

REVIEW ARTICLE

Behavioural and cognitive-behavioural interventions for sleep disorders in infants and children: A review

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This review covers the literature on behavioural and cognitive-behavioural treatments for sleep disturbance in infants, pre-school, and school-age children. Treatment areas are dyssomnias (disorders of initiating, maintaining, or excessive sleep) and parasomnias (behaviours which occur predominantly during sleep). Interventions aimed at preventing sleep disorder through targeting infant sleep patterns are also examined. Controlled experimental studies are the main focus of this review but case studies and clinical reports are also included. It is concluded that, for families willing to undertake behavioural and cognitive-behavioural interventions, some treatments appear effective for some infant and child sleep problems, in the short term at least. The adequacy of current research is discussed, and suggestions for future research are given.

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Introduction

Clinicians are often asked for assistance in managing children's bed-time and sleep behaviour. This can range from problems with settling to sleep or night waking, through to night fears and a range of parasomnias such as sleep terrors or somnambulism. Disruptions to normal sleep routines can have serious effects on the wellbeing of both children and parents, and has been linked to children's cognitive functioning and emotional regulation [1,2] as well as to maternal depression [3] and, in young children, the development of other behaviour problems [4,5]. There are a range of available treatments. In this article, we review behavioural and cognitive-behavioural interventions that have been used to treat sleep disorders in infants and children. Adolescents and their particular disorders of sleep, and disorders of sleep in children and adolescents with special needs are not dealt with in this review.

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A behavioural intervention is one where the principles of learning theory are applied to bring about a change in how a person responds to a particular object or event. A cognitive-behavioural intervention is one where treatment approaches use both cognitive (e.g., working with thoughts, attitudes and beliefs) and behavioural methods to change overt (visible) and covert (hidden, e.g., cognition and emotion) behaviours. Interventions that focus on infants, with limited language capacity, tend to be behavioural, whereas with older children, who are more amenable to communication and persuasion, cognitive-behavioural interventions can be more practically applied. It is worth noting, however, that even purely behavioural interventions involve a cognitive component when working with parents, since one often has to alter the thoughts, attitudes, and beliefs of parents before they would be willing and convinced enough to undertake a behavioural treatment programme.

Other psychological approaches to treating children's sleep disorders, such as strategic therapies, where the clinician decides and implements often paradoxical strategies which are not directly negotiated with the child or family involved [6–9], and hypnosis [10–14] have been reported in case studies. These have not been included in this review as they do not fit within generally accepted definitions of behavioural or cognitive-behavioural therapy.

Our review of the literature has been concerned with behavioural or cognitive-behavioural interventions for sleep disorders in healthy infants (6 to 24 months of age), preschoolers and children of approximately primary-school age. We have also looked at some preventive interventions that included children younger than 6 months of age. The review has yielded a limited number of systematic empirical investigations based on randomized, controlled designs or well controlled multiple baseline or reversal designs. As well as these controlled studies we have included the numerous case reports which were identified. They are a useful source of clinical material, and indicate the richness of this area for future research. Sleep schedule disorders have no published investigations into intervention but there is published clinical advice. There are no published investigations into interventions in the prevalence and importance of these problems, this advice has been briefly mentioned where appropriate.

In accordance with the Revised International Classification of Sleep Disorders [15], research into treating children's sleep disorders has been divided into the following clinical categories: (i) dyssomnias: disorders of initiating sleep, maintaining sleep, or excessive sleepiness; (ii) parasomnias: physical phenomena or behaviours which occur predominantly when the individual is asleep. A third category in this review concerns preventive interventions, an important area for future research given the widespread nature of sleep disorders.

Dyssomnias

Practice Points: 1

Sleeplessness

1. Intervention, other than preventive intervention, is generally not considered for infants under 6 months of age.

2. Extinction works rapidly and effectively without side effects to decrease infant sleep problems. The use of gentler alternatives is desirable.
3. Effective alternatives to unmodified extinction are scheduled awakening, the parental presence programme and the use of extinction in conjunction with a mild sedative.
4. The use of bed-time stimulus techniques in isolation shows promise but has not been evaluated in a controlled study.
5. The use of combinations of techniques, written material, and group format treatment may be cost-effective but needs more systematic evaluation.

Sleeplessness

Sleeplessness in infants and young children (i.e. bed-time resistance, difficulty settling to sleep and night awakening) is extremely common and accounts for much of the published work on sleep problems in infants and children. The literature on intervention in this area is extensive, and covers a wide range of types of studies from clinic outcome reports, with no measures of child sleep behaviour, to randomized controlled studies. The literature in this area was reviewed in 1993 by France and Hudson [16]. Due to the large amount of material to be covered here this earlier review has been summarized under the headings of treatment approaches. Full details have only been given for major studies after 1993. Readers wishing further details of studies prior to that date are referred to the original review.

As mentioned above, an important point to note is that treatment options for infants and young children will be determined to a large extent by the child's age. Generally intervention is not considered for infants under 6 months of age (for a full discussion of choice and implementation of treatment options in young children see France, Henderson and Hudson 1996) [17].

Extinction

Extinction is the theoretical basis for several different approaches to managing infant sleep disturbance. Extinction focuses on the way in which a child's problem sleep behaviours (e.g., bed-time resistance, signaling to the parents during settling or waking at night) are being maintained by inappropriate parental attention. Removal of the rewarding consequence results in a rapid decrease in the problem behaviours. That is, the child is not attended to, once put to bed, unless the parents judge it to be absolutely necessary. Extinction is invariably used in conjunction with stimulus control, in that regular bed-time and pre-bed-time routines are established.

Unmodified extinction has effectively reduced settling and night waking problems in both case-studies [18] and experimental designs [19–21]. Notwithstanding the effectiveness of extinction there are problems with its use. Parents may be unwilling to use it because of the requirement to ignore the child's crying, and their fears that the procedure could be harmful [21,22]. Additionally, the Post-Extinction-Response-Burst (PERB) [19,21,23], with its consequent increase in intensity and variability of infant behaviour such as crying, results in distress to both parents and children. Several

authors have been critical of extinction on the grounds that possible harmful collateral effects make its use potentially unethical (see France, 1994, for a review) [24].

Three studies have empirically addressed the question of harmful effects [25–27]. No evidence of deleterious effects was found in these studies but, given the concerns expressed by parents and professionals alike, the development of modifications and alternatives to unmodified extinction, which are empirically demonstrated to reduce infant distress, is desirable.

Modifications of extinction

Minimal check

One frequently used modification of extinction has been dubbed the “minimal check programme” [17]. This involves allowing the parent/s to check the infant briefly at regular intervals during the period the child is crying. This technique has been investigated in a multiple-baseline-across-subjects design [28], a group comparison [29], and an uncontrolled clinical outcome study [30]. Intervals between checking have ranged from 5 to 20 minutes. Improvements to infant sleep were reported in all of these studies. However, whether the minimal check programme leads to reductions in infant crying and whether the effects are as robust as extinction and other modifications of it, has yet to be clearly established [28, 31].

Parental presence programme

This procedure is based on the assumption that in many cases sleep disturbance in young children is due to the child’s separation anxiety, so parents are asked to stay with the child during the first week of an extinction programme. The parent is asked to sleep in a separate bed in the child’s room for a week, without having any interaction or involvement with the child during the night even if the child awakens. After the end of this period the parent resumes sleeping in a separate room.

The efficacy of this approach in decreasing sleep disturbance has been demonstrated in both a between-groups design [29], and a multiple-baseline-across-subjects design [28] with some evidence indicating that there is a decrease in PERB with this procedure [28, 31].

Graduated extinction and fading

These entail gradually reducing the intensity of the parental response that is maintaining the unwanted behaviour. Graduated extinction involves either systematically increasing the time before responding to bed-time crying (incremental graduated extinction, also termed controlled crying) or systematically decreasing the time spent interacting with the infant during settling and night awakening (decremental graduated extinction).

Rolider and Van Houten [32], and Durand and Mindell [33] used incremental graduated extinction in multiple-baseline-across-subjects designs. They instructed parents to increase the latency of response to night crying by 5 minute increments. In a group comparison, Adams and Rickert [34] used this technique in a controlled study for addressing bed-time tantrums in children 18–48 months of age. In all of these studies, graduated extinction resulted in marked improvements.

In a recent study Reid, Walter and O’Leary [26] randomly assigned young children (16–48 months) to incremental graduated extinction, unmodified extinction and waiting list control groups. Both the interventions resulted in improved sleep with no negative

side effects. The authors commented, however, that their groups of approximately 16 were too small to detect significant differences between the groups that might, for example, indicate decreased PERB in the graduated extinction group.

Another study took an innovative approach to the use of incremental graduated extinction. In a multiple-baseline-across-subjects design Mindell and Durand [35] intervened using graduated extinction at bed-time only and measured the generalization effects to night awakenings. In all except one of the six pre-school children involved, bed-time intervention resulted in night wakings decreasing to acceptable levels.

Decremental graduated extinction has only been systematically evaluated in one, multiple-baseline-across-subjects study [23]. Parents' usual time spent attending to the child on awakening was measured and systematically eliminated by decrements of one seventh every 4 days. Parents were instructed not to attend to their child upon awakening after the 28th day. Eight of the 10 participants (6–14 months) showed marked improvements which were maintained at 2 month follow-up, but graduated extinction did not invariably overcome the PERB.

A similar technique is "fading" where the properties of the reinforcer are systematically modified to become less rewarding, for example by the parent offering a bottle of water rather than milk. Jones and Verduyn [36], in an uncontrolled study, reported the outcome of a fading paradigm with 19, 4- to 59-month-old children. At the end of the intervention 86% of the children's sleep problems were resolved or showed partial resolution to the extent that the parents considered that no more intervention was necessary.

Combination of extinction with medication

In an uncontrolled study of 35 10- to 57-month-old children, Bruni *et al.* [37] evaluated the use of incremental graduated extinction with niaprazine (1 ml/kg). Pre- and post-test measures indicated significant improvements in number of awakenings and the time to fall asleep at bed-time. France, Blampied and Wilkinson [38] treated three groups of sleep disturbed infants by using trimeprazine (initial dose 30 mg, reduced by 6 mg every second night) combined with extinction. Two other groups received either placebo or no drug in combination with extinction. All participants showed marked reductions in sleep disturbance. The sedated children demonstrated markedly less PERB, with only a slight and temporary recovery of night crying after drug withdrawal.

Stimulus control

As noted, the above extinction programmes invariably contain elements of stimulus control. Appropriate cues for sleep onset such as pre-bed routines, time of day, and a fixed sleeping place are provided consistently in association with bed-time. Some authors have used such routines as their predominant technique [39–41]. Although these studies were not controlled they all reported marked improvements in infant settling.

One recent study which presented bed-time stimulus control as its predominant technique was a reversal design by Ashbaugh and Peck [42]. They intervened with settling and night awakening problems in a 2-year-old. The mean of her settling time (10.30) was taken with 30 minutes added. That became the settling time for the first

night in order to maximize the chances of the child falling asleep immediately and associating entry to bed with sleep onset. If the child fell asleep within 15 minutes, her bed-time was set 30 minutes earlier the next night—if not a response cost procedure was implemented where she had to stay up for 30 minutes before being allowed to return to bed. Over the period of intervention her bed-time was moved earlier according to these criteria, until an acceptable bed-time was reached. The rationale for the response cost procedure was that keeping the child up would be aversive, as the bed-time resistant child usually retains control over getting up and over returning to bed. There were improvements to her sleep disturbance during intervention phases although the authors also applied negative consequences to night waking, so the effectiveness of the stimulus control procedure itself is difficult to determine.

Scheduled awakening

This technique involves pre-emptive awakening prior to the usual time of awakening during the night. The periods of time between scheduled awakenings is gradually increased with the aim of establishing an undisturbed sleep period lasting the whole night. This technique has been evaluated with successful reduction of night awakenings in a case study [43], a multiple-baseline-across subjects design [44] and a group comparison with extinction as an alternative treatment for night waking [21]. One study with a mixed outcome was Johnson and Lerner [45]. In a multiple-baseline-across-subjects study they found that problems with parental compliance and child ill health affected the progress of half of the 12 children (6–30 months) involved in their study. Scheduled awakening has a higher parental adherence rate than unmodified extinction [21] but is limited to treating children without settling problems.

Studies employing a variety of methods

Several studies have used either a combination of techniques (such as stimulus control, fading, rewards, modified and unmodified extinction and parent education) or different techniques with different subjects. These studies all reported improvement in sleep disturbance. They vary widely in the specificity of information provided and the rigour of their evaluation, ranging from case studies [46], clinical outcome studies [47–49], and controlled experimental studies [50, 51].

A variety of techniques have also been presented to parents in booklet form [48, 50–52] with mixed results indicating that the method of delivery of behavioural advice is an area which could be usefully addressed by future research [53, 54]. There has also been discussion the cost-effectiveness of presenting interventions to parents and young children in group formats [55], but no published empirical evaluations exist.

Night-time fears

Many children demonstrate fear behaviour at bed-time. They may refuse to enter their rooms, show great agitation and distress, demand to sleep with their parents or insist on the use of night-lights or other aids against the dark. This is normally short-lived but in some cases can persist over a considerable period of time [56].

Both controlled studies and case studies have been reported in the literature. Self-control approaches utilizing relaxation, guided imagery, and positive self-statements have been predominant in the treatment of night-time fears. Graziano and Mooney [57] conducted a randomized, controlled trial with a "waiting list" control group. Thirty-three families (with children aged from 6–12 years) were given direct instruction on how to overcome intense night-time fears. The intervention focused on training the children in self-control, using relaxation, pleasant imagery, and "brave" self-statements. These skills were practiced with parents at home. The parents rewarded the children with tokens according to how "brave" they were over periods of the night. Intervention group parents reported night-time fears as significantly improved. This improvement remained for the majority of the children at 2-year follow-up [58].

These techniques were extended to younger children by McMenemy and Katz [59] in a multiple-baseline-across-subjects study with five children, aged 4–5 years. Story-book characters provided models of coping behaviour. The children learned relaxation skills, and "brave" self-statements, then modelled what the characters in the story did in fearful situations. The children were offered tokens for practising, and for successfully performing coping behaviours when scared in bed. Treatment resulted in a reduction in the self-report of fear, and in fear behaviours. However, this varied across participants. At 6-month follow-up, however, fear behaviours had consistently disappeared.

Similar self-control strategies were presented in a manual provided to parents of six children, aged 3–11 years, with night-time fears. Using a multiple-baseline-across-subjects design, Giebenhain and O'Dell [60] trained parents to teach self-control strategies to their children and to reward successfully staying in the bedroom the whole night. Children had a progressively dimmer night-light each night. The decrease in illumination tolerated by the children while in the room over the course of the intervention was maintained at a 12-month follow-up.

In a multiple-baseline-across-subjects design with six children aged 7–10 years, Friedman and Ollendick [61] added reinforcement to a self-control package. The children were rewarded with "bravery tokens" for successful performance of self-control strategies at bed-time. The children's fears were significantly reduced after treatment, and willingness to go to bed increased. This positive outcome was difficult to interpret, however, given improvement over the baseline period for some of the children.

The use of rewards in combination with self-control techniques makes it difficult to determine the contribution of each component. To examine this, Ollendick *et al.* [62] used a multiple-baseline-across-subjects design with two treatment phases: self-control training alone (based on Graziano and Mooney [57, 58]) and self-control training with contingent reinforcement. The participants were two girls aged 8 and 10 years of age, both exhibiting bed-time fears secondary to separation anxiety. The first phase involved anxiety management, replacing negative with positive self-statements, problem-solving, self-reinforcement, and praise. In the second phase, reinforcement (both material, and social) for complete nights spent in their own beds was added. A marked reduction in fears for both girls, and a return to their own beds was reported. This was maintained at 2-year follow-up. The self-control-only phase produced a slight reduction in fearful behaviour, but the introduction of the reinforcement schedule caused a marked increase in improvement. As the authors noted, however, it is not possible from this design to assess what influence the contingent reinforcement for staying in bed may have had, but it is clear that the efficacy of the self-control programme was substantially enhanced by its use.

An alternative approach to self-control strategies has been systematic desensitization, using gradual exposure to a frightening situation or image. King *et al.* [63] conducted a multiple-baseline-across-subjects evaluation of systematic desensitization with three children aged 6, 8, and 11 years old. A hierarchy of fearful images was negotiated with each child, and a script constructed to help the child resolve the imagined fearful situation. Two out of the three children showed marked improvement in relevant night-time behaviours. In addition, the children tolerated being in a dark room prior to bed-time for longer. It was noted, however, that the children did not themselves rate the dark room situation as being fearful so the usefulness of this as an outcome measure is doubtful. In a case study, systematic desensitization was used in combination with a fantasy “helper” with a 5-year-old boy [64]. As the child was being guided through a fear hierarchy, the helper (Batman) was used to deal with the fearful images that each successive step evoked. This resulted in elimination of the fears, which was maintained at 18-month follow-up.

Another approach was used by Kellerman [65] who described a case study using “incompatible response training”. Three children (aged 5, 8, 13 years) were trained to perform alternative behaviours (such as displaying anger) when afraid. This was combined with monetary reinforcement for appropriate night-time behaviours. There was a marked improvement in all cases, maintained at 24-month, 16-month, and 9-month follow-up, respectively.

Finally, Ferber [66] has suggested that some night-time fears may be related to a more general sleep-schedule problem. A child who is put to bed inappropriately early has time to brood and fantasize. Coinciding bed-time with the child’s readiness to sleep could resolve the problem without further intervention.

Practice Points: 2

Night-time fears

1. The use of self-control strategies (relaxation training, guided imagery and positive self statements) is well established. The addition of rewards for successful implementation seems to improve outcomes.
2. Systematic desensitization is an alternative, promising, but less well established approach.

Sleep schedule disorder

1. Chronotherapy is the recommended treatment.
2. Unreasonable parental expectations about appropriate sleep times can contribute to sleep schedule disorders (and to night fears).

Sleep schedule disorder

Children with a sleep schedule disorder may present with being unable to sleep at bed-time or nap-time, waking early in the morning, excessive sleepiness at inappropriate times, or a fragmented night-time sleep [66].

Generally, sleep-schedule problems result from a mismatch between the individuals’ circadian sleep-wake system, and the environmental demands regarding the timing and duration of sleep. In children, Ferber has also described a sleep schedule disorder which results from a clash between the child’s needs and the parents’ desires and

expectations of timing and duration of sleep. Treatment would involve negotiating with the parents to establish age-appropriate sleep and wake times for the child [66, 67].

There is no published research dealing specifically with correcting sleep phase disorder in children. The primary recommended mode of treatment for sleep-schedule disorder is chronotherapy. This involves progressively shifting the time of sleep by a set period each day until the desired sleep time is reached, where the sleep is then stabilized [68].

Parasomnias

Practice Points: 3

Parasomnias

1. Arousal disorders: somnambulism, sleep terrors and confusional arousals, often simply need sleep hygiene and parental reassurance.
2. Exposure to the dream content, rehearsing new endings, relaxation, and diminishing parental response are all helpful interventions for nightmares.
3. RMD is seldom associated with injury. Contingency management, overcorrection and extinction have all been employed.

Parasomnias are physical phenomena or behaviours which are associated with sleep. They occur predominantly during sleep but also during the transition period between sleep and wake states. The parasomnias are disorders of arousal, partial arousal and sleep-stage transition and are conventionally categorized according to the stage of sleep in which they tend to occur [15], that is, (i) arousal disorders (associated with slow wave sleep (SWS)), (ii) parasomnias associated with REM sleep, (iii) sleep-wake transition parasomnias and (iv) parasomnias associated with any sleep stage.

Behavioural/cognitive-behavioural intervention studies for the treatment of parasomnias have addressed somnambulism and sleep terrors (arousal disorders), nightmares (a parasomnia associated with REM sleep) and rhythmic movement disorders (a sleep wake transition parasomnia).

Somnambulism and sleep terrors

Somnambulism and sleep terrors are two of the three arousal disorders, the other being confusional arousals. Arousal disorders can be thought of as representing a continuum of behaviour ranging from confusional arousals where the child gradually arouses and moans, sits up, cries etc., to sleep terrors where a dramatic display of agitation and screaming is seen. In between these two extremes, somnambulism can be either quiet or agitated. Arousal disorders are associated with impaired arousal, or partial arousal, from sleep. The onset of these disorders is in SWS and thus arousal disorders are most often seen during the first third of the night when SWS is more abundant. An individual is asleep during any episode so they are not alert and responsive and they have a limited recall, if any, of the events once they have woken. Overtiredness can precipitate arousal disorders. Often, on clinical enquiry, there is a

family history of the occurrence of arousal disorders. Parasomnias in this category are common in young children but nevertheless can be alarming and distressing for parents to witness. Intervention is usually reserved for those cases with unusually frequent or intense episodes. Normally, explanation and reassurance to parents, including advising them to make the child's sleep environment safe to prevent injury during any episodes, is all that is required.

Somnambulism

Treatment of somnambulism has typically employed scheduled awakening. In a controlled study, a multiple-baseline-across-subjects design was used to evaluate the use of scheduled awakenings in three participants (aged 6, 12 and 7 years) [69]. Treatment involved waking the children approximately 15–30 minutes prior to the typical time of occurrence of their episodes, over a 1-month period. As soon as the intervention commenced, episodes of sleepwalking ceased. This was maintained at 6-month follow-up for two of the children, with the other showing a marked reduction in frequency of the episodes (three episodes over 6 months). Anecdotal evidence from two of the parents suggested that the children continued to awaken themselves. They may have been conditioned to partial arousal prior to transition from slow-wave sleep.

Two case studies have also employed scheduled awakenings [70, 71]. In one, reinforcement and "conditioning" were used after psychotherapy was unsuccessful in treating a 7-year-old boy who presented with nightmares, sleep-talking, and somnambulism, although the actual diagnostic features of this case are unclear [70]. The boy was awakened from his nightmares to interrupt his somnambulism. On awakening, he destroyed a picture of the "bug" which featured in his nightmare. The mother also reinforced the boy for verbally expressing his feelings, during the day. Sleep-walking rapidly declined over the course of the 6-week treatment. Over the 14-month follow-up period, some isolated episodes continued.

In a similar vein, an 8-year-old boy with a 6-year history of twice-weekly somnambulism (plus enuresis) was treated by scheduled awakening alone [71]. After five nights, the episodes had ceased, as had the enuresis. This was maintained at 12-month follow-up.

Sleep terrors

Sleep terrors have been reported to be successfully eliminated in 19 children aged from 5 to 13 years by the use of scheduled awakening [72]. In this technique, the normal times that episodes occurred (or consistent autonomic cues of an episode) were noted by the parents over a number of nights. They were then instructed to fully awaken the child 15 minutes prior to this time. For all children, the episodes stopped within a week of starting treatment. This was maintained at 1 year follow-up. The success was attributed to the interruption of what was seen as a faulty slow-wave sleep pattern, which reverted to a normal pattern when the child was awoken. While scheduled awakening is one of the few published techniques for sleep terrors, there is some evidence from clinical experience to suggest that there may be unwanted side-

effects, such as worsening of the situation due to sleep deprivation. Caution is therefore required in the application of this approach until more information is available (R. Dahl and R. Ferber, personal communication, September 23, 1999). Ronen [73] reported on the use of self-control measures to treat an 8-year-old girl with sleep terrors, although the mixed presentation of this child left diagnosis unclear. Treatment came after a successful previous intervention targeted at sleep-onset difficulties, and after an unsuccessful extinction intervention targeted at the sleep terror behaviour. The intervention comprised 10 weekly-sessions, followed by four monthly-sessions, using a number of components. Cognitive restructuring helped conceptualize the behaviour as under her control. Personal targets were then set by the girl for reducing the frequency of sleep terror episodes, and the associated crying and co-sleeping with the parents. These target behaviours were eliminated over the course of the intervention. Progress was maintained at 12 month follow-up.

Nightmares

The repeated occurrence of frightening dreams affect 10–50% of young children. They are differentiated from night terrors by a number of features. Firstly, a lower level of panic [74]. Secondly, a child awakening from a nightmare is easily awakened and has vivid recall of dream content. Thirdly, nightmares arise almost exclusively during REM sleep and thus are more common in the last third of the night when REM sleep is more abundant.

There are no published accounts in the literature of controlled studies looking at the use of behavioural or cognitive-behavioural techniques to specifically manage nightmares. Some of the interventions that attempt to deal with night-time fears do, however, deal with nightmares as a component of an overall sleep-related anxiety problem [10, 63, 65].

Two case studies have employed anxiety management and self-control strategies such as systematic desensitization, guided imagery and relaxation. In the case of an older child, Cavior and Deutsch [75] treated a 16-year-old male by guiding him through the course of his dream with instructions to remain relaxed. After three therapist-guided sessions and several independent practice sessions, the anxiety disappeared, although the dream still occurred. This was maintained at 6-month follow-up. In addition, "dream reorganization" was used by Palace and Johnston [76] with a 10-year-old boy. This involved guided rehearsal of new dream endings involving mastery of the dream situation. After 16, 60-minute sessions of treatment, the nightmares were eliminated. This was maintained at 6-month follow-up.

A strictly behavioural "response prevention" method was used in one case where frequent nightmares occurred subsequent to an accident resulting in severe burns [77]. The child's mother was instructed to wake the child (aged 5 years) at the first sign of a nightmare episode, and to then let her return to sleep with minimal interaction. This resulted in reduction of the nightmares to one per week, at which point the intervention changed to an extinction of parental response to the nightmare episodes, whereon the episodes ceased entirely. This was maintained at 6-month follow-up. The child also showed pronounced phobic reactions to fire-related stimuli (e.g., matches) which was later successfully treated with systematic desensitization using pictures.

Rhythmic movement disorder

Rhythmic movement disorder (RMD) is a class of sleep disorders characterized by repetitive stereotypical behaviours which most usually occur either within or around the transition from sleep to wake, or from wake to sleep. Four types are commonly referred to: head-banging, head-rolling, body-rocking and body rolling [68, 78–80].

RMD is most common in infancy and has usually stopped by 4 years of age, although it can persist through adolescence and into adulthood [68, 81]. It usually occurs during lighter NREM sleep. Injuries can occur, especially with head-banging, but more often complaints or concerns from parents are due to witnessing the bizarre nature of the child's behaviour rather than as a result of the child sustaining injury [80].

There are no controlled studies reported in the literature on the treatment of RMD in children by cognitive-behavioural or behavioural management.

The few case studies in the literature report the use of a combination of contingent reinforcement and feedback [79, 82–84]. In the first of these reports, a 16-year-old boy decreased the frequency of his head-banging behaviour over 30 weeks of treatment which involved feedback (an audible alarm connected to his bed), self-control (a requirement to sleep on his back) and monetary reinforcement [82]. In another case, a 7-year-old girl with head-banging was treated with contingent reinforcement combined with overcorrection [84]. The overcorrection procedure involved practising stopping her head just prior to striking the bed, and then lying down. She was rewarded for nights without head-banging episodes. The frequency of episodes decreased to zero, although she did “acquire” an alternative behaviour (rocking from side-to-side) when head-banging ceased, which was not treated. The entire treatment took over a year.

Two cases of family-based behaviour modification for RMD have been reported [79]. The children in the two cases (aged 12 and 11 years) were both thought to have independently acquired head-banging as a sequel to otitis media as toddlers, possibly due to their mothers' use of rocking as a means of soothing. In both cases, a reduction in head-banging was brought about by placing the child's mattress on the floor, making it harder for the behaviour to occur. Complete elimination of the behaviour was only accomplished, however, in the first case when contingent financial reward for cessation was instituted. With the second child, a more general intervention with regard to sleep hygiene and family routines was undertaken.

Golding [83] reported a case study where head-banging occurred as part of the settling habit in a 4-year-old boy. During sleep onset, and during night waking episodes, the child would strike the edge of his bed with his head as a means of inducing sleep. This habit was eliminated by the use of contingency management, so that head-banging was followed by the mildly negative consequence of having to walk around for a brief period. Appropriate behaviour (i.e., not head-banging) was reinforced by the use of a star chart, and of course, eventually by sleep. This resulted in an elimination of night waking (and thus removed the opportunity for head-banging in the night), but the head-banging at sleep onset persisted. This was finally eliminated when parental attention to head-banging was also extinguished. Absence of episodes continued for 4 months, but they recurred when the child became stressed. A repeat of the programme resulted in cessation of episodes, which was maintained at a 12-month follow-up.

Preventive interventions

Practice Points: 4

Preventive intervention

1. Useful preventive advice to parents of infants includes: bed-time routines, minimal response to night wakings, feeding between 10–12 pm and putting the child to bed awake.
2. There have been no studies investigating preventive intervention into sleep disorders in older children.

Programmes aimed at preventing sleep problems in children have generally focused on establishing good sleep habits in infants. There have been no studies published on prevention of problems in older children.

Prevention programmes have generally aimed to eliminate/ameliorate sleep disturbance in infants by educating parents in sleep hygiene and in modifying their feeding routines and response to the child at night. They have varied in the developmental stage at which they have been applied, starting either prior to birth [85–87], or at less than 6 months of age [88,89].

Two controlled studies have focused on very young children. Pinilla and Birch [86] investigated whether exclusively breast-fed babies could be taught to sleep through the night. They randomly assigned 13 parents to an intervention group where instruction focused on concentrating feeding to between 10 pm and 12 am, and progressively increased the interval between feeds. They also taught the parents to respond minimally to the child. By 8 weeks, 100% of treatment infants were sleeping “through the night” (defined as sleeping continuously from midnight to 5 am). There were no follow-ups beyond 8 weeks. In a randomized, parallel group design, Wolfson *et al.* [87] instructed 29 first-time parents on infant sleep patterns, as well as teaching how to concentrate feeding times, discriminate infant wakefulness, and aid their babies to discriminate between night and day (e.g., by darkening the room only at night). A control group received a similar amount of contact time, but no training. At 6–9 weeks of age, children from the intervention group showed longer sleep episodes and longer total sleep. The parents also woke and responded less to infant signalling, and reported a greater sense of competence. These gains were not, however, maintained at 20 weeks of age, where no significant differences in sleeping patterns between the two groups were observed, although a significantly larger proportion of children from the intervention group were sleeping continuously for 5 hours or more, for five or six nights each week, than were children from the control group.

Although preventive intervention with very young infants has achieved more consolidated sleep patterns at an early age, there have been no studies which have looked at whether these changes in fact translate to improved sleeping after the first few months of life.

Two other studies have reported intervention with parents once their babies were a few months old and measured sleep behaviour later in the first year. These studies appear to have resulted in more robust effects but long-term follow-up has not yet occurred. Adair *et al.* [88] used a prospective cohort design with an historical control group. They gave parents information about sleep onset associations, instructed them to put their child to bed awake, and required them to maintain a sleep diary, as well

as providing opportunities for conversation with a paediatrician about sleep. This intervention was initiated when the children were 4 months old. At 9 months of age the intervention group reported 36% less night waking per week (a mean of 2.5 versus 3.9 in the control group). In a randomized, controlled trial, Kerr *et al.* [89] gave parents of 3-month-old infants information on settling methods and the importance of routine, during a home visit with supplementary written information. Parents were interviewed about settling and night waking at 9 months of age. A significantly smaller percentage of children in the intervention group had difficulties in settling and night waking, but there was no follow-up.

An alternative approach to that of parental education was undertaken by Goodlin-Jones *et al.* [85]. In a 12-month-long trial they tested the use of maternal odour, over the first year of life, as a means of facilitating the development of settled sleep-wake behaviour in infants. Twenty-one mothers were randomly assigned to one of three groups: using a sleep-aid (a T-shirt), that had maternal odour, placed in the cot; or a control group with a “neutral” (scentless) sleep-aid. Maternal feelings of well-being were measured by self-report, and infant sleep-behaviour was measured by videotaping samples of sleep at regular intervals. The authors found that while the “odour” group had better self-reports of well-being, infant sleep behaviour did not differ between the groups. The authors suggested that the mothers’ improved sense of well-being may have resulted from their participation.

As a matter of general concern, the developmental appropriateness of prevention programmes needs more consideration. The sleep of very young infants is often disorganized, but changes rapidly over the first few months. Preventive programmes should aim to capitalize on appropriate developmental momentum rather than manipulating sleep development at arbitrary times. In order to achieve this, preventive intervention needs to be based on normative studies that are needed to indicate the best developmental “windows” for safe and effective intervention. In addition, the optimal outcome measures for preventive studies need to be carefully conceptualized so as to reflect changes in infant sleep. The presumption is that these programmes will prevent sleep disturbance, rather than simply change the sleep patterns of young infants in the short-term. While short-term relief may be of benefit to parents, if the effects do not persist then this does not fit within the definition of primary prevention. In this case, outcome measures need to assess the prevalence of primary sleep disturbance from the second half of the first year, as well as later, secondary sleep disturbance.

Discussion

Research Agenda

Future directions

1. There has been little investigation into whether modifications of extinction reduce the PERB while remaining effective.
2. The use of stimulus control in treating sleeplessness needs systematic evaluation.
3. Alternative means of delivering treatments may be cost-effective but need evaluation.

4. Methods of treating several of the sleep disorders of children, e.g., sleep schedule disorders, nightmares, RMD, have not had adequately controlled evaluation.
5. Research into prevention of sleep disorders in older children is a rich and promising area for research, given the evidence for associations between sleep disorders and cognitive functioning, emotional regulation, behaviour problems and the development of psychopathology [91].
6. Long-term evaluation of prevention of sleep disorders in infants is under-researched. A foundation of empirically-based, normative, developmental information needs to be established.

Research Agenda

Issues of method

1. Outcome measures for preventive programmes need to assess the effects on both primary and secondary sleep disturbance.
2. Clinicians who familiarize themselves with appropriate single-case research designs can carry out intervention research with small numbers of similar cases.
3. Direct measures of child behaviour and parental compliance, component analysis, long-term follow-up and balanced treatment of control groups should be employed.

There is abundant evidence suggesting that behavioural and cognitive/behavioural interventions can be employed to effectively treat a number of common childhood sleep disorders. The most well-established applications are with sleeplessness in young children and with children's night fears. Other sleep disorders have been the subject of a number of promising studies and case reports that provide useful guidance to the clinician but these suggestions lack controlled evaluation. Some important child presentations have not been adequately studied. Primary preventive intervention trials have only been conducted with infants and, although they indicate some useful advice that clinicians can give parents, they have yet to demonstrate long-term beneficial effects on infant sleep problems.

Clinical practice in the area of intervention for sleep disturbance for infants and children is marred both by a paucity of research and also limitations in the research that does exist. Where research has been conducted, it has suffered from a lack of rigour in terms of the time span over which measurements were taken, and the kind of measures used. For example, in some of the studies no baseline measures were taken. The information has also been typically collected in the form of self-report, with few attempts to assess reliability. Measures of parental adherence to the interventions are mostly absent. In one study where a measure of parental adherence was measured, it revealed that only 21% of parents were implementing the programme [88].

Studies have also failed to deconstruct complex interventions into components, so that where cognitive techniques (e.g., guided imagery) have been used in combination with behavioural techniques (e.g., contingent reinforcement) it is difficult to isolate the critical factors leading to a successful outcome. Studies combining written instruction with group education have not allowed separate analyses of each component to be conducted. Where control groups have been used, the amount of attention that each group has received from experimenters has varied, and changes may simply reflect expectation in the group who received more input. Control groups have also

received explanations for their involvement that do not give the same sense of active contribution to their child's well-being as do those in intervention groups.

The age range of participants in some studies has been wide, which leaves the results potentially open to distortion through changes due to normal development, for example changes in underlying sleep state organization or language ability. This also makes it problematic to determine the suitability of a particular intervention type for a given age-group.

There have been few attempts to assess long-term effects post-treatment. Whilst an intervention may have short-term benefits, the long-term outcome is an important aspect of efficacy that has not been ascertained. Only one study (of night time fears) has included a longer-term follow-up, at 2 years post-intervention, and here the results were encouraging [57, 58]. Similar follow-up investigations of other interventions and sleep disorders are needed.

Intervening through education is a predominant approach in the area of childhood sleep disturbance. This presents its own set of problems; differing prior education levels of the parents and methods of delivering "education" (e.g., face to face or via a booklet) could affect the efficacy of interventions and these factors need to be specifically addressed so that the most appropriate form of intervention for particular families can be determined. Self-selection bias is a further area that researchers, while not able to manipulate, should be aware of when reaching conclusions as to the efficacy of an intervention [89].

These criticisms aside, the general impression from the studies reviewed is positive. Behavioural and cognitive-behavioural methods do appear to be efficacious in resolving some sleep problems. However, before efficacy can be conclusively stated, or the active components of treatment can be identified, further research is required. Controlled studies are needed, where specific, well-defined interventions and their components can be assessed by the use of appropriate and reliable assessment tools. Demographic information about the family needs to be collected, as does some measure of parental compliance with any intervention. Long-term follow-up data would also be of use. The sporadic presentation of some types of sleep disorders makes it difficult for controlled studies to be undertaken. For such clinical groups, the usefulness of controlled single-case research design (particularly where two or three children present in a similar fashion), should not be underrated [90].

In the absence of such data, general principles of intervention have to be based upon the available literature. From this data, one can conclude that for the group of families willing to undertake behavioural and cognitive-behavioural interventions, these treatments appear to be effective for some infant and child sleep problems, in the short term at least, with only cautious optimism with respect to long-term outcomes being justified.

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Glossary¹

Behavioural methods: Behaviour modification techniques that apply general principles of operant conditioning, respondent conditioning, and modelling, especially toward altering overt behaviours.

Bed-time scheduling: The process of setting a consistent bed-time/wake time routine, that is, establishing stimulus control of sleep times.

Chronotherapy: Progressively shifting the time of circadian cues (e.g., sleep, wake, light, activity, mealtimes, social activity) by a set period each day until the desired sleep time is reached, where the sleep is then stabilized.

Cognitive-behavioural therapy: Treatment approaches that use both cognitive and behavioural methods to change overt and covert behaviours.

Cognitive restructuring: Training the child to re-evaluate potentially distressing events so that when they are viewed from a more realistic perspective they lose their power to upset. This involves changing the ways that the child organizes their experiences, and providing alternative explanations or appraisals.

Contingency management: The combined use of positive and negative consequences to alter the frequency of a behaviour or behaviours.

Extinction: Withholding reinforcement following unwanted behaviour. Removing a reward that previously served to maintain an unwanted behaviour.

Fading: The process of gradually removing or changing a prompt for a behaviour to decrease reliance on it.

Graduated extinction: Removal of a reinforcing stimulus in discrete steps over time, for example by reducing the amount or duration, rather than by abrupt cessation.

Guided imagery: A process whereby the therapist guides the child through imagery, for example of a stimulus hierarchy, to rehearse images of mastery or to enhance the relaxation response.

Incompatible response training: Reinforcing behaviour that is physically incompatible with (or cannot be performed at the same time as) the undesired behaviour.

Multiple-baseline design: A research design where all baseline phases start simultaneously, but continue for different lengths of time. This allows an opportunity to control for time-related (e.g., maturational) effects that are independent of any experimental manipulation. Multiple-baseline designs can be across subjects which allows each participant to act as his/her own control, or across behaviours where the intervention is targeted at different behaviours at different times (e.g., at settling problems then at night awakenings).

Overcorrection (positive practice): Requiring the individual to practise positive behaviours which are physically incompatible with the inappropriate behaviour. Or requiring the individual to practise the undesirable behaviour to the extent that it becomes aversive.

¹ Most glossary entries are based on definitions from: Martin Herbert (1987). *Behavioural treatment of children with problems: a practice manual*. London: Academic Press; Edward P. Sarafino (1996). *Principles of behavior change: understanding behavior modification techniques*. New York: Wiley.

Post-extinction-response-burst: A temporary increase in the frequency, variability or magnitude of a response that sometimes occurs soon after an extinction procedure has been introduced.

Reinforcement: Increasing the likelihood of a particular behaviour occurring in the future by following a requisite response with a particular outcome. Reinforcement can be positive, where a desirable stimulus or outcome is presented, or negative, where an aversive stimulus or outcome is removed or prevented from occurring.

Relaxation training: Techniques designed to induce psychological and physical calm, for example by having the person alternately tense and relax separate muscle groups, or by focusing on pleasant imagery.

Response cost: Removing a pre-specified amount of a valued item (e.g., a set number of tokens or access to television) following undesired behaviour.

Response prevention: The individual is prevented from performing an undesired behaviour, for example preventing somnambulism by scheduled awakening.

Reversal design: A single-case design which allows evaluation of the intervention by implementing, removing, then re-establishing it.

Self-efficacy: A person's beliefs about his/her ability to succeed at performing a particular behaviour.

Self-management and self-control: Helping the child to re-label his/her experiences and change expectations of self-efficacy and likely outcome. Teaching children to monitor their own thoughts, feelings and behaviours, apply the skills they have learnt and to reward their own appropriate behaviour (by self-praise or allowing themselves a treat, for example).

Single-case research designs: Research designs which rigourously evaluate the effects of intervention with an individual case or cases.

Sleep scheduling: The process of setting age-appropriate sleep and wake times. Sleep onset time should be determined by the time that the child usually falls asleep. Fading can then be used to move the sleep onset time to one that allows the child to meet individual sleep requirements.

Stimulus control: The ability of an antecedent stimulus to act as a signal for the performance of a specific behaviour. For example, the effect of placement in the cot on the likelihood of sleep onset.

Stimulus hierarchy: A list of anxiety-generating stimuli that is ranked in reverse order in terms of the degree of fear each provokes.

Systematic desensitization: Gradual exposure to a hierarchy of aversive stimuli using either: imagined objects/events (or pictures); or real-life objects or situations. This normally occurs after the child has been trained in relaxation. Reinforcement occurs after every successful stage of exposure.

Unmodified extinction: Abrupt cessation of reinforcement for a behaviour.