year-Old Caucasian Female. Upon presentation to the clinic, Milly’s mother reported that she had been sleepwalking nightly for approximately 3 months. Milly would typically “scurry” down the hallway when sleepwalking, would sometimes mumble or cry during these episodes but, according to maternal report, did not seem frightened. During episodes of sleepwalking, mother sometimes attempted to wake Milly. If she was successful in awakening her, Milly would often appear confused. Most of the time, mother reported that she would lead Milly back to bed. Her mother was concerned that Milly could harm herself during sleepwalking episodes. Milly, like the other subjects, had no memory of her sleepwalking.

Procedure

Children referred to the Pediatric Sleep Disorders Clinic for sleepwalking were identified during a telephone intake. The families were then telephoned and informed about the study protocol. If the family agreed to participate, the child was seen in the clinic for a full evaluation. After obtaining informed consent, parents were taught to keep a record of their child’s nightly sleep behavior (see below) and randomly assigned to a 1-, 2-, or 3-week baseline.

Measure. Parents were taught to record their child's sleep behavior using a sleep record. Specifically, they were instructed to record each incident of sleepwalking, its time of onset, latency from time the child fell asleep, and a narrative description of the child's behavior during the sleepwalking episode. The time of onset and latency to the episode were used to determine the optimal time of the night for implementing the scheduled awakening procedure. The narrative de-
scription was used to ensure that the parents were accurately reporting sleepwalking episodes. In the initial interview, any other out-of-bed behaviors were reviewed with each parent to help them differentiate those behaviors from sleepwalking. In all three cases, parents very accurately distinguished sleepwalking from other out-of-bed behaviors because their children rarely got out of bed during the night except to sleepwalk.

Baseline. During baseline, parents recorded their child's sleep behavior, using the sleep record described above. They continued monitoring sleep behavior for the duration of the baseline period to which they were assigned (i.e., 1, 2, or 3 weeks).

Intervention. Parents and children were seen again at the clinic at the end of the baseline period. Data sheets were reviewed and parents were instructed in the implementation of scheduled awakenings. All parents were taught to use scheduled awakenings approximately 15 to 30 minutes before the usual time of the onset of sleepwalking. This time was individually set based on each child's baseline data regarding the time of onset of sleepwalking. This was typically 1½ to 2½ hours after the child fell asleep. Specifically, parents were instructed to wake their child by shaking them lightly and asking them to wake up. Once the child responded by opening their eyes slightly or mumbling to parents, parents were instructed to then allow their child to fall back asleep. Parents implemented scheduled awakenings for 1 month. During this time, they continued to keep the Sleep Record on a daily basis.

Follow-Up. Following the intervention, parents were asked to continue monitoring sleepwalking episodes daily for 1 month. At 2, 3, and 6 months posttreatment, the families were contacted by phone and asked about the number of sleepwalking episodes during the preceding month. At the 6-month follow-up, the families were asked about the number of episodes during the preceding 3 months, the time between the 3- and 6-month follow-up.

Experimental Design

A nonconcurrent multiple baseline design across subjects was used to demonstrate control of the intervention over the dependent variable of sleepwalking.

RESULTS

Treatment

The incidence of sleepwalking across the three children is shown in Figure 1. During baseline, all three children were consistently having sleepwalking episodes and immediately following treatment, each child's sleepwalking reduced to zero rates. For John, sleepwalking occurred every night during the 7
nights of baseline. Jason had an episode of sleepwalking on 12 out of 14 nights of baseline. Similarly, Milly had 17 episodes of sleepwalking across 21 nights of baseline. Immediately following the introduction of scheduled awakenings, the frequency of sleepwalking decreased to zero throughout the 28 days of intervention.

Follow-Up

The mothers of all the children were contacted by phone at 1, 2, 3, and 6 months posttreatment and asked about the incidence of sleepwalking during the
period between the last contact and the follow-up phone call. Jason's and Milly's mothers reported no incidents of sleepwalking during the time preceding any of these follow-up phone calls. Jason's mother reported that in addition to the elimination of sleepwalking, he had also ceased sitting up in bed and having sleep terrors. She anecdotally reported Jason appeared to have more peaceful sleep and was very satisfied with the treatment. Milly's mother also noted an improvement in Milly's sleeping and was satisfied with treatment. Neither mother reported that the treatment was burdensome to implement. John's mother reported no incidents of sleepwalking during the 1-month follow-up period and only one incident during the month between the 1- and 2-month follow-up, one incident between the 2- and 3-month follow-up, and one incident during the 3 months between the 3- and 6-month follow-up. Despite the substantial decrease in John's sleepwalking, his mother continued to be concerned about his occasional sleepwalking episodes. She also reported that John continued to talk in his sleep and experienced several sleep terrors during the follow-up period. Although John's mother anecdotally reported that treatment was not difficult to implement, she was less satisfied with the treatment results than were Jason's and Milly's mothers.

DISCUSSION

The present study found that scheduled awakening was an effective intervention in eliminating sleepwalking in three children. One of the children (Jason) had a 3-year history of sleepwalking prior to receiving intervention. A second child (John) had only a 6-month history of sleepwalking, but he engaged in potentially harmful behaviors during some of the episodes (i.e., attempting to climb out a second-story window) and thus required treatment. The third child (Milly) had an even shorter history of sleepwalking (i.e., 3 months) but her mother was very concerned and was eager for treatment. Despite the differences in the history of sleepwalking, all three children responded immediately to the intervention of scheduled awakenings. Two of the children, Jason and Milly, immediately experienced uninterrupted sleep at night following the scheduled awakenings. In addition, Jason stopped his sleep terrors and sitting up in bed. John, who presented with restless sleep and sleep talking, continued to show these sleep behaviors after the sleepwalking was eliminated. All three children maintained treatment gains following the cessation of the intervention. Jason and Milly were followed for 6 months and their parents reported no further incidents of sleepwalking. John was followed for 6 months and his parents reported only one incident of sleepwalking at each follow-up period.

These results are encouraging, especially the maintenance of treatment gains, because there are so few effective interventions documented for the treatment of sleepwalking. The reason for the maintenance of treatment gains following treatment cessation are not clear from the present study. However, anecdotal
reports from two of the three participating parents indicate that the children began to arouse on their own soon after treatment implementation. Thus, one hypothesis is that the children become conditioned to self-arousal prior to transition from slow wave sleep, thereby eliminating the need for external arousal by parents and treatment maintenance. This plausible hypothesis provides a direction for future research. One possible methodology for examining the self-arousal theory posed here for treatment maintenance is the use of an actigraph. Actigraphs are small devices worn on the wrist (like a wristwatch) that examine sleep/wake patterns through motion detection. Such an instrument could provide corroborating, objective data on subject self-arousal.

Weaknesses of the study include lack of reliability data on parent monitoring of sleepwalking. Given that sleepwalking only occurs in the child’s home during nighttime sleep, objective reliability data by a second observer would be difficult to obtain. Potential solutions to this problem would be use of the actigraph to document movement associated with sleepwalking. Alternatively, motion-activated or time-lapse videorecording of the child’s sleep would provide a method of conducting a reliability check. In the current study, it is possible that parents may have missed some sleepwalking incidents. However, given how disturbing parents found this behavior, it is unlikely that the dramatic treatment results were due to underreporting. Another weakness is the failure to objectively quantify the social validity of the intervention. Anecdotally, parents in this study reported it was not difficult to implement the scheduled awakenings procedure, mainly because scheduled awakenings were implemented before the parents themselves went to bed for the evening. However, because a hypothesized strength of the intervention was its unintrusive nature, more objective data would provide important information on the ease of implementation. Future studies could address this by having parents complete a Likert-like scale of burden of implementation on a nightly basis.

The present study is clinically significant as it demonstrates that the behavioral intervention of scheduled awakenings is comparable to other treatment modalities, such as medication, but without potentially harmful side effects. No increase in daytime sleepiness or difficulty with morning awakening was reported, suggesting that the intervention did not adversely affect other aspects of the children’s sleep. The intervention may be effective in reestablishing treatment gains if sleepwalking episodes recur in the future. The degree and speed of change in the target behavior, combined with the ease of administration of the treatment, makes scheduled awakenings an appealing treatment option worthy of further investigation with a larger number of sleepwalking subjects. The investigation of scheduled awakenings with other parasomnias, such as sleep terrors, is also indicated. Finally, future research should compare the two behavioral interventions, scheduled awakenings to naps, across age groups. It may be that naps would be more appropriate with younger children.
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REFERENCES


