DYSSOMNIAS IN CHILDREN WITH ADHD:
BEHAVIOURAL FAMILY INTERVENTIONS

A dissertation
submitted in partial fulfillment
of the requirements for the Degree
of
Master of Education
in the
University of Canterbury
By
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University of Canterbury
2005
ACKNOWLEDGEMENTS

In completing this dissertation, I would like to extend my thanks to my supervisor, Dr Karyn France for her expertise, guidance and support throughout the year. Special thanks are also owed to my second supervisor, Dr Kathleen Liberty, for the time and effort she provided in assisting me with the daunting task of writing this dissertation.

My appreciation is further extended to the families who participated in this study and your willingness to open your homes to me. It was a pleasure and an incredible learning experience to work with you all.

To my fellow course mates and friends - your encouragement, support, laughter and friendship has truly made this year an enjoyable experience. Being able to share the difficulties and successes has undoubtedly helped me get through what has been a demanding and challenging year.

Finally, to my parents and family – your encouragement, patience, ability to listen and caring interest in my study has made a huge difference. Thank you for always supporting me in everything I do.
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ABSTRACT

Sleep disturbances are extremely common among children with Attention Deficit Hyperactivity Disorder (ADHD) and are reported to occur more frequently than in typically developing children. These sleep problems are likely to be highly stressful for family members and may have adverse effects on the well-being of both the child and parents. Unfortunately, there is a paucity of research investigating the development and efficacy of behavioural management strategies to treat the sleep disturbances of children with ADHD.

This study used a multiple baseline design across participants to examine the effects of individualized behavioural family interventions in treating the inappropriate bedtime behaviours and sleep disturbances presented by four children (aged 5-11 years) diagnosed with ADHD. Assessment data suggested that sleep disturbances were reinforced and maintained by parental attention. The behavioural strategies implemented to treat the sleep problems were comprised of standard extinction procedures involving differential reinforcement of inappropriate and appropriate behaviours, positive reinforcement programmes, a structured positive bedtime routine and a response cost procedure.

Results showed that the multiple sleep problems presented by these four children, including bedtime disturbances, sleep onset delay, night wakings, bedtime non-adherence and co-sleeping, were reduced as a function of their respective individual behavioural interventions. Sleep and behavioural improvements were mostly maintained at 3 months follow-up. Generalized positive effects on the child’s daytime behaviour, changes in parental mood, increased parental sleep and increased confidence in parenting skills were also reported following completion of the sleep intervention programmes.

These findings indicate that behavioural management strategies are an effective method to alleviate and/or eliminate sleep disturbances experienced by children with ADHD. Implications for the assessment and treatment of sleep disturbances in this special needs paediatric population are discussed as well as recommendations for current clinical practice and future research.
CHAPTER 1

INTRODUCTION

Sleep Disturbances

Sleep serves several roles in everyday life and is important for both physical and mental well-being. Unfortunately, sleep disturbances are among the most common complaints throughout the general paediatric population and represent a major area of concern for many parents. For example, a chronic lack of sleep can adversely affect a child’s life by causing significant psychosocial, health and educational consequences. Recent reviews of children’s sleep disorders agree that approximately ¼ of all young children have some type of sleep disturbance (Mindell, 1993). However, there are some groups of children that are particularly prone and at special risk of developing sleep problems. Sleep disturbances are highly prevalent in children and adolescents with psychiatric disorders and are often a significant source of stress for the families (Mindell & Owens, 2003). The types of sleep disorders that occur in these paediatric special needs populations are more common and severe than in the general population, with multiple sleep disorders likely to occur (Mindell & Owens, 2003).

Classification of Sleep Disturbances

Sleep problems may be viewed as occurring along a continuum of severity and chronicity that ranges from transient and self-limited disturbance to a disorder that meets specific diagnostic criteria as outlined in the International Classification of Sleep Disorders (ICSD) and/or the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (American Psychiatric Association, 1994; American Sleep Disorders Association, 1997). Determining patterns of sleep that constitute abnormal behaviour is often quite subjective and influenced by parent childrearing attitudes, expectations for, tolerance of and interpretation of the child’s sleep behaviour (Lozoff, 1995). For example, disruptive bedtime behaviours in early childhood may be viewed and accepted as an inevitable part of this developmental period. Definitions of sleep problems are also to a certain extent determined by cultural practices and belief systems. For example, some societies place a high value on the early acquisition of independent skills by children (Lozoff, 1995). This promotes the belief that “self-soothing” in infants is an important developmental milestone and that co-sleeping is not
an acceptable practice because it prevents the child from becoming independent. In contrast, some cultures consider co-sleeping a normal sleep practice (Lozoff, 1995).

Sleep disorders are classified into two major categories: dyssomnias and parasomnias. The main focus of this research is on dyssomnias, which are primary sleep disorders caused by difficulties initiating or maintaining sleep (e.g., insomnia, sleeplessness), or that involve excessive sleepiness. These sleep problems are associated with a predominant disturbance in the amount, quality and/or timing of sleep (Mindell, 1993; Stores & Wiggs, 2001). Classically, insomnia is divided into initial insomnia described as difficulty with falling asleep at the beginning of the night whereas middle insomnia is defined as difficulty returning to sleep after nocturnal awakenings during the night (Stores, 2001). Dyssomnias can be further classified as either intrinsic sleep disorders (originating from causes within the body of primarily a biological nature), extrinsic sleep disorders (caused by external factors such as parental discipline style or medication use) and circadian rhythm sleep disorders (characterized by the inappropriate timing of sleep within the 24 hour sleep period) (Anders & Eiben, 1997; Didden & Sigafoos, 2001; Stores & Wiggs, 2001).

Parasomnias are not examined in this research but constitute a group of sleep disorders related to arousal, partial arousal or sleep stage transitions (Stores, 2001). These disturbances interrupt the sleep process and are characterized by abnormal behavioural states involving the inappropriate activation of physiological systems during the sleep-wake cycle (e.g., sleep terrors, sleep walking, enuresis, restless leg syndrome, nightmares, sleep talking, rhythmic movement disorders) (Didden & Sigafoos, 2001; Owens, France, & Wiggs, 1999; Stores, 2001; Stores & Wiggs, 2001). For a more comprehensive review of paediatric sleep disorders see Anders and Eiben (1997) and Mindell (1993).

**Attention Deficit Hyperactivity Disorder (ADHD)**

Attention Deficit Hyperactivity Disorder (ADHD) is the most common neuro-psychiatric disorder of childhood and adolescence that presents to children’s mental health services (Barkley, 1998). The core symptoms of this disorder include varying degrees of inattention, impulsiveness and hyperactivity, with the current diagnostic classification, the DSM-IV-TR, identifying three subtypes of ADHD: predominantly inattentive, predominantly hyperactive-impulsive and combined subtypes (American Psychiatric Association, 2000).
Although modern conceptualizations routinely regard ADHD to be a neurobehavioural syndrome, the specific nature of suspected brain dysfunction has yet to be established and at present the cause of ADHD remains unknown. ADHD also shows a high rate of comorbidity with other clinical disorders (e.g., anxiety, mood disorders, depression Oppositional Defiance Disorder, Conduct Disorder) and other problems (e.g., learning problems, academic underachievement, poor social relations) (Barkley, 1998). Furthermore, this disorder has been found to have a negative impact on an individuals’ functioning within the family, school and community.

The childhood prevalence of ADHD is estimated to be about 5-7% for boys and 2-4% for girls in both the United States and Europe, with boys being diagnosed at least three times more frequently than girls (Barkley, 1998). Stimulant medication, particularly methylphenidate (MPH), is the most widely prescribed treatment for this disorder and is estimated to constitute between 75% and 95% of the prescribed drugs for children diagnosed with ADHD (Ball & Koloian, 1995; Barkley, 1998). About 75% of children with ADHD respond to MPH with improved attention span, decreased impulsivity, decreased off-task activity and decreased social disruptiveness (Barkley, 1998). However, ADHD is a disorder of major concern in child psychopathology because it interferes with many areas of the child’s life and predisposes the child to psychiatric and social disorders in later life.

During the past 25 years there has been considerable interest in the relationship between sleep problems and children with ADHD, with parents frequently reporting sleep disturbances possibly more so than in any other child psychiatric group (Chervin, Dillon, Bassetti, Ganoczy, & Pituch, 1997). The impact of disrupted sleep and/or inadequate sleep on the cognitive, emotional and social development and behaviour in these already at-risk children is potentially profound (Mindell & Owens, 2003). Given the reported prevalence of sleep problems in association with ADHD, it is therefore important to assess and treat the sleep disturbances experienced by these children. This has led to a growing number of studies examining and evaluating the nature and characteristics of these sleep disturbances and a need to develop treatments for these children, in particular treatments that can be implemented by parents in the home.
CHAPTER 2

LITERATURE REVIEW

Types of Sleep Problems in Children with ADHD

Organic

Research has begun to document that a percentage of children diagnosed with ADHD actually have an unrecognized primary sleep disorder. Specific conditions that have been reported in association with ADHD symptoms include sleep related breathing disorders (SRBD), such as obstructive sleep apnea syndrome (OSAS), characterized by repeated episodes of upper airway obstruction, and periodic leg movement disorder (PLMD), described as periodic muscle contractions involving the extension of the big toe and flexion of the ankle (Mindell & Owens, 2003). These movements occur in sleep and may result in awakening (Malek-Ahmadi, 1999). Children with ADHD are also described as manifesting more problems in the areas of sleep-related involuntary motor movements during the night (e.g., restlessness, jerky movements, sleep talking, teeth grinding), but not parasomnias (e.g., night terrors, sleep walking, night wakening) in comparison to normal controls (Corkum, Moldofsky, Hogg-Johnson, Humphries, & Tannock, 1999; Corkum, Tannock, & Moldofsky, 1998; Lecendreux, Konofal, Bouvard, Falissard, & Mouren-Siméoni, 2000; O'Brien et al., 2003a). Furthermore, restless legs syndrome, delayed sleep phase and narcolepsy are other specific sleep disorders that have been connected to ADHD symptoms (Mindell & Owens, 2003).

There is also a well documented association between symptoms that define ADHD (e.g., hyperactivity, inattention, impulsivity) and those that characterize SRBD and PLMD (Chervin et al., 1997; Chervin et al., 2002; O'Brien et al., 2003a; O'Brien et al., 2003b; O'Brien, Holbrook et al., 2003). Earlier studies have reported an increased frequency of PLMD during sleep among children with ADHD, raising the speculation of possible shared neurobiological mechanisms underlying both ADHD and sleep disorders (Picchietti, England, Walters, Willis, & Verrico, 1998; Picchietti & Walters, 1994). Some authors have also reported increased rates of externalizing symptoms and hyperactivity among children with OSAS (Ali, Pitson, & Stradling, 1996; Chervin et al., 1997; Chervin et al., 2002). Other major
findings include a high prevalence of snoring among children with a diagnosis of ADHD, with reports of snoring seven times that of the general population (O’Brien, Holbrook et al., 2003).

Identification and effective treatment of the organic problems (e.g., SRBD or PLMD) has resulted in significant improvements and even elimination of night-time and day-time behavioral difficulties symptomatic of ADHD, including a decreased need for treatment with stimulant medication (Ali et al., 1996; Picchietti & Walters, 1994). For example, a study by Ali et al. (1996) compared children with and without sleep disorders who were on a waiting list for adentotonsillectomy, often used to treat OSAS. After the surgical procedure, the group with sleep disorders displayed significant improvements in parents’ ratings of aggression, inattention and hyperactivity. They also demonstrated improvements on a measure of sustained attention. Other recent studies have shown that up to 80% of habitually snoring children with ADHD (approximately ¼ of all children with ADHD) were estimated to benefit significantly from adequate treatment of the co-existing sleep disorder (Chervin et al., 1997).

Sleep disturbances as a result of an organic problem may contribute significantly to the learning and behavioural problems already present as part of the ADHD (Mindell & Owens, 2003). The robust association between SRBD symptoms with inattention and hyperactivity is consistent with the possibility that sleep disorders could be the cause of the behaviour rather than an effect of hyperactivity and inattention in a significant number of children (Stores, 2001). Thus, undiagnosed organic problems could affect behaviour in a substantial number of children who are not commonly evaluated for sleep disorders.

Behavioural

In an extensive review of empirical research published since 1970, Corkum et al. (1998) explored the frequency, type and significance of sleep disturbances in children with ADHD. This review, combined with more recently published studies, indicates a variety of sleep disturbances are consistently reported by parents of children with ADHD, including more bedtime resistance, delayed sleep-onset, sleep-related anxiety, frequent nocturnal awakenings, daytime sleepiness, difficulty with morning awakenings, restless sleep, display more instability in their sleeping patterns, more frequent episodes of enuresis and shorter sleep duration than healthy control children (Ball, Tiernan, Janusz, & Furr, 1997; Corkum et al., 1998; Crabtree, Ivanenko, & Gozal, 2003; Day & Abmayr, 1998; Gruber, Sadeh, & Raviv,
2000; O’Brien et al., 2003a; Owens, Maxim, Nobile, McGuinn, & Msall, 2000; Ring et al., 1998).

In contrast, some researchers have failed to show a relationship between sleep disturbances and ADHD per se, suggesting that the previous findings might be related to medication status or comorbidity (e.g., oppositional defiance disorder, conduct disorder, depression) (Corkum et al., 1998; Corkum et al., 1999; Corkum, Tannock, Moldofsky, Hogg-Johnson, & Humphries, 2001; Lecendreux et al., 2000; Mick, Biederman, Jetton, & Faraone, 2000; Ring et al., 1998; Stein et al., 2002). In a review of studies by Corkum et al. (1998) that incorporated both subjective and objective measures, no differences were found in total sleep time across 90% of the studies reviewed. Research examining delayed sleep onset has further demonstrated inconsistencies, with variable times reported between ADHD and control groups (i.e., longer, shorter and no difference) (Corkum et al., 1998). Assessments of movement while children with ADHD are asleep also fail to show differences in sleep duration and sleep onset compared with control children (Kaplan, McNicol, Conte, & Moghandam, 1987; Tirosh, Sadeh, Munvez, & Lavie, 1993).

As the main focus of this research is on dyssomnias, definitions describing the characteristics of these primary sleep problems are presented. First, bed refusal involves the child refusing to go to bed at a regular time or when instructed (France, Henderson, & Hudson, 1996). This is often referred to as “bedtime resistance” or “settling difficulties” and results in displays of behaviours such as shouting, crying, tantrums, throwing objects and destructiveness (Mindell & Owens, 2003). Bedtime delaying tactics are also frequently employed as excuses for not going to bed (e.g., drinks, stories, cuddles, toileting) (Mindell & Owens, 2003). Second, parental limit setting difficulties are characterized by the inadequate enforcement of bedtime limits by a caretaker, with resultant stalling or refusal to go to bed at an appropriate time. This is also typically manifested as bedtime resistance (Mindell & Owens, 2003; Owens et al., 1999). Third, sleep onset association problems occur when the child requires external conditions (e.g., parental presence) to fall asleep both at bedtime and after night wakings (Owens et al., 1999). Fourth, delayed sleep-onset is the length of time a child takes to fall asleep after being placed in bed at night (Mindell & Owens, 2003). Delays in going to sleep may result from the child’s inability to initiate sleep or refusal to sleep, which is often accompanied by tantrums, demands for parent attention or specific rituals such as bedtime stories (France et al., 1996). It is also important to note that children have different developmental requirements in terms of recommended sleep requirements depending on their
age. Ferber (1985) suggests that children aged between 3 and 6 years need approximately 10 ¼-12 hours per day, typically going to bed around 7-9pm and waking about 6-8am. For children aged between 7 and 12 years, social, school, and family activities generally mean that bedtimes gradually become later and later, with most 12-years-olds going to bed at about 9pm (Ferber, 1985). There is still a wide range of bedtimes for this age group, from 7.30-10pm., as well as total sleep times, from 9-12 hours, although the average is between 10-11 hours per day (Ferber, 1985).

In addition, night wakings involve a waking during the night that occurs after the initial onset of sleep and before the normal waking time in the morning (France et al., 1996). During this time, the child signals to the parent by crying, calling out or sometimes getting out of bed as opposed to re-initiating sleep independently (France et al., 1996). Finally, co-sleeping is described as when a child sleeps and shares a bed with the parents or another family member for part of the night or the entire night. Co-sleeping is defined as a sleep problem when this is undesired by the other person but is used as a method to prevent disrupted sleep for the child and/or the parent (France et al., 1996).

Prevalence

Sleep problems are more widespread in children with ADHD than among the general paediatric population. Previous studies have consistently supported higher prevalence rates of sleep complaints as reported by parents of children with ADHD. However, accurate rates are difficult to obtain because of failures to recognize the sleep problems and limited referral cases for medical attention. Consequently, it is reasonable to assume that the following quoted figures are underestimations (Stores, 2001).

Several studies based on subjective measures (e.g., parental reports, questionnaires, standardized instruments, rating scales, sleep diaries) indicate a high rate of various sleep disturbances among children diagnosed with ADHD in comparison to their typically developing peers (Ball & Koloian, 1995; Ball et al., 1997; Chervin et al., 1997; Chervin et al., 2002; Corkum et al., 1999; Corkum et al., 2001, Crabtree et al., 2003; Kaplan et al., 1987; Marcotte et al., 1998; O’Brien et al., 2003a; Owens et al., 2000; Ring et al., 1998; Stein, 1999). A comprehensive review of the literature revealed estimates of sleep problems based on samples of children with ADHD to be between 25% and 50% compared with 7% of normal
controls (Corkum et al., 1998). This represents a fivefold increase in the rate of reported sleep problems in children with ADHD compared with parental reports of healthy children. This finding was confirmed by a parent report-based study that found almost half of children with ADHD have sleep difficulties, compared to 25% and 10% respectively of controls (Trommer, Hoeppner, Rosenberg, Armstrong, & Rothstein, 1988).

A few studies have examined the specific sleep problems experienced by children with ADHD. Kaplan et al. (1987) found that 60% of parents of 40 children with ADHD described them as more prone to have inadequate sleep than normal children, with 38% of that sample also reporting that their child experienced frequent nocturnal awakenings. Sleep onset difficulties are reported to be experienced by up to 56% of children with ADHD compared with 23% of typically developing children, with approximately 39% of children with ADHD also showing night waking problems (Greenhill, Puig-Antich, Goetz, Hanlon, & Davies, 1983; Kaplan et al., 1987; Trommer et al., 1988). In addition, children with ADHD have been reported as being more tired upon awakening in the morning (55%) compared to normal children (27%) (Trommer et al., 1988). Results also indicate that parents of children with ADHD were more likely to report sleep problems regardless of their child’s medication status, when compared to parents of controls (O’Brien et al., 2003a).

Ring et al. (1998) has also compared the sleep profiles of children with ADHD with those of their healthy siblings. They showed that children with ADHD demonstrated a significantly greater prevalence of single or multiple sleep disturbances as well as higher rates of specific sleep disorders (i.e., initial and middle insomnia) than their healthy siblings. A further interesting finding that emerged from this study was that although significantly more children with ADHD showed evidence of sleep disturbances than their healthy siblings, both groups demonstrated higher rates of sleep problems than community control populations of a similar age (Ring et al., 1998). This suggests that the development of sleep problems may be related to familial patterns and sleep practices rather than a sleep disorder.
Issues in Sleep Problems in Children with ADHD

Definition of ADHD

Historically, sleep problems were considered an inherent feature of ADHD and were included within the formal diagnostic classification system. Prior to 1980, sleep disturbances among children with ADHD were so widely presumed that the psychiatric diagnostic manual in use at the time formally listed disturbed sleep as a defining characteristic of Attention Deficit Disorder with Hyperactivity (American Psychiatric Association, 1980). However, neither of the more recent diagnostic manuals have included any reference to sleep disturbance as a criterion symptom of ADHD due to the realization that they are neither specific nor necessary for the diagnosis (American Psychiatric Association, 1987, 1994, 2000).

The relationship between ADHD and sleep disturbance is also complicated by parallels between the effects of sleep deprivation and sleep disorders and the core characteristic symptoms of ADHD (Chervin et al., 1997; Corkum et al., 1998; Mindell & Owens, 2003). These include problems with attention and focusing, hyperactivity, irritability and disturbed mood, increased aggression, oppositional behaviours and poor impulse control (Mindell & Owens, 2003; Wiggs & Stores, 1996). Consequently, the considerable overlap between the cognitive, behavioural and emotional profiles suggests that children diagnosed with ADHD may actually have a primary sleep disorder and that such a diagnosis could account for their symptom presentation (Brown, Maistros, & Guilleminault, 1995; Dahl, Pelham, & Wierson, 1991; Marcotte et al., 1998). The evidence for sleep disturbance being the primary cause, or at least a major contributory factor, to the presentation of behavioural disturbances symptomatic of ADHD and associated academic difficulties seems particular compelling (Stores, 2001). This has important implications for differential diagnostic considerations with regard to ADHD as treatment may be misdirected and opportunities missed to alleviate symptoms (Stores, 2001).

Comorbid Disorders

Many children diagnosed with ADHD often present with co-morbid psychiatric disorders, such as conduct disorder (CD), oppositional defiance disorder (ODD), anxiety,
mood disorders (e.g., depression) and Tourette syndrome (Corkum et al., 1998; Marcotte et al., 1998; Mindell & Owens, 2003). Given the comorbidity between ADHD and other clinical disorders, it has been hypothesized that these separate but related psychological problems contribute to the sleep problems and form the basis for the parent-perceived sleep difficulties among children with ADHD (Stein et al., 2002, Stores, 1996). For example, ODD may be related to limit-setting problems and increased bedtime resistance while depression and anxiety have been associated with difficulties falling and staying asleep (Mindell & Owens, 2003).

Recently published studies have attempted to assess the impact of co-morbid disorders on the presentation of sleep disturbances in children with ADHD. For example, Stein et al. (2002) found that the severity of depressive symptomatology was found to contribute significantly to the degree of sleep disturbance in adolescents with ADHD, independent of medication status. Sleep disturbance in adolescents (13-16 years) diagnosed with ADHD in childhood was also correlated with a greater severity of depressive and anxiety symptoms.

Other studies have challenged the specificity of sleep problems to a diagnosis of ADHD and have found no significant associations between ADHD and sleep disturbances after controlling for co-morbid psychopathology or pharmacotherapy with stimulants (Corkum et al., 1999; Mick et al., 2000). For example, Kuhn, Lund, and Olesh (1998) compared sleep disturbances in children with ADHD with children who exhibited generalized behaviour problems, including children with a dual diagnosis of ADHD and ODD/CD or a single diagnosis of ODD/CD. Results showed that children with ADHD did not exhibit more sleep disturbance than children with generalized behaviour problems (e.g., ODD and/or CD) (Kuhn et al., 1998). In a different study, Marcotte et al. (1998) compared children diagnosed with ADHD and those diagnosed with a specific learning disability (LD). It was found that the clinical groups (ADHD, LD, ADHD+LD) differed from a community based control group, but did not differ from each other in their sleep-related problems. This study additionally showed that as none of the children with ADHD were taking medication before or at the time of this study, sleepiness and other sleep related problems reported by their parents could not be attributed to psychopharmacological side effects associated with medications used to treat ADHD (Marcotte et al., 1998). Finally, a recent questionnaire study has also reported that dyssomnias were more highly correlated with various confounding factors (e.g., comorbid ODD, stimulant medication) while differences in sleep quality were inconsistently related to an ADHD diagnosis (Corkum et al., 1999).
Medication of ADHD Behaviours

Stimulant pharmacotherapy, primarily methylphenidate (MPH), is a widespread treatment choice for children with ADHD and is used to induce short term enhancement of behavioural, academic and social functioning (Barkley, McMurray, Edelbrock, & Robbins, 1990; Stein, 1999). However, these medications are frequently reported to produce adverse physiological side effects, with insomnia presenting as one of the most common complaints (Barkley et al., 1990). Research investigating whether psycho-stimulant use is clinically associated with causing or exacerbating sleep disturbance has focused on two central concerns: the sleep patterns of medication-free children with ADHD and the effects on sleep of frequently prescribed stimulant medication (Ball & Koloian, 1995; Stein, 1999) Most research addressing these two concerns has relied on parent perception surveys and/or objective polysomnogram data (Ball & Koloian, 1995; Pearl, 2003) However, these two data sources have often produced contradictory findings and research has been inconclusive as to whether children with ADHD who take stimulants experience greater sleep difficulty than other children (Ball & Koloian, 1995).

Parents have consistently reported that children taking stimulants have greater sleep difficulties than those who remain medication free (Ball & Koloian, 1995). Studies have found that stimulant medication prolongs sleep onset and increases the likelihood of experiencing dyssomnias (Corkum et al., 1998; Corkum et al., 1999). However, the interpretation of these studies is difficult because the children were taking different medications at different doses and adhering to different administration schedules.

Other research has showed no differences in the sleep characteristics of medicated and non-medicated children diagnosed with ADHD (Ball et al., 1997; Corkum et al., 1998; Day & Abmayr, 1998; Kent, Blader, Koplewicz, Abikoff, & Foley, 1995; Stein et al., 1996; Tirosh et al., 1993). For example, O’Brien et al. (2003b) investigated the potential effects of stimulant medications on subjective and objective sleep characteristics of children with ADHD compared with control children. In this study, the use of stimulant medication was not associated with differences in subjective sleep quality or objective sleep measures compared to non-medicated children with ADHD. This research provides initial evidence that stimulant medication used for the behavioural management of ADHD appears to have minimal effect on subjective and objective sleep characteristics in children with ADHD. Research has also shown no consistent, significant differences in sleep duration patterns or satisfaction with
sleep between children with ADHD treated with MPH compared with healthy siblings, raising important questions about the influence of MPH on sleep (Ring et al., 1998).

It is also difficult to determine whether medication side effects (e.g., sleep problems) displayed by children with ADHD are attributable to the stimulant medication or whether they are actually pre-existing features of the child’s behavioural profile. In an attempt to differentiate these features, Efron, Jarman, and Barker (1997) assessed behavioural symptoms of children with ADHD before commencing a trial of medication to determine whether a symptom was a genuine adverse side effect of the medication as opposed to aspects of the child’s underlying ADHD behavioural phenotype. Results suggested that many symptoms commonly attributed to stimulant medication are actually preexisting characteristics of children with ADHD (Efron et al., 1997).

Medication Schedules

There is large debate surrounding the effect of medication schedules on the sleep patterns of children with ADHD (e.g., two doses a day (b.i.d.) versus three doses a day (t.i.d.)) with some evidence indicating that this can influence sleep outcomes (Chatoor, Wells, Connets, Seidel, & Shaw, 1983; Kent et al., 1995; Stein et al., 1996). One study examined the effect of a nocturnally administered dose of stimulant medication and found significant changes in sleep architecture (e.g., delay in first REM period and a decreased percentage of REM sleep) (Greenhill et al., 1983). Chatoor et al. (1983) and O’Brien et al. (2003b) also found that children with ADHD demonstrated decreased REM sleep percentage compared with controls.

However, other research contradicts these findings. Kent et al. (1995) evaluated the effects on behaviour and sleep of a dose of methylphenidate administered at 4pm to children with ADHD. Findings revealed that the additional third dose of medication markedly improved behavioural control in the late afternoon and sleep was not disturbed (e.g., no evidence of a MPH-induced prolongation of sleep onset). However, it did affect the level of tiredness upon waking (i.e., children on a three dose schedule were rated as more tired) (Kent et al., 1995). Stein et al. (1996) also examined both parent ratings and actigraphy and found no significant differences between b.i.d. and t.i.d. MPH dosing schedules on sleep variables. However, there was a trend towards a reduction in total sleep time on the t.i.d. schedule.
Morning and afternoon administrations of stimulants is the most common medication regime for children with ADHD, as many clinicians avoid a third, late-afternoon or evening administration for fear of inducing the presumed insomnia side effects. Unfortunately, during the evenings, many parents experience a great deal of stress and conflict with behavioural control and when trying to help their children complete homework assignments and the b.i.d. regime offer little amelioration of the symptoms many children with ADHD display after school. This can also result in "rebound" hyperactivity and indirectly, sleep onset difficulties. Unfortunately, the concerns expressed regarding the adverse effects of the t.i.d. dosing on sleep persist in the absence of research demonstrating such effects. However, findings demonstrate that children with ADHD derive substantial symptom reduction from MPH administered in late afternoon, with no untoward effects on sleep (Kent et al., 1995). Furthermore, research has shown clear behavioural stability and control in the evening with greater compliance with bedtime routines and settling, with attendant benefits for family relations (Kent et al., 1995).

Contrary to some clinical practice and despite causing temporary changes in sleep parameters, the administration of stimulant medication late in the day may promote better sleep by improving bedtime behaviour (Chatoor et al., 1983). Although the majority of children treated with stimulant medication experience some adverse side effects, these commonly subside spontaneously during the first 1 to 2 weeks of treatment. Some medical experts have suggested that insomnia side effects are transient rather than long-lasting and symptoms can be expected to dissipate with treatment (Ball & Koloian, 1995). Consequently, as research data has been contradictory and confusing regarding which children may experience side effects of stimulant medication, dosing schedules should be selected according to the severity and course of ADHD symptoms rather than in anticipation of dosing schedule-related side effects (Stein et al., 1996).
Etiology of Sleep Problems in Children with ADHD

Neurologic Dysfunction

The presence of an intrinsic dysfunction linking sleep disturbances and ADHD is largely speculative at this point. However, sleep organization and the regulation of sleep and wakefulness are highly complex and active physiologic processes that involve the interaction of multiple central nervous system (CNS) components and which impact on many other organ systems in the body (e.g., cardiovascular, respiratory) (Mindell & Owens, 2003). Consequently, poor CNS regulation of arousal and activity associated with ADHD may result in sleep disturbances (Mindell & Owens, 2003).

25 years ago it was suggested that disturbed sleep in children with ADHD may be related to yet undetected neurological mechanisms governing attention and arousal (Busby, Firestone, & Pivik, 1981). Sleep problems have often been attributed to core difficulties in regulating attention with previous research demonstrating positive links between physiological indices of arousal obtained from children during the day and a history of sleep disturbance (Fisher & Rinehart, 1990). As ADHD may be a disorder resulting from the dysregulation of arousal mechanisms, this would have direct implications for the influence of ADHD on the autonomic processes associated with the regulation of sleep (Mindell & Owens, 2003).

Sleep and daytime alertness patterns were investigated in a polysomnograph-based study carried out by Lecendreux et al. (2000) to determine the presence of possible underlying sleep/wake disorders. Results revealed no significant differences in sleep architecture variables between ADHD participants and controls, instead demonstrating similarities in nocturnal sleep patterns (e.g., awakenings) between the two populations. However, this study also found that children with ADHD had an abnormally strong tendency to fall asleep during the day. In a different study, Ring et al. (1998) found no correlation between severity of ADHD and disturbed sleep. Evidence has also showed that attentional regulation, when measured independent of parental report, was not related to sleep disturbance (Kuhn et al., 1998). This result suggests that the relationship between ADHD and sleep disturbance may be more closely related to severity of behaviour and not neuropsychological mechanisms governing attention and arousal.
Environmental and Behavioural Factors

Sleep habits can be viewed as learned behaviours superimposed on fundamental processes of circadian and sleep biology that can also be influenced by multiple psychosocial and cultural variables (France & Blampied, 1999; Mindell & Owens, 2003). Therefore, a possible explanation is that sleep problems are related to environmental and behavioural factors and are thus extrinsic to ADHD.

The psychosocial processes of child-parent interactions is one factor commonly mentioned as impacting on childhood sleep disturbance (Owens-Stively et al., 1997). Sleep is known to be associated with learning and conditioning with parenting practices affecting and altering a child’s sleep behaviours (Sadeh & Anders, 1993; Stores, 2001). The attitudes and behavioural management techniques of parents in relation to their child’s sleep habits and patterns are important in numerous ways, especially as influencing the definition, recognition, cause and maintenance of a child’s sleep disturbance (Stores, 2001). Therefore, the construct that much of sleep behaviour is learned behaviour not only underscores the importance of developing and promoting healthy sleep behaviours early in childhood but also emphasizes the role that parents and caregivers play in shaping and modifying sleep behaviours in children (Mindell & Owens, 2003).

The relationship between learning and sleep disturbance can be explained by utilizing the principles of social learning theory and operant conditioning inherent within the applied behaviour analysis framework (France & Blampied, 1999). This conceptual paradigm is based on the premise that positive and negative reinforcement contingencies play an important role in shaping and maintaining disruptive night-time behaviours (Didden & Sigafos, 2001). These behaviours may become operantly controlled if the child learns that by exhibiting such behaviours they may avoid, escape or delay being put to bed (i.e., negative reinforcement), can gain access to valued social or parental attention such as extra hugs, kisses or comfort (i.e., positive reinforcement), may receive preferred tangible activities or items such as food or drink (i.e., positive reinforcement) or are allowed to stay up late contingently (i.e., positive reinforcement) (Didden & Sigafos, 2001; France & Blampied, 1999). For example, bedtime stalling behaviours and requests are based on what the child has learned will elicit a parental response (Mindell & Owens, 2003).
The powerful nature of these reinforcement contingencies is further strengthened when both the child and parent behave in a way that serves to avoid aversive bedtime events or stimuli, thus producing a coercive behaviour trap (France & Blampied, 1999). For example, problems arise when a child cannot initiate or resume sleep without the comforting presence of a parent or other associations the child cannot readily achieve without parental assistance (France & Blampied, 1999). A behaviour trap is then created when to avoid separation anxiety and falling asleep alone, the child repeatedly signals for parental attention, with signaling behaviours increasing in intensity and frequency until the desired parental response is obtained (France et al., 1996). Parental attention and accompanying warmth, comfort and entertainment provided upon attending to the child’s distress inadvertently serves as a powerful natural reinforcer for the child. The child learns that inappropriate responses generate more reinforcement than alternative socially desirable behaviours, thus increasing the likelihood that such behaviours will be used again to elicit the desired parental response.

In exchange, having the child stop crying and go to sleep during the night is likely to be a mutually powerful reinforcing consequence for parents. The parent is rewarded by avoiding the aversive nature of the child’s behaviour, resulting in minimal disruption or distress to either parent or child. Consequently, the parent quickly learns that providing immediate attention upon the emergence of the child’s disruptive behaviours can often prevent the exacerbation of these behaviours as well as the stress and frustration from further child non-compliance. Thus, both parent and child behaviours can be seen as mutually trapped in a cycle which ensures the maintenance of the problems for both. Therefore, consideration should be given as to whether parental behaviours serve to maintain the sleep problem through the operation of coercive behaviour traps that inadvertently reinforce certain undesired sleep patterns (France et al., 1996; France & Blampied, 1999; Lozoff, 1995).

Parents’ occasional attempts to withdraw reinforcement of bedtime demands and night wakings frequently results in a temporary increase in the frequency, intensity or duration of the distressed behaviours, known as the Post Extinction Response Burst (PERB) (France et al., 1996). This response often produces increased levels of stress and anxiety for the parent, making it extremely difficult for them to continue intentionally ignoring their child’s heightened distress. It is also common for parents to believe that they are actually making the problem worse and they often discontinue this procedure through guilt or misinterpretation of the PERB (France, 1994). This unfortunately results in the strengthening of the coercion trap, as the resumption of parental attention intermittently reinforces the child’s distressed
behaviours at a more intensive level. This leads to the consequent exacerbation of the behaviour and renders it more resistant to change (France & Blampied, 1999).

The common problem in children of difficulty getting off to sleep can be the result of many different factors, including failure on part of the parents to establish satisfactory bedtime behaviours, over-stimulation of the child before or at bedtime, putting the child to bed too early, an environment that is not conducive to sleep or the development of negative feelings associated with bedtime (e.g., fear of the dark, being left alone, punishment, conflict, rejection) (Stores, 2001). Bedtime resistance can also often result in significant family tension, including arguments between the child and parent or even marital discord. This tension may contribute to heightened arousal in the child, making sleep onset even more difficult (Mindell & Owens, 2003).

One frequently reported sleep difficulty involves limit setting problems in which parents institute limits in an unpredictable or inconsistent way around sleep behaviours (e.g., occasionally allowing the child to fall asleep in the parents’ bed) (Mindell & Owens, 2003). Sleep problems are consequently maintained or made worse by the parents’ inability or unwillingness to establish and constantly enforce rules for bedtime and settling to sleep. This type of inconsistent parental response provides intermittent reinforcement and maintains the behaviour. However, setting limits is only appropriate if the child is physiologically capable of going to sleep at the required time (Mindell & Owens, 2003).

A second common problem occurs when children learn to associate certain conditions with falling asleep. Setting events can comprise a routine (e.g., brushing teeth, going to the toilet, listening to a story), a particular environment (e.g., dim light in room) and/or a particular toy (e.g., a teddy bear). Sleep onset associations become problematic when these same setting events are required to reinitiate sleep following arousals or awakenings during the night (France & Blampied, 1999; Mindell & Owens, 2003). A primary cue at the time of sleep onset is often related to parental presence. If parental presence becomes a required setting event, this prevents the child from learning the requisite sleep self-initiation skills (France & Blampied, 1999). Thus, the inability of the child to self-soothe and resume sleep independently without parental intervention becomes a proximal factor in the development of primary sleep disturbances (France & Blampied, 1999). For example, parents who respond to night wakings in a child who is distressed inadvertently reinforce the wakings and preserve the sleep-onset association.
A further fundamental aspect in the development of sleep problems involves sleep hygiene, which can influence arousal levels and have a detrimental effect on sleep organization (Didden & Sigafos, 2001; Stores, 2001). Sleep hygiene comprises those conditions and practices that promote or impede continuous and effective sleep. These include regularity of bedtime and arising time; conformity of time spent in bed to the time necessary for sustained and individually adequate sleep (i.e., the total sleep time sufficient to avoid sleepiness when awake); bedroom space and location, light, noise, restriction of caffeinated beverages before bedtime; and employment of exercise, nutrition and environmental factors so that they enhance, not disturb, restful sleep (Owens, Palermo, & Rosen, 2002; Stores 2001).

The contribution of psychosocial factors to the development and maintenance of sleep problems in children with ADHD has not been systematically investigated. The review by Corkum et al. (1998) revealed a lack of research studies examining environmental variables that may account for the reported sleep differences prevalent among this paediatric population. The influence of culture and family on sleep behaviours was also not assessed in any study, which is surprising considering cultural differences in child-rearing strongly influence sleep patterns and practices (e.g., co-sleeping) (Corkum et al., 1998).

It has been suggested that children with ADHD may be more vulnerable to developing sleep disturbance through the particular cluster of behaviours symptomatic of ADHD. These challenging behaviours may lead to a more difficult temperament in early childhood, placing additional stress on the parents and influencing parental behaviour. This idea has been reinforced by a study showing that parents of children with ADHD and difficult temperaments reported more sleep problems than those with easy temperaments (Marcotte et al., 1998). Oppositional behaviours also prevent children with ADHD from following rules and engaging in appropriate bedtime behaviours. This suggests that many of their sleep problems may be due to challenging behaviours during bedtime routines, therefore reflecting a sleep limit-setting issue rather than representing a sleep disorder. This proposition has been supported by Corkum et al. (2001) who found that child-parent interactions during bedtime routines were more problematic in children with ADHD compared with normally developing children. For example, this study found that parents of children with ADHD needed to call their children more frequently to get ready for bed, received poorer responses from these children for bedtime calls and required more adult attention to settle for the night (Corkum et al., 2001).
Effects of Sleep Problems in Children with ADHD

There is extensive clinical and experimental evidence that sustained sleep disturbance that impairs sleep quantity or quality can have a profound effect on psychological, cognitive and social functioning as well as having a detrimental effect on both the child and family (Stores, 2001). Support for the adverse effects of persistent sleep loss or disruption comes mainly from sleep deprivation experiments and the manifestations of certain chronic sleep disorders. However, these findings largely come from studies involving adult subjects but suggest, in principle, comparable effects of chronic sleep deprivation occurring in children and adolescents (Stores, 1996). It is also important to note the existence of developmental differences in the expression of symptoms indicative of sleep disturbance. For example, sleepiness in children may not be immediately recognizable by the classic manifestations of sleepiness that occur in adults (e.g., drowsiness, yawning, reduction in activity level) (Mindell & Owens, 2003). Instead, sleepiness may often take the form of mood disturbances, behavioural problems (e.g., hyperactivity, poor impulse control, lack of concentration) and neurocognitive dysfunction (Mindell & Owens, 2003; Stores, 2001).

Cognitive Function and Educational Performance

Sleep deprivation or fragmentation significantly compromises learning and attention skills and can exacerbate behavioural difficulties and impair performance at school (Gozal, 1998; Marcotte et al., 1998; Quine, 1992; Stores, 2001). Experimental studies of sleep loss demonstrate a progressive deterioration in cognitive function, especially inattentiveness, poor concentration, decreased reaction time, impaired vigilance, poor memory, decreased executive functioning (e.g., decision making, problem solving), learning problems and poorer academic performance (Stores, 2001). These effects are further complicated by children experiencing upper airway obstruction, which is commonly associated with ADHD, as this has also been associated with poor academic performance and other psychological difficulties (Gozal, 1998). However, the nature and extent of these effects are related to the length of sleep loss and are influenced by the individual’s motivation, personality and usual sleep requirements (Mindell & Owens, 2003).
Behaviour and Mood

The co-existence of sleep problems exacerbates virtually all medical, psychiatric, developmental and psychosocial problems in childhood (Mindell & Owens, 2003; Saxby & Morgan, 1995, Stores, 2001). There is also increasing recognition that sleep disturbances may lead to or intensify daytime behaviour problems in children with developmental disorders and other various diagnoses (Wilens, Biederman, & Spencer, 1994). For example, the literature appears to support the finding that ADHD-associated sleep disturbances and accompanying sleep deprivation may worsen the clinical presentation of ADHD symptoms, particularly in the morning hours (Mindell & Owens, 2003). In addition, attention and academic dysfunction in ADHD is likely to be more severe.

The regulation of mood is affected by sleep quality and quantity and insufficient sleep can result in poor emotional regulation and adverse behavioural effects, including tiredness or fatigue, irritability, anxiety, depression, aggression, oppositional behaviour, hyperactivity, noncompliance, increased risk taking and poor impulse control (Stores, 1996). The impairment of attention combined with the failure to inhibit inappropriate behavioural responses (e.g., impulse control problems) has significant implications for the development of a child’s ability to successfully negotiate social interactions with family and peers and learn socially acceptable patterns of behaviour (Mindell & Owens, 2003). In addition, impairments resulting from a sleep disturbance would further compound the problems of children with ADHD who by definition already experience difficulties with social behaviour as part of their disorder.

Inadequate sleep related to environmental or lifestyle factors (e.g., erratic schedules), particularly if chronic, may exacerbate or contribute to difficulties settling at bedtime and prolong sleep onset (Mindell & Owens, 2003). A child’s emotional state may also be affected indirectly by the distress caused by aspects of the sleep disorder, such as bedtime being an upsetting time or associated with tension, separation anxiety from parents, punishment or other unpleasant experiences, including fear of the dark and nightmares (Stores, 2001).

Parents and Family Functioning

When children have sleep problems, the ensuing disturbance is often experienced by the whole family and the consequences for parenting and family functioning can be very serious. Disruptive sleep patterns in children have been reported as a significant source of stress for families and parents. There is considerable evidence to suggest that sleep problems
are associated with a number of negative factors, including high levels of maternal stress, depression, impaired child-parent relationships and parenting skills, negative maternal attitudes towards the child, marital discord, under-functioning at work and even child abuse (Quine, 1992; Stores, 1996, 2001). The impact of childhood sleep problems are further intensified by their direct effect on parents’ sleep quality and quantity, resulting in chronic daytime fatigue, mood disturbances and a decreased level in effecting parenting (Mindell & Owens, 2003). This can also affect the emotional climate within the family with disagreements regarding the best approach to manage and deal with the child’s sleep problem.

Little is known about the impact of sleep problems in children with ADHD on parental stress. However, the coexistence of daytime challenging behaviours and nocturnal sleep problems would place parents under considerable stress throughout the 24-hour period. Research shows that parents of children with severe developmental disabilities and sleep problems are more likely to experience additional family difficulties and exhibit symptoms of stress than parents of such children without sleep problems and it is likely that this would apply to children with ADHD as well (Quine, 1992). Mothers of children with learning disabilities and severe sleep problems have been described as more irritable, have a greater loss of control and use of physical punishment, are less affectionate towards their children and generally hold more negative attitudes toward their child (Quine, 1992). An increase in maternal complaints of physical and psychological health problems were also described in the same study (Quine, 1992). Richdale, Francis, Gavidia-Payne, and Cotton (2000) also examined the sleep problems of children with an intellectual disability and their relationship with parent stress, coping and child behaviour problems. The presence of sleep problems was significantly associated with both the intensity and frequency of hassles (e.g., high parent stress levels) and the presence of behaviour problems, with settling difficulties and night awakenings indicated as particularly stressful (Richdale et al., 2000).

Preliminary findings suggest that successful treatment of a child’s sleep problems can result in reduced stress levels and generalized positive effects on family life, including significant changes in mood, marital satisfaction, child-parent relationships and increased parental sleep (Mindell & Durand, 1993). Improvements in the mother’s mental state, confidence in her own parenting ability (e.g., increased perceived control over nocturnal events) and ability to cope with the child’s sleep have also been described (Mindell & Durand, 1993; Quine, 1992; Wiggs & Stores, 1998, 2001). Wilens et al. (1994) also reported substantially less family conflict secondary to a reduction in the child’s evening and morning disruptive activities.
Assessment of Sleep Problems in Children with ADHD

Two general methods are used for assessing sleep problems. Subjective measures (e.g., sleep diaries, questionnaires, interviews, sleep logs) focus on the observable aspects of sleep, such as duration, time to fall asleep, number of night wakings and the number and duration of naps. These measures tend to be retrospective in nature, with the exception of sleep diaries, which are a daily log of sleep variables recorded by the participant and/or observer (Corkum et al., 1998). One potential concern of data collected using sleep diaries is the accuracy of the information reported. However, some research suggests that sleep diaries may be as accurate as other, more intrusive assessment procedures (Rogers, Caruso, & Aldrich, 1993).

Objective measures of sleep architecture typically capture information that is not observable by the human eye (Corkum et al., 1998). First, polysomnography (PSG) is a diagnostic tool involving the continuous and simultaneous recording of multiple physiological measures during sleep in a laboratory setting (e.g., respiratory variables, body movements, arousals) (Corkum et al., 1998; Mindell & Owens, 2003). This method provides detailed information of alterations of sleep stages and sleep-wake states. Second, actigraphy uses a small wristwatch computerized device to monitor body movements during sleep (Corkum et al., 1998). Actigraphs discriminate between sleep-wakes states as well as the total duration of sleep, number of arousals and length of sleep onset. Actigraphy is a relatively non-intrusive method of collecting objective information about motor activity levels and provides the opportunity to perform naturalistic studies of children’s sleep-wake patterns. Actigraphy procedures and polysomnography have shown consistent agreement for identifying basic patterns of sleep and wakefulness (Stores, 2001). Lastly, video recordings are commonly used to observe sleep behaviours.

Although subjective accounts of sleep abnormalities in children with ADHD are prevalent (e.g., restless sleep, sleep onset and maintenance difficulties), objective verification of these disturbances is less robust (Corkum et al., 1998). The discrepancy between parental reports and objective assessment methods has been consistently documented in the literature (Corkum et al., 2001; Greenhill et al., 1983, O’Brien et al., 2003a; Trommer et al., 1988). Furthermore, investigations employing objective measures to assess sleep physiology and architecture in children with ADHD have been unable to confirm the existence of any discernable differences between ADHD participants and healthy controls on variables such as
sleep duration, sleep efficiency, sleep-onset and percentage of rapid eye movement sleep (REM) (Ball & Koloian, 1995; Tirosh et al., 1993).

Explanations for parent-perceived sleep difficulties in the absence of more objective evidence include the idea that parents of children with ADHD may complete questionnaires with a negative response bias, leading them to over-identify all forms of problematic behaviour (Ball & Koloian, 1995; Corkum et al., 2001; Tirosh et al., 1993). This suggests parents of children with ADHD maybe more sensitive to all of their children’s problems than parents of normal control children. Lastly, Corkum et al. (2001) suggested that objective-subjective in congruences could be related to differences introduced between retrospective accounts on questionnaires and prospective collection of sleep measures. Despite this, research has shown that parental sleep diaries do provide reliable and valid estimates of sleep parameters when compared with direct measures. For example, Rogers et al. (1993) compared subjective information recorded in sleep diaries with objective information recorded through polysomnographic monitoring. The percentage agreement between these measures was high, indicating that sleep diaries were a reliable instrument for collecting data about sleep-wake patterns. Other studies have reported a high correlation between parental sleep diary records and infrared time-lapse video recording (TLVR) (Anders, 1979; Minde et al., 1993). Sleep diaries continue to be a widely used clinical and research tool in the assessment and monitoring of sleep problems as they are a practical and cost-effective measure of sleep and provide a clear format to easily show sleep changes occurring with treatment. However, the contradiction between parent perceptions and objective data evidenced in prior research with children with ADHD remains unresolved.

**Treatment of Sleep Problems in Children with ADHD**

The development of sleep management strategies associated with ADHD has received little systematic investigation. To date, most research has focused exclusively on sleep staging and architecture in children with ADHD and not towards managing or resolving their sleep difficulties. However, various pharmacological and behavioural treatment methods are available and are highly effective at ameliorating sleep problems, with treatment choice based on the underlying sleep disorder and not on the presenting symptoms (Didden & Sigafoos, 2001; Mindell & Owens, 2003; Owens et al., 1999; Owens et al., 2002; Wiggs & France, 2000).
Medication

Pharmacotherapy is often considered for treating significant difficulties in initiating and maintaining sleep. The efficacy of medications used in assisting sleep for children with ADHD is founded on the side effects profile of drowsiness (Wilens et al., 1994) Several medications for paediatric sleep disturbances are commonly prescribed including antihistaminergic medications (e.g., diphenhydramine), antipsychotics (e.g., thioridazine, chlorpromazine) and clonidine (Rosen, Owens, Scher, & Glaze, 2002). The antidepressant bupropion has also been used to treat PLMD. Lastly, melatonin has also been heralded as a valuable and uncomplicated treatment for various sleep-wake cycle disorders, with reports of its effectiveness in treating sleep problems in children with developmental disabilities, including ADHD (Didden & Sigafos, 2001). However, to date, there is a paucity of data to support their efficacy and tolerability, with virtually no information to guide decisions about appropriate medication doses or duration of therapy in paediatric patients (Rosen et al., 2002).

Clonidine

Originally developed as an antihypertensive medication, clonidine is used to treat daytime symptoms of hyperactivity and impulsivity in ADHD. However, its sedative properties and short half-life promote its utility as a sleep medication and it appears to be highly effective in helping to induce sleep onset in children with ADHD (Mindell & Owens, 2003). The rationale behind clonidine use is that the decrease in sleep onset delay associated with short-term use of the medication just before bedtime eliminates prolonged bedtime struggles and increases sleep duration (Mindell & Owens, 2003).

The successful use of clonidine in ameliorating sleep disturbances in children with ADHD has been reported with significant improvements in sleep quality in the majority of subjects (Prince, Wilens, Biederman, Spencer, & Wozniak, 1996) Common parental observations of their children after treatment include less oppositional behaviour in the context of sleep activities, reduced sleep onset, less sleep restlessness, increased number of hours slept and improved morning awakenings. In addition, many of these children are reported to have fewer ADHD-like symptoms the next day, which parents attributed to an improved quality of sleep (Wilens et al., 1994). However, increased daytime sedation, hypotension and rebound hypertension have been reported side effects (Prince et al., 1996).
Prince et al. (1996) conducted a retrospective study of 62 children and adolescents with ADHD who had been given clonidine for sleep problems. Clonidine was helpful in ameliorating baseline, medication-induced, or medication-exacerbated sleep disturbance associated with ADHD, with 85% of subjects demonstrating marked improvements. Similar results have been reported by Brown and Gammon (1992) who described clonidine’s effectiveness in reducing medication-induced sleep onset difficulties in 18 children with ADHD that had not responded to conventional interventions.

*Other Medications*

There are extremely few case studies reporting the implementation and treatment outcomes of pharmacological interventions for sleep problems in children with ADHD. One study by Gupta, Austin, Cali, and Bhatara (1998) showed the complete remission of nightmares and significant improvement in sleep within a month of starting treatment with cyproheptadine in a 9-year-old boy with ADHD, ODD and post traumatic stress disorder. At 6 months follow-up, the nightmares were still in remission and the subject continued to sleep well. However, the outcome results of this study (e.g., decreased frequency of nightmares) were based on self-report by the child with no quantitative measures of sleep or of the nightmares recorded.

In a different study, a 14-year-old girl treated for ADHD complained of sleep difficulties including intermittent awakenings, restlessness and nightmares (Malek-Ahmadi, 1999). She transitioned from her current dose of 37.5-mg of pemoline to 0.5-mg of clonazepam at bedtime, which resulted in a remarkable improvement in her sleep pattern. Eight months later she underwent a polysomnographic study which also confirmed the clinical diagnosis of PLMD. A few months later she was started on bupropion where the daily dose was gradually increased to 200-mg. There was a gradual and progressive improvement in her ADHD symptoms, her overall behaviour and academic performance. No further difficulties were experienced with her sleep pattern.

In one further study, Campbell, Tamburrino, Evans, and Franco (1995) treated a 3-year-old boy for symptoms associated with ADHD, one of which included a presenting problem of insomnia. Fluoxetine was initiated at a dose of 5-mg every morning. One week later the boy was sleeping better at night and was reported to be more responsive to his
parents. Three weeks later the emergence of some sleep disturbance and increased oppositional behaviour at home resulted in an increase to 10-mg of Fluoxetine. At 6 weeks follow-up the child was sleeping well.

Pharmacologic interventions appear to be promising treatments for sleep disturbances associated with ADHD and may have a place in the short term management of some sleep disorders. However, there is little evidence supporting the use of medication as an isolated method of treatment (Mindell & Owens, 2003). Although treatment response is often more rapid with medication than with behavioural interventions, most studies fail to demonstrate long-term effects on the sleep patterns of children. The long-term efficacy of medication is also questionable as often the immediate treatment goal is to alleviate or improve rather than eliminate the sleep problem (Mindell & Owens, 2003). Furthermore, medication regimes do not address ingrained behavioural stimulus response patterns the child has learned. Consequently, the use of medication frequently diverts attention away from considering the underlying cause or contributory factors associated with sleep problems or is used out of desperation on the part of parents unfamiliar with effective behavioural alternatives (Stores, 2001). In addition, such treatment practices may implicitly encourage parents to seek out pharmacologic solutions for their child’s behavioural problems, instead of instituting a more labour-intensive but ultimately more successful behaviour management programme. Thus, the use of pharmacotherapy in combination with behavioural therapy and good sleep hygiene should be used, as this strategy is far more likely to yield long-term success (Mindell & Owens, 2003)

**Behavioural**

Behavioural strategies for alleviating sleep disturbances are based on the theory that parents play an important role in the development and maintenance of sleep difficulties and night wakings (Mindell, 1999; Owens et al., 2002). This approach applies basic social learning theory principles to effect changes in observable behaviours with parents as well as children learning to modify their behaviours to be more conducive to the child’s sleeping (Owens et al., 2002; Wiggs & France, 2000). The efficacy of specific behavioural interventions in reducing disruptive sleep patterns has been well documented in multiple controlled studies (Mindell & Owens, 2003). A wide range of behavioural management techniques and procedures employed with typically developing children have also been applied effectively with children with
developmental delays, learning disabilities and various other special needs (Didden, Curfs, van Driel, & de Moor, 2002; Mindell & Owens, 2003; Wiggs & France, 2000; Wiggs & Stores, 1998).

In general, most behavioural interventions begin with a functional analysis that is used to identify antecedent and consequent variables that control problem behaviour in natural environments. The primary purpose of this analysis is to determine the underlying causes of problem behaviours by identifying social, cognitive, affective and environmental factors that may initiate, maintain or end the problem behaviour. In addition, most behavioural programmes utilize principles of good sleep hygiene. This involves altering and adjusting the child’s environment and/or lifestyle to make it more conducive to sleep, including maintaining a regular sleep schedule, ensuring sufficient sleep and engaging in appropriate bedtime routines (e.g., lack of over-arousing or stimulating activities, TV, punishment or upsetting experiences) (Didden & Sigafoons, 2001). Most behavioural techniques promote self-soothing and returning to sleep independently, setting firm limits by establishing and consistently enforcing rules for going to bed and settling to sleep, reinforcement of good behaviour as well as more specific psychological treatments (e.g., systematic desensitization) (Didden & Sigafoons, 2001; Roane, Piazza, Bodnar, & Zimmerman, 2000; Stores, 2001; Wiggs & France, 2000). Individual behavioural strategies, however, are seldom used alone. They are generally used in combinations customized to the needs of the individual child and family or in conjunction with pharmacotherapy when appropriate (Owens et al., 2002). Extinction procedures are one of the most commonly used and well established behavioural treatments for settling and night waking problems in children and is described first. For additional information on these and other behavioural treatments for sleep problems in children with and without disabilities, refer to Mindell (1999), Owens et al., (1999), Owens et al., (2002), Stores (1996) and Wiggs and France (2000).

Extinction Procedures

Two types of extinction procedures are used primarily for children with settling and night waking problems. First, standard extinction involves removing the rewarding consequence (e.g., parental attention) that reinforces and maintains the inappropriate bedtime behaviour, except when safety is a concern (Owens et al., 1999; Owens et al., 2002). For example, Didden, Curfs, Sikkema, and de Moor (1998) showed that withholding parental
attention following night-time disruptive behaviours resulted in relatively quick and lasting reductions of sleep disorder symptoms in children with developmental disabilities. However, this technique often produces a Post-Extinction-Response-Burst (PERB) with consequent increases in the frequency, intensity and variability of the child’s misbehaviour that can result in increased distress and anxiety for both the parents and the child (France et al., 1996; Owens et al., 1999). Although the PERB is a sign that effective contingencies are being changed, parental inability to ignore bedtime crying behaviours long enough for the procedure to be effective means the efficacy of extinction can be undermined. This occurs when parents attend to the child during an extinction burst and thereby reinforce the undesired behaviour (Owens et al., 2002). In addition, most parents find it difficult to implement this procedure due to fear of causing psychological trauma to their child due to prolonged extinction (e.g., rejection). However, unwanted side effects with extinction have not been demonstrated by clinical as well as empirical studies in this area (Owens et al., 1999; Owens et al., 2002).

A modified extinction technique that lessens the potential distress to the parents and child is *graduated extinction*, also referred to as systematic ignoring (France, 1994). This procedure involves gradually reducing the intensity of the parental response that is reinforcing and maintaining the unwanted behaviour (Owens et al., 1999). The most common approach is for parents to wait progressively longer periods of time across subsequent nights before attending to the child (Didden & Sigafos, 2001; Wiggs & France, 2000). There are also two variations of graduated extinction procedures. First, "minimal check" requires that the child falls asleep without parental presence but allows the parent to make brief scheduled checks that gradually decrease in frequency (Owens et al., 1999; Owens et al., 2002). Second, "extinction with parental presence" involves the parent remaining in the child's room, while carrying out a program of systematic ignoring (France et al., 1996; Owens et al., 2002).

**Studies**

A review of the literature reveals that very little attention has been devoted to developing and researching the practicality and efficacy of behavioural intervention programs for sleep disturbances associated with ADHD (Prince et al., 1996). There is a paucity of published behavioural sleep interventions carried out with this specific paediatric population, with only 8 reported cases published. One of the first case studies involved the implementation of a behavioural programme targeting insomnia in a 7-year-old boy with ADHD (Bergman,
Elimination of his sleep difficulties was obtained as well as a marked reduction in hyperactivity, with the effects still evident at follow-up 6 months later.

Didden et al. (1998) carried out a functional assessment to identify antecedent and consequent variables that controlled the problem sleep behaviour of a 6-year-old boy with ADHD in his natural home environment. His presenting problems comprised bedtime refusal and subsequent disruptive behaviours to avoid being put to bed. Night wakings also regularly resulted in co-sleeping. After the assessment, these behaviours were determined to be maintained by parental attention and a non-graduated extinction procedure was employed in combination with a positive reinforcement programme. This involves systematically rewarding desired sleep behaviours using appropriate incentives (e.g., social praise, sticker charts, points) (Owens et al., 2002). Extinction of parental attention combined with the positive reinforcement schedule was highly effective in substantially reducing his sleep problems. The percentage of partial intervals with night-time disruption decreased from an average of 21 during baseline to 9 post-intervention. Follow-up data indicated that effects were maintained over time, with the percentage of intervals decreasing to near zero levels (Didden et al., 1998).

Didden, de Moor, and Curfs (2004) also assessed the effectiveness of the behavioural treatment approach in decreasing sleep problems in three children with developmental disabilities. One of the children was a 10-year-old boy with ADHD and a mild developmental disability. He presented with frequent night-wakings and disruptive behaviours upon waking (e.g., playing with toys and light switches, disturbing family members, talking loudly during the night). Differential reinforcement of incompatible sleep behaviours using tokens plus a response cost was implemented. This response cost procedure can often involve other valued items (e.g., access to the TV) that can be removed following undesired behaviour (Wiggs & France, 2000). In this study, ten tokens were provided initially and one token was taken away each time the child displayed disruptive behaviours. In order to obtain a reward (e.g., playing with a ‘Gameboy’), the child had to retain at least 5 tokens each night. Additional treatment strategies were introduced approximately 2 weeks into the intervention phase, involving extinction of parental attention and a mild punishment (e.g., locking his bedroom door). Results showed that the mean number of minutes of disruptive behaviours reduced from just over an hour at baseline to 12 minutes at follow-up (Didden et al., 2004).
Kayser et al. (1997) carried out a brief inpatient evaluation to study the effects of a behavioural intervention and MPH on the inappropriate behaviours (e.g., self-injury, aggression, non-compliance) and sleep disturbances displayed by a 6-year-old boy with ADHD. His sleep concerns consisted of stereotypy during sleep (e.g., body rocking). No specific procedures were used to increase sleep; instead nursing staff simply put him to bed on a regular schedule and ignored him after he was put to bed. This behavioural intervention was effective in reducing the targeted inappropriate behaviours to near-zero levels despite the presence or absence of MPH. His percentage of sleep improved when off MPH, suggesting that the MPH negatively affected his sleep and he responded consistently better to the sleep schedule of the inpatient unit during the course of his admission (Kayser et al., 1997).

Bedtime fading has also been reported to be an effective treatment for sleep problems in children with ADHD (Piazza & Fisher, 1991). This procedure involves setting the child’s bedtime later than their typical bedtime to increase the probability that rapid sleep onset will occur. After the child falls asleep rapidly, the bedtime is gradually made earlier by a pre-determined set interval time until the desired bedtime is achieved (Didden & Sigafoos, 2001; Owens et al., 2002; Roane et al., 2000). In the study by Piazza and Fisher (1991) a 6-year-old girl diagnosed with ADHD presented with bedtime resistance, multiple night wakings requiring attention, inadequate sleep duration of between only 4-6 hours of sleep per night and nocturnal enuresis. Refusal to adhere to her scheduled bedtime (9pm) was met with limited resistance from her caregiver. Instead the caregiver frequently submitted to the girl’s demands and tantrums to continue to play or watch TV until she would fall asleep between 10.30pm and 1am. Treatment of the girl’s sleep problem consisted of delaying bedtime to a time at which there was a high probability of a short delay to sleep onset. Following implementation of this procedure, the bedtime was regulated by advancing it by 15 minutes across subsequent nights upon continued rapid sleep onset. Results revealed that this faded bedtime protocol improved both the timing and quantity of her sleep. Prior to treatment, the girl was achieving only 34% of the recommended amount of age-appropriate sleep. Post-intervention, this had increased to 100%. In addition, other sleep behaviours not specifically targeted for treatment (e.g., bed refusal, night wakings, nocturnal enuresis) were also eliminated (Piazza & Fisher, 1991).

Positive bedtime routines have also shown to be highly effective in reducing chronic sleep problems in children with ADHD (Milan, Mitchell, Berger, & Pierson, 1982). This approach involves the development of a routine set of structured activities that immediately precedes the child’s bedtime (e.g., changing clothes, brushing teeth, reading a story) with the
completion of each activity resulting in positive reinforcement (e.g., praise) (Roane et al., 2000). This method aims to create appropriate cues for sleep onset that are provided consistently in association with bedtime (Owens et al., 1999). For example, Milan et al. (1982) evaluated the effectiveness of this procedure to eliminate the bedtime disruptive behaviours of three emotionally disturbed and severely handicapped children. One child was a 4-year-old boy who had been diagnosed as ‘hyperactive’ and had a history of seizure activity. The primary sleep complaint consisted of bed refusal in which the boy exhibited violent reactions of crying, screaming and tantrums upon parental requests to go to bed. Previous attempts to elicit compliance (e.g., threats, reasoning, physical punishment) were met with limited success. Consequently, the boy was permitted to fall asleep in the lounge and then transferred to his own bedroom (Milan et al., 1982). Treatment for the boy’s sleep problem was comprised of implementing a fixed sequence of bedtime activities, of which completion of each step resulted in positive praise. Upon establishment of this routine, the starting time of this sequence was gradually faded until it coincided with the bedtime preferred by the parents. Following treatment, the boy’s bedtime resistance was practically eliminated from a baseline average of 44 minutes with behavioural changes maintained at 1 and 2 year follow-up evaluations. The boy’s level of co-operation prior to and during bedtime routines also improved substantially, with effects maintained at follow-up (Milan et al., 1982).

A number of reports of successful behavioural interventions for sleep problems in children also suggest that resolution of the child’s sleep problem is associated with improvements in their daytime behaviour, such as irritability, hyperactivity, non-compliance and aggression (Mindell, 1993; Wiggs & Stores, 1999). For example, Dahl et al. (1991) presented a case study of a 10-year-old girl with ADHD and delayed sleep phase insomnia. She had a history of long sleep latencies (2-3 hours) with her sleep duration averaging 7 hours per night. She was also described as extremely difficult to arouse in the morning and frequently displayed signs of severe irritability and daytime fatigue at home and school. However, no napping was observed during the day. The multiple sleep problems presented by this girl were treated with a combination of behavioural modification (i.e., contingency management) and chronotherapy. This is a procedure used to treat sleep-wake cycle disorders and is designed to synchronize the endogenous circadian cycle with the daily schedule. It involves systematically delaying bedtime over a period of days to reset the internal circadian clock until the desired age-appropriate bedtime is reached (Didden & Sigafoos, 2001; Owens et al., 1999; Owens et al., 2002; Roane et al., 2000). The treatment programme resulted in significant improvements in her sleep, including an increase of average sleep duration from
7.2 hours to 9 hours per night and a reduction in average sleep onset to 60 minutes. In addition, her ADHD symptomatology, learning and daytime behaviours improved (e.g., peer interactions, increased productivity in arithmetic tasks, more completion of seat work) as well as symptoms of irritability, alertness and oppositional behaviours. These gains were maintained over the formal 4 month follow-up period as well as 18 months later, as indicated by teacher ratings and classroom performance (Dahl et al., 1991).

A different study by Thackeray and Richdale (2002) attempted to directly assess the impact on daytime behaviours following treatment of a child’s sleep difficulties. In this study, a 10-year-old boy with ADHD, anxiety and a mild intellectual disability was treated for problems pertaining to co-sleeping, frequent night wakings requiring parental presence to resume sleep, fear of the dark and early morning waking times. Treatment strategies were comprised of standard extinction procedures combined with positive reinforcement, such as praise and tangible rewards, for demonstrating independent sleep behaviours (e.g., no co-sleeping). Upon completion of the intervention, results revealed the boy was consistently falling asleep independently every night with no observed instances of co-sleeping. Night wakings decreased from 2 nights per week during baseline to not waking during the night at all. Improvements in sleep duration were also observed, increasing by 60 minutes from baseline to post-intervention (Thackeray & Richdale, 2002). In addition, daytime behaviours were monitored using diaries and direct observations. These objective measures revealed small and gradual improvements noted by school staff and parents regarding on-task behaviours, alertness and disruptive behaviours. However, reports were inconsistent across both informants and identified target behaviours. Thus, support for daytime behavioural change as a result of improved sleep remained inconclusive (Thackeray & Richdale, 2002).

Other Behavioural Strategies

The efficacy of other behavioural techniques to treat sleep problems in children with ADHD has yet to be investigated. First, sleep-wake scheduling involves implementing consistent and age-appropriate sleep and wake times with a strict contract from the child and parent to adhere to the sleep schedule (Owens, Palermo, & Rosen, 2002; Wiggs & France, 2000). It works from the premise that linking bedtime with the time the child actually falls asleep results in bedtime acting as a cue for sleep. In addition, the child is deprived of daytime sleep (e.g., avoiding weekend oversleep and daytime napping) such that sleep is more likely to
occur at a specific time (Roane et al., 2000). Second, scheduled wakings alters sleep staging by the parent awakening and consoling the child approximately 15-30 minutes before a typical spontaneous awakening and allowing the child to resettle as usual. These awakenings are then faded out (Mindell, 1999; Owens et al., 2002). Third, there is a different version of the response cost procedure that involves removing the child from bed for a pre-specified amount of time if the child fails to fall asleep within a desired sleep onset time interval. This procedure is based on the principle that keeping the child awake is aversive (Owens et al., 2002).

**Summary**

In general, behavioural interventions are more likely to have both short and longer term efficacy and are presented as a preferable option to pharmacological treatment, especially when parental attention plays a critical role in shaping and maintaining the disruptive nighttime behaviours of children. Behavioural treatment of specific sleep problems also appears to have a co-effect on other behaviours associated with ADHD, improving attention and hyperactivity, as well as family functioning and reducing stress levels.

**Methodological Issues in Sleep Research with ADHD**

A review of the research examining sleep disturbances in children with ADHD indicates the majority of studies suffer from several methodological issues. First, there have been variations in the type, number and manner of measuring and recording sleep parameters in studies that utilize a comparison control group (e.g., typically developing children), making it difficult to assess the actual differences in sleep between children with ADHD and controls (Corkum et al., 1998). Results from studies examining the nature of sleep disturbances in children with ADHD have also differed depending on the methodology and outcome measures used to assess sleep problems (e.g., questionnaires vs polysomnographs). In addition, polysomnographic techniques with children raises a number of procedural issues in that the sleep laboratory is an unfamiliar environment that could be threatening to most children (e.g., sleeping away from home, wires attached to the child’s scalp). Thus, the number of nights needed for adaptation to the laboratory to feel comfortable in the new surroundings poses secondary difficulties (Corkum et al., 1998).
A second procedural limitation involves poorly defined diagnostic groups that challenge the integrity of the sleep research. The diagnostic criteria for ADHD has been inadequate and inconsistently applied over studies and has not differentiated between subtypes of ADHD (Corkum et al., 1998). Diagnostic procedures have ranged from reliance on a previous formal diagnosis, to using parent and teacher interview and rating scales. This limitation is critical as different diagnostic procedures may identify different children as ADHD, and therefore findings may not generalize to the larger population of children diagnosed with ADHD (Corkum et al., 1998).

Third, many studies did not report inclusion or exclusionary criteria nor screen for co-morbid disorders (Corkum et al., 1998). Furthermore, the medication status of participating children has been unclear or when specified, has varied widely on the type of stimulant medication, dose and schedule of administration (Corkum et al., 1998). The lack of clarity on co-morbidity and the child’s medication status makes it difficult to determine to what extent any particular treatment described in a study can be generalized to apply to other children with ADHD. Lastly, there have been inadequate control procedures concerning the gender composition of comparison control groups, where the ADHD group consisted of 90% males and the control groups were comprised of a larger proportion of females (Corkum et al., 1998).

Variables Affecting the Efficacy of Behavioural Interventions

Most factors influencing the outcome of behavioural interventions relate to the parent, who plays an integral role in executing behavioural treatment strategies (Owens et al., 2002). Parental exhaustion or chronic sleep deprivation may indicate the parent lacks the mental and physical energy needed to implement a behavioural program (e.g., parent may fall asleep in the child’s room during a graduated extinction intervention) (Owens et al., 2002). Parental depression or other mental illness or disorder can further compromise their ability to carry out the treatment plan (Owens et al., 2002). Ineffective parenting techniques (e.g., lack of limit setting) may also occur specifically around sleep-related issues because of conflicting priorities concerning sleep or the parent is too tired to teach appropriate alternative behaviours or deal with problematic behaviour in the middle of the night. In addition, parents may be unwilling or emotionally incapable of meeting the demands, time and energy needed to implement the treatment programme because they are overwhelmed by competing priorities (e.g., caring for other children, job-related duties) (Stores, 2001). Other characteristics of the
home environment may further impede the effective application of behavioural procedures (e.g., living arrangements, shared bedrooms, presence of extended-family members or siblings).

A lack of parental understanding about how the treatment plan should be implemented or appreciation of the importance of specific aspects of the plan may also result in the ineffective use of certain strategies (Owens et al., 2002). For example, the inconsistent application of the extinction strategy creates an intermittent reinforcement schedule that serves to increase the strength and persistence of undesired behaviours (Owens et al., 2002). Parental discouragement by past failed attempts at treatment may also produce significant doubts about the effectiveness of the programme (Stores, 2001). Furthermore, although parents may agree that a treatment approach (e.g., extinction) could be effective, they may fail to accept and thus implement the strategy because they view it as harsh or harmful (Owens et al., 2002).

Rationale for the Current Study

Some of the research reviewed in the literature has shown that children with ADHD are at greater risk of developing sleep problems. This is concerning considering that the learning and behavioural difficulties experienced by this paediatric special needs population would be further compounded by the well known negative impacts of sleep problems on children. In addition, parents and family members are placed under considerable stress attending to both the child’s daytime and night-time care-giving demands, often impacting on and to the detriment of their own well-being. This highlights the need for effective interventions to manage and ameliorate sleep problems as quickly as possible in children with ADHD.

The efficacy of behavioural interventions is consistent with the belief that parents inadvertently play an important role in maintaining their child’s sleeping difficulties and disruptive night-time behaviours. Intervention studies also indicate that the development and implementation of sleep management strategies involving changes in parental behaviour improves sleep in children and can substantially improve the quality of life for the child and their family. However, there is limited research investigating the effect of behavioral interventions for sleep problems in children with ADHD. This current study examines the use of individually planned behavioural family interventions to significantly reduce and/or eliminate sleeping problems in four children with ADHD.
CHAPTER 3
METHOD

Participants and Setting

This research received approval from the University of Canterbury Ethics Committee (see Appendix 1) and was conducted as part of the Canterbury Sleep Programme (CSP) at the University of Canterbury, Christchurch, New Zealand. The CSP accepts referrals from local medical practitioners, child health nurses and parents for research purposes. Four children with ADHD and their parents were recruited voluntarily to the study through word of mouth and an advertisement circulated to parents who were members of the Canterbury Parent-to-Parent support group (see Appendix 2). Interviews, meetings and interventions took place in the family home of the participants. All the families lived in Christchurch, New Zealand and were treated at no charge. The criteria for participant inclusion in this study were that:

1. The child was perceived as having a sleep problem by the parent(s), experiencing one or more of the following: a) bed refusal, b) sleep onset delay, c) night waking, or d) co-sleeping. Definitions are given on pages 6-7.
2. The sleep problem was considered problematic by the parent(s).
3. The child had been formally diagnosed with ADHD by a paediatrician or psychiatrist.
4. The child was between the ages of 4 and 12 years.
5. The child had no apparent medical or physical condition that was determined to be the primary cause of the sleep disturbance.
6. The child had exhibited the presenting sleep problem for at least three months.

Children were also eligible for inclusion regardless of their medication status relating to the management of ADHD symptoms. Descriptions of the children and their families are summarised in Table 1. Pseudonyms have been used to preserve the anonymity of the participants. Two girls (aged 6 years, 11 months and 8 years and 9 months) and two boys (aged 11 years, 1 month and 5 years, 6 months) and their families participated in this research. Three of the children were from two-parent families and one child was from a single parent family. The parents were between the ages of 38 and 58 years. All of the children had one or more siblings. Three children were NZ-European (pakeha) and one child was part NZ-
European and part of a different ethnic descent. English was the first language for all the families. The children covered a range from lower to upper socio-economic status families, as rated by the Elly-Irving Index (Elley & Irving, 2003) (see Table 1). All four children had been previously diagnosed with ADHD by a Paediatrician. The parents of the children reported long-term difficulties with their children’s sleep since infancy and had experienced moderate to high levels of stress associated with the sleep behaviour. Three of the children were taking medication to manage the symptoms of ADHD at the time of recruitment into the study. Emily was prescribed an extended-release formulation of methylphenidate designed to last throughout the day with just one dose. Sarah and Jason were prescribed the classic short acting form of methylphenidate. One of the children, Jason, was also taking sleep medication (melatonin) for his sleep disturbance. Full information for each child is given in the individual procedures. Some of the children had other co-morbid disorders. A summary of the children’s details and sleep difficulties are presented in Table 2.

Table 1. Demographics and characteristics of the participating families

<table>
<thead>
<tr>
<th>Child</th>
<th>Gender</th>
<th>Age (at initial interview)</th>
<th>Ethnicity</th>
<th>No. of Siblings</th>
<th>Birth Order</th>
<th>Parents Residing</th>
<th>SES*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jason</td>
<td>Male</td>
<td>5 yrs, 6 mths</td>
<td>NZ European</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Sam</td>
<td>Male</td>
<td>11 yrs, 1 mth</td>
<td>NZ European</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Emily</td>
<td>Female</td>
<td>6 yrs, 11 mths</td>
<td>NZ European</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Sarah</td>
<td>Female</td>
<td>8 yrs, 9 mths</td>
<td>NZ European / Other ethnicity</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

* Socio-economic status as rated on the Elly-Irving Scale (Elly & Irving, 2003) based on the occupation of the principle income earner, where 1=highest and 6=lowest, 7 was added to the scale to represent a parent who was receiving a domestic purposes benefit.
Table 2. ADHD diagnosis, medication status and sleep disturbance

<table>
<thead>
<tr>
<th>Child</th>
<th>Age of Diagnosis</th>
<th>Current Medication</th>
<th>Dose</th>
<th>Schedule</th>
<th>Type of Sleep Disturbance</th>
<th>Onset of Sleep Disturbance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jason</td>
<td>3 yrs</td>
<td>Methylphenidate</td>
<td>20 mg</td>
<td>1 x 7:30am</td>
<td>Co-sleeping</td>
<td>Infancy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 x 1:00pm</td>
<td>Night waking</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Melatonin</td>
<td></td>
<td>1 x 7:00pm</td>
<td>Sleep onset delay</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(sleep tablet)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sam</td>
<td>10 yrs</td>
<td>None</td>
<td></td>
<td></td>
<td>Co-sleeping</td>
<td>Infancy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Bedtime non-adherence</td>
<td></td>
</tr>
<tr>
<td>Emily</td>
<td>4 yrs</td>
<td>Methylphenidate</td>
<td>36 mg</td>
<td>1 x 7:30am</td>
<td>Co-sleeping</td>
<td>Infancy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Night waking</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sleep Onset Delay</td>
<td></td>
</tr>
<tr>
<td>Sarah</td>
<td>2 ½ yrs</td>
<td>Methylphenidate</td>
<td>20 mg</td>
<td>1 x 8:00am</td>
<td>Co-sleeping</td>
<td>Infancy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Night waking</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sleep Onset Delay</td>
<td></td>
</tr>
</tbody>
</table>

Measurement

Conners’ Parent Rating Scale – Revised (CPRS-R)

To verify the clinical diagnosis of ADHD, the Conners’ Parent Rating Scale – Revised (CPRS-R) was employed (Conners, Sitarenios, Parker, & Epstein, 1998). The CPRS-R is a standardised screening measure designed to assess externalizing and internalizing problems in children aged 3 to 17 years. This rating scale is a subjective measure and has good reliability and validity with norms for age and gender (Conners et al., 1998). The 27-item version was used, yielding 3 factors: oppositional, cognitive problems/inattention and hyperactivity. Although not used in the formal diagnostic process for ADHD, the ADHD index of this rating scale is well validated and a score of 2 standard deviations about the mean (i.e., a score ≥ 70) provides a recognized measure of children who are at risk for a diagnosis of ADHD. Sam, Emily and Sarah had scores in the clinical range on the ADHD Index Scale (i.e., 2 or more standard deviations above the mean), confirming the presence of ADHD behaviours. Jason had a significantly elevated score, 1 ½ standard deviations above the mean. The CPRS-R was also utilized as a pre- and post measure of any changes in symptoms indicative of ADHD.
Socio-Economic Status (SES)

The Elley-Irving Socio-Economic Index: 2001 Census Revision was used to determine the current SES of each participating family (Elley & Irving, 2003). This scale was developed based on statistics from the 2001 Census of New Zealand and has been frequently employed as a tool by researchers (Elley & Irving, 2003). The Index ranks 630 occupations on a scale of 1 to 6 (1= highest SES, 6= lowest SES) based on the average income and educational level for each occupation. The Index, however, does not specify a category for parents who receive a welfare benefit, work part time or who are full time caregivers. In this study, one parent received the Domestic Purposes Benefit (DPB). To represent this parent, “7” was added to the scale.

Sleep Diary

To measure each child’s sleep patterns, a sleep diary was developed to systematically record the child’s sleep behaviour and parental behaviour at night-time (see Appendix 3). The diary was completed daily by one parent during conditions of baseline, intervention and follow-up and was used as the main assessment instrument to monitor ongoing progress and treatment outcome. Information of various sleep parameters (e.g., sleep duration, sleep onset, night awakenings, arising and bedtime resistance, napping) was obtained as well as questions assessing child-parent interactions during routines associated with sleeping and waking. In general, sleep diaries are widely used in clinical settings and have been found to have reasonable face validity and high internal consistency. They also provide valuable information about various aspects of sleep, thus avoiding the bias and difficulties associated with retrospective reporting (e.g., generalization from parental reports) (Stores, 2001).

Reliability

To assess the reliability of the sleep diary data, the second parent was asked to keep independent recordings of their child’s sleep behaviour and act as the reliability observer for the other parents’ observations. This procedure was designed for families where two parents were available to participate. Both parents were asked to record sleep diaries for 3 nights during the intervention phase and 2 nights during follow-up. However, in one family there
were significant difficulties in completing reliability records due to work schedules. In the third family, the father was not actively engaged in the parental care-giving role and preferred not to be involved. In the single parent family, this method was not employed. A second method to obtain reliability data involved comparing the recorded agreement between daily telephone reports noted by the researcher with the parental sleep diary records (Lawton, France & Blampied, 1991). Direct observation methods, such as infra-red time-lapse video recording (TLVR), were not utilized in this study to check the reliability of parental sleep diary records due to practical limitations. The main concern was due to the age and mobility of the children, as it was likely that the children would have played with or even damaged the video equipment when placed in their bedroom. Furthermore, the novelty of placing a video camera in the child’s room may have interfered with and disrupted the child’s sleep. Based on these factors, video recordings were eliminated as a viable option to obtain reliability data. Other sleep measures (e.g., actigraphy) also had economic limitations and would not have provided information on important parent and child behaviours or interactions. Therefore, comparisons between independent sleep diaries in addition to the researcher’s telephone notes were considered the most appropriate methods to assess reliability in this study.

Reliability was assessed by calculating the percentage of consistency (e.g., agreements) between the sleep diary and notes taken by the researcher during phone calls (for all the participants). In some cases the percentage of consistency between the mother’s sleep diary and the independent sleep diary records of the father was also calculated. The measures used to determine reliability were the time the child went to bed, fell asleep and woke in the morning. A 15 minute margin of error in relation to time was allowed between records.

\[
\text{Reliability} \, (\%) = \frac{\text{the number of consistent time records}}{\text{the total number of time records}} \times 100
\]

**Co-Sleeping Scale**

A co-sleeping scale was developed to assess each child’s co-sleeping patterns, with higher scores indicating more pervasive co-sleeping behaviours (see Appendix 4). This scale is not psychometrically validated, but provides a comparable measure that targets a variety of co-sleeping practices and related behaviours. The term co-sleeping is used frequently in the literature and is therefore used in this study to remain consistent with previous studies. This scale also incorporates parental presence at sleep onset. This practice often prompts the child
to seek parental attention to reinitiate sleep following arousals or awakenings during the night and can frequently lead to the child being allowed to co-sleep as a way of managing wakings.

Social Validity

A *Programme Evaluation Questionnaire* (see Appendix 5) developed by the CSP was used to assess the social validity of the sleep programme. Parents were posted the questionnaire and completed it independently at home at the conclusion of the intervention. It contained ratings on a 4-point scale of general satisfaction with the programme, the quality of help they received, ease of content understanding, ease of implementing new strategies, the amount of stress experienced from implementing the programme, as well as whether they would recommend this programme to a friend.

Experimental Design

A non-concurrent multiple baseline design across participants was employed to investigate the efficacy of family behavioural interventions in addressing sleep problems in children with ADHD. This design provided an element of experimental control while allowing for the individualization of each intervention plan. It also permitted an assessment of responses to behavioural interventions within participants (e.g., individual case studies) and across participants (e.g., multiple target behaviours) to consequently detect the presence of an experimental effect of treatment. Participants were randomly assigned to a 1-week, 2-week or 3-week baseline condition that was determined prior to the study. Previous studies have used similar groupings and baseline lengths, indicating these time lengths are sufficient to address variations in sleep patterns and to elicit the child’s typical sleeping pattern and associated behaviours (Didden et al., 1998; Didden et al., 2002; Didden et al., 2004; Mindell & Owens, 2003).
General Procedure

Interview

Participants were initially contacted by telephone and an information sheet outlining details of the research study was given to parents (see Appendix 6). After the parents had indicated their interest in participating, the nature of the sleep program was explained and an initial sleep assessment interview was conducted to ascertain the type of presenting sleep complaint as well as the frequency, duration, and intensity of the sleep disturbance. Data pertaining to the child’s sleep history, sleep habits, sleep routines for both weekdays and weekends and behaviour during bedtime (e.g., stalling or refusal behaviours), night-time awakenings and morning and daytime behaviours were obtained as well as identifying usual child management practices that may contribute to the initiation and maintenance of the problem sleep behaviour.

Other information gathered included family demographics, developmental history, medical history and current health, including a review of physical symptoms commonly associated with sleep disturbances (e.g., breathing difficulties, snoring, asthma) as well as any previous or current prescribed medications for the child. Furthermore, information was gathered to screen for the presence of additional psychiatric comorbidities (e.g., ODD, CD, depression). All this information was used to determine whether their child met the inclusion criteria for the research programme and was thus suitable for participation. If the assessment suggested a behavioural cause to the child’s sleep difficulty as opposed to a medical or physical cause, a tailored behavioural family intervention programme was discussed. This was the case for all participants. Written consent to participate was then obtained from the parent(s) and their child, where appropriate (see Appendix 7). Parents also completed the Conners’ Parent Rating Scale – Revised (CPRS-R).

Baseline

Upon completion of the initial interview, the format and use of the sleep diary was explained to the parent(s). Specifically, parents were instructed that the diary was to be completed by the parent responsible for and most familiar with the bedtime and morning routines. Parents were asked not to make any changes in the present bedtime regime and to
begin collecting baseline data for an assigned number of nights (1-, 2-, 3-week period). In order to prevent target behaviours changing prior to completing the baseline phase, parents were not instructed on how to handle their child’s sleeping difficulties. At the end of the baseline phase, the sleep diaries were collected.

**Functional Analysis**

This analysis refers to a range of procedures used to identify antecedent and consequent variables that control problem behaviour in natural environments. To determine the underlying functions and causes of problem behaviours, it is necessary to identify social, cognitive, affective and environmental factors that may initiate, sustain or end the problem behaviour. Information gathered from the functional analysis is then used to facilitate intervention planning designed to change behaviour in a desirable direction.

A functional analysis of each child’s presenting sleep problems and needs was based on information gathered from the assessment interview, home visits and baseline sleep data. In addition, parents were asked about any problems or changes seen in the child’s behaviour during baseline. This information was used to generate hypotheses about possible mechanisms maintaining each child’s sleep problems.

**Intervention Implementation**

Target behaviours were identified for each child and interventions were individually designed to meet the needs of the family. Behavioural strategies were outlined and discussed with the parents during a home visit so the parents could make an informed decision about whether or not they felt able and willing to carry out the technique. This included general information about the sleep problem their child was experiencing and explaining the rationale and positive and negative aspects (e.g., the Post-Extinction Response Burst) behind each therapeutic technique (i.e., extinction procedures, positive reinforcement) involved in the proposed behavioural intervention. An information sheet outlining the strategies and agreed behavioural programme was given. Additional written information was provided to reinforce the concepts discussed and to serve as a reference during the process. Parents were also encouraged to identify and problem-solve any particular difficulties they might anticipate with
treatment implementation (e.g., stress management, sibling disturbance, sharing of treatment implementation).

The children received treatment for a variety of problems, such as bed refusal, sleep onset delay, night waking and co-sleeping (see Table 2). Interventions were introduced after baseline and parents were instructed to discontinue their usual management techniques. Families were provided with daily telephone contact during this phase to monitor progress, support and encourage the parents as well as providing an opportunity to offer further advice, discuss any problems encountered or amend the programme as necessary. Families were also advised to contact the researcher at any time of the day or night if they were experiencing difficulties with their child’s sleep or implementing the programme. Intermittent home visits were organised according to each family’s needs.

Maintenance

Discontinuation of the intervention phase was jointly determined by the researcher and the parent(s), when sleep problems were reduced to a satisfactory level; the child was consistently achieving the identified goals of treatment and the parents no longer felt a need for support and advice. The intervention program was then replaced by a maintenance program. Parents were informed that if they found the behaviours increased again or there was a disruption in the child’s sleeping pattern, particularly after illness or a change in routine, a few nights’ return to the program may be necessary. Daily telephone contact was also discontinued with the understanding that parents were more than welcome to contact the researcher at any time for advice or support.

Follow-up

Follow-up data were collected 3 months after completion of the intervention phase. Parents were asked to record a sleep diary for two weeks to determine if any treatment effects on the child’s sleep behaviour had been maintained over time. Furthermore, parents were given the opportunity to review any changes in their child’s behaviour, discuss their satisfaction with the treatment programme and evaluate areas for continued progress and/or maintenance.
Data Coding

The following variables were coded and graphed from the sleep diary data.

*Night awakenings:* were defined as the number of times the child awoke that the parents were aware of between settling and the scheduled wake time. For all participants, 6am was deemed an appropriate wake time and any waking prior to this time was determined to be a night waking.

*Sleep onset delay:* was the number of minutes between first being settled to bed by the parents to the first interval the child was found asleep. This included settling difficulties whereby the child exhibited behaviours competing with sleep (e.g., shouting, crying, tantrums, throwing objects, destructiveness).

*Co-sleeping:* was defined as the practice of the child and parent(s) sleeping together in the parents’ or the child’s bed for all or part of the night.

*Bedtime non-adherence:* failure to comply with a pre-determined bedtime (e.g., 9pm).

*Child illness:* Nights when the child was sick were recorded, as illness can significantly affect sleep patterns and behaviour.

**Case Study 1**

**Subject and Setting**

Jason was a 5 year 6 month old boy who lived at home with his mother, his three older sisters, his aunt, cousin and the partner of one of his sisters. During his early postnatal development and infancy, Jason experienced various health problems, requiring multiple hospitalizations before 18 months of age. Secondary to these complications, Jason also experienced chronic physical discomfort and one of these health conditions required him to remain upright when sleeping. This consequently necessitated that Jason move into his mother’s bedroom so she could ensure he remained vertical during the night. His mother
advised that Jason currently presents in good general health, has a well-managed diet and no longer experiences the difficulties associated with his previous health problems. His mother also reported that Jason achieved all his developmental milestones age appropriately.

In 2001 Jason was diagnosed with ADHD by a paediatrician at the age of 3 years and was prescribed methylphenidate to be taken twice daily. At the start of this study, Jason was taking a 20-mg dose at 8am and 1pm. In addition, at the age of 3 years Jason was prescribed and currently remains on a single dose of melatonin taken daily at 7pm in an effort to reduce his sleep onset difficulties. Jason’s mother noted some initial improvement after commencing this medication, although reported little consistent effect at the time of the study.

Procedure

Interview

Jason’s sleep schedule was reported to be relatively inconsistent. Although a regular pre-bedtime routine was reported with a stated bedtime of 7.30pm, his sleep onset time varied from 9pm to 1am. In addition, Jason had persistent night wakings each night between 2-3am requiring constant parental attention. This sleep history revealed that his average sleep duration on most nights was between 5-7 hours. However, despite limited sleep, Jason was not reported to nap during the day.

Co-sleeping was also indicated as a primary concern, with Jason sleeping between 6-7 nights each week with his mother. Jason shared a large bedroom downstairs with his mother, although he had his own separate single bed in her room. He also had a second bed upstairs in a room he previously shared with one of his older sisters. Initial attempts to settle Jason in his own bed downstairs were reported to be unsuccessful. He would engage in a variety of bedtime refusal behaviours, including constantly requesting food and drink as well as non-compliance with settling to bed by running around the house, playing with toys and annoying family members. His mother stated that her management of these situations was comprised of preparing food for Jason to prevent further demands or tantrums and allowing Jason to settle to sleep in her bed. However, once asleep attempts to remove Jason to his own bed during the night resulted in him engaging in disruptive behaviours, including tantrums, kicking,
screaming and yelling. Consequently, to avoid further confrontation his mother would permit Jason to remain in her bed.

Jason’s mother indicated that his sleep difficulties were significantly impacting on her own well-being and disrupting her own sleep pattern. Chronic sleep deprivation and consequent impairments in her ability to function during the day were causing substantial stress. Her willingness to participate in the sleep programme was also out of consideration for her own welfare as well as assisting Jason to learn appropriate sleep behaviours and increase his sleep duration.

Functional Analysis

Three target behaviours were identified for Jason: sleep-onset delay, night wakings and co-sleeping. After analyzing the data, it was hypothesized that parental attention was controlling Jason’s disruptive bedtime and night-time behaviours. As a young infant, it appears that Jason rapidly learned that settling off to sleep was associated with intensive parental presence and that these same setting events were required to ensure sleep re-initiation during night awakenings. In addition, Jason has been inadvertently reinforced for his aversive behaviours (e.g., tantrums, crying, screaming) as an effective method of gaining attention and meeting demands (e.g., food, desire to co-sleep). Thus, powerful reinforcement principles were operating involving a behaviour trap for both parent and child, in which Jason’s patterns of learned behaviours continued to elicit the parental response that served to establish and maintain the problem sleep behaviours.

However, it is important to note that Jason’s severe health problems had previously been a recurrent source of distress and necessitated the move towards co-sleeping practices. These health concerns would have also rendered his mother vulnerable to the development of Jason’s sleep disturbance because of the contingencies such illnesses set up for the permanent development of a more stimulating and responsive parenting style. At this stage, it appeared that Jason had not had the opportunity to learn sleep self-initiation, resulting in his disruptive attention-seeking behaviours to obtain the presence of his mother to assist him in falling back to sleep.
Intervention

A behavioural sleep programme was developed for Jason that incorporated a standard extinction procedure in which parental attention was withheld following displays of disruptive night-time behaviours and demands for attention by calling out from bed. If Jason removed himself from bed, he was immediately returned to bed with parental attention kept to a minimum. This procedure was combined with a positive reinforcement programme. This programme was implemented with the aim of reinforcing desired sleep behaviours, including settling to sleep independently and remaining in his own bed throughout the night. Jason was informed that he could receive a single ‘Yuggio’ game card in the morning following nights of complete compliance to the identified goals. This daily incentive system was also paired with positive attention and praise.

Strategies to address co-sleeping behaviours were complicated by the current bedroom arrangement. This was because Jason would continue to experience a certain form of parental presence upon waking during the night due to sharing a room and the relative simplicity of accessing his mother. The intervention therefore proceeded in two steps, which was also preferred by the mother who indicated she wanted to attempt to resolve the co-sleeping behaviours before attempting to move him elsewhere. Therefore, the first goal of treatment was for Jason to consistently fall asleep without parental presence in his own bed in the room he shared with his mother and remain there during the night. To achieve this, the mother was asked to put Jason to bed and carry out the usual pre-bedtime routine at a more consistent bedtime (around 7.30-8pm). After bidding him goodnight, she was instructed to leave the bedroom and not re-enter until she planned to go to bed. If Jason removed himself from bed while settling to sleep or upon night awakenings, he was immediately returned to his bed with minimal parental attention. In phase two Jason was to move upstairs to the bedroom he previously shared with his sister. Secondary to this move was the removal of his single bed downstairs as a preventative measure to ensure he only had one bed available to sleep in.

Maintenance and Follow-up

See the general procedure.
Case Study 2

Subject and Setting

Sam was an 11 year 1 month old boy who lived at home with his mother, father and older sister. During his early postnatal development and infancy, Sam experienced a myriad of health related problems and was hospitalized twice. His parents reported that he achieved his developmental milestones age appropriately but described him as an extremely active child. He currently has asthma, hay fever and sinusitis. Sam was diagnosed with ADHD by a paediatrician at the age of 10 years and was prescribed methylphenidate to be taken twice daily. However, upon commencing this regime Sam experienced multiple side effects, including abdominal pain, headaches and nausea, which resulted in the cessation of the medication. His parent’s report he continues to manage well without the medication. Throughout the duration of this study, Sam was not taking any prescribed medications. Sam also has co-morbid diagnoses of dyslexia and dyspraxia.

Procedure

Interview

Sam’s parents reported that a substantial amount of time each evening was spent directing and prompting him to bed. His parents indicated there was no structured pre-bedtime routine or activities and there was a considerable degree of non-compliance in adhering to his scheduled bedtime of 8.30pm, which was a recurrent source of disagreement between Sam and his parents. Sam’s bedtime resistance was characterised by displays of procrastinating behaviours (e.g., watching TV, wanting food) or delaying tactics employed to obtain parental attention to settle to bed (e.g., needing nightly talks, cuddles).

Sam also found it difficult to keep still and quiet once in bed and initiate sleep independently. Instead, his mother stated she would regularly lie in bed with him to help soothe Sam off to sleep. Most nights Sam would settle to sleep in his parent’s room more frequently than his own room. Once asleep, his parents refrained from moving him back to his own room, instead allowing him to co-sleep the whole night. This often resulted in the father
transferring to Sam’s room to sleep. In summary, Sam’s parents had become frustrated and
tired with the degree of time and attention Sam required around bedtime and the frequency of
co-sleeping.

*Functional Analysis*

Two target behaviours were identified for Sam: bedtime non-adherence and co-
sleeping. Although the mother reported that Sam would regularly co-sleep, this did not occur
during the 1-week baseline period Sam was randomly assigned to. However, parental presence
when falling asleep was observed on 7 out of 8 nights during baseline. Although Sam
preferred parental presence to fall asleep, he showed the ability to reinitiate sleep
independently following awakenings in the night during baseline.

Co-sleeping appeared to be a comfort response, especially in obtaining warmth,
attention and affection from his mother. This sleeping practice would have served as a
powerful natural reinforcer for Sam and increase the likelihood that co-sleeping would
continue to occur. There also appeared to be a lack of promoting age appropriate independent
sleep behaviours at this stage of Sam’s development. When co-sleeping occurred, neither of
his parents would require him to relocate back to his own room. It is hypothesized that the
father was negatively reinforced when choosing to sleep in Sam’s room, by avoiding potential
conflict or stress with non-compliance when asking Sam to move back to his room. Thus,
there was minimal disruption or distress to either parent or child during the night. In contrast,
it is hypothesized that the mother was intermittently reinforced by using co-sleeping as time
for bonding with Sam. Thus, although the frequency of co-sleeping was considered
problematic by the mother, it also served as a time for sharing and strengthening the
attachment relationship. In summary, limit setting problems appeared to contribute to Sam’s
sleep difficulties, through a lack of predictable and consistent limits enforced by his parents
around sleep behaviours (e.g., requiring Sam to sleep in his own bed).

*Intervention*

Sam’s behavioural intervention proceeded in two phases and emphasized a positive
reinforcement programme directed at rewarding his adherence to the new bedtime of 9pm and
remaining in his own bed throughout the night. During the first 3 weeks of intervention, daily
incentives and the specific requirements needed to earn them were verbally agreed upon between Sam and his parents. This included the choice of family meal and small inexpensive toys for nightly adherence. Larger rewards, such as more expensive toys, were reserved as a reward to reinforce several nights of desired sleep behaviours (e.g., chess set, magnet games). On nights when external circumstances dictated that Sam was unable to adhere to his bedtime (e.g., family outings, school events, weekly scout meetings), it was not considered as non-adherence. This was left to the parents discretion, but Sam’s parents were encouraged to note and praise quick settling to bed upon returning home late. The importance of establishing a consistent bedtime routine and enforcing bedtime rules was also discussed with Sam and his parents.

A structured positive bedtime routine was later added to the reinforcement programme. This involved developing a routine set of tasks immediately preceding Ashley’s bedtime that were outlined on a chart. These activities included preparing his school bag for the next day, organizing his soccer or swimming gear when required, brushing his teeth, showering, going to the toilet and getting changed into his pyjamas. Upon completion of these specific activities in addition to bedtime adherence, Sam received positive reinforcement (e.g., praise) and a star on his chart for that night. Sam and his parents verbally agreed upon the provision of a reward and the required number of stars needed to obtain it. For example, Sam was required to earn 4 stars across consecutive nights to earn a small game he desired.

A response cost procedure was also planned. This involved temporarily advancing Sam’s bedtime to 8.30pm following a night of non-adherence to the agreed 9pm bedtime. This earlier bedtime would be enforced until Sam complied and the 9pm bedtime was reinstated the following night.

Maintenance and Follow-up

See the general procedure.
Case Study 3

Subject and Setting

Emily was a 6 year 11 month old girl who lived at home with her mother, father and younger sister. During infancy, her development was complicated by health problems. This included surgery and hospitalizations at a very young age. Emily has not experienced any major recurrent problems from these health concerns nor have they caused any long-term effects regarding her development. Emily achieved all her developmental milestones age appropriately and is currently a very healthy young girl. She now attends a primary school where she receives speech and language therapy.

At the age of 4 years Emily was diagnosed with ADHD by a paediatrician and prescribed the short acting form of methylphenidate to manage her symptoms of ADHD. However, her parents reported that Emily’s behaviour showed no marked improvement while taking this medication. Subsequently, Emily transitioned to and currently remains on a single 36-mg slow release dose of methylphenidate taken daily at 7.30am, which is reported to have markedly improved her behavioural symptoms of ADHD.

According to her mother, Emily never slept well since she was a newborn. Her first few years of life were characterized by settling problems, sleep onset delay, night awakenings and the need for parental presence to initiate and maintain sleep. Previous attempts to eliminate her sleep problems using soothing strategies recommended from Plunket (e.g., pacifiers, rocking, pushing the cot) were met with limited success.

Procedure

Interview

At the time of referral, Emily presented with bedtime resistance, indicated by procrastinating with the bedtime routine, getting out of bed multiple times after lights out and constantly seeking parental presence to fall asleep. Her mother reported she would regularly stay with Emily until she fell asleep and at times inadvertently fall asleep with her. Emily also displayed persistent night-time awakenings requiring parental attention. Her parents stated that
Emily exhibited approximately 2-3 awakenings per night. Emily would enter her parent’s bedroom during the night and attempts to return Emily to her own bed often proved unsuccessful, frequently resulting in severe disruptive behaviours (e.g., temper tantrums, crying, screaming). These behaviours immediately ceased when her parents submitted to her demands by allowing her to stay and sleep in their bed. Emily ended up co-sleeping approximately 3-4 nights per week, which often resulted in her father relocating to the spare bedroom to sleep.

Her mother indicated there was a regular pre-bedtime routine that included taking a bath, reading books, talking, back scratches, prayers and lying in bed with her as she drifted off to sleep. The mother also reported there were no problems concerning snoring, sleep-related breathing problems, napping or parasomnias (e.g., sleep-walking, night terrors). However, Emily’s sleep problems markedly increased when her mother was hospitalized for a week for an operation. Upon her mother’s return home for recuperation, Emily was allowed to sleep in her parent’s bedroom. Since this time, Emily’s sleep difficulties were causing a significant amount of stress for both her parents, including substantial sleep deprivation and exhaustion.

Functional Analysis

Three target behaviours were identified for Emily: night wakings, co-sleeping and sleep onset delay. The data indicated that Emily required parental presence to fall asleep and insisted on these same setting conditions to reinitiate sleep following arousals or awakenings during the night. Thus, Emily learned to associate certain conditions with falling asleep, which precluded her from learning the pre-requisite skills to initiate sleep independently. In addition, aversive behaviours exhibited during pre-bedtime routines and night wakings were reinforced by parental attention. In this case, a behaviour trap had been created to avoid separation anxiety and falling asleep alone. Emily would repeatedly signal for parental attention, with disruptive behaviours increasing in intensity and frequency until the desired parental response was obtained. Emily would have quickly learned that displaying such behaviours was an effective and efficient means of eliciting parental attention.

The common parental response comprised behaviours that served to eliminate Emily’s disruptive behaviours immediately, such as submitting to her demands, staying with her while she fell asleep or allowing her to co-sleep. This would have provided a powerful reinforcing
consequence for the parents by avoiding the stress and aversive nature of Emily’s non-compliant and defiant behaviours and being able to sleep uninterrupted for the rest of the night. Thus, the parents were also engaged in the behaviour trap by acting in a way that prevented the exacerbation of Emily’s behaviours as well as the stress and frustration from further non-compliance. In summary, parental behaviours served to maintain Emily’s sleep problems through the operation of coercive behaviour traps that inadvertently reinforced certain undesired sleep patterns.

**Intervention**

Emily’s sleep programme comprised a standard extinction programme involving differential reinforcement of inappropriate and appropriate behaviours (see Appendix 8). First, this involved systematically ignoring disruptive night-time behaviours and demands for attention by calling out from bed. Second, when Emily removed herself from bed, she was provided with clear warnings of ‘time out’ for continued misbehaviour (e.g., “That is not ok. Go back to bed or we will have to shut the bedroom door”). In instances where she persisted in deliberately defying parental instructions, this brief time out procedure (e.g., shutting the door) was implemented until she had remained quiet for 2 minutes. Parental attention was kept to a minimum during these episodes and upon redirection to bed when re-entering her room. This same extinction procedure was also employed during night wakings when removing her back to her own bed. In addition, both parents were informed about the PERB response during the first few nights of the intervention.

Throughout the intervention phase, a positive reinforcement programme was also implemented with the aim of rewarding desired sleep behaviours. Emily was told that if she stayed in her own bed until morning, she could place a sticker on a sleep star chart and choose a reward from her ‘reward box’ containing small inexpensive toys and items. The sticker chart continued as daily reinforcement, but the requirements for earning a reward were gradually increased from one night up to 5 consecutive nights of desired sleep behaviours. Her parents also praised instances of good behaviour by providing positive attention the following morning. Emily was reminded daily of the new changes and understood what she was required to do in order to obtain a reward.

**Maintenance and Follow-up**

See the general procedure.
Case Study 4

Subject and Setting

Sarah was an 8 year 9 month old girl who lived with her mother, father and older sister and brother. She was born following an uneventful pregnancy and her developmental milestones were described as early. At the age of 2 years and 9 months, she was diagnosed with ADHD by a paediatrician and prescribed a small dose of methylphenidate. Her current medication is a single 20-mg dose of methylphenidate taken daily at 8am. Sarah’s sleep patterns had also become problematic, with the occurrence of occasional night terrors. At the age of 4 years, she was trialled on a clonidine patch to treat her marked sleep disturbance. However this was discontinued after 5 months due to limited effect and allergic reactions.

Sarah’s pre-school years were characterised by a number of behaviour and general management concerns around oppositional behaviour, non-compliance, aggression and anxiety. During this time, her mother also reported the emergence of major night-time settling difficulties, long sleep onset delays and disruptive night-time behaviours. A sleep programme was implemented at this time involving a graduated extinction procedure in withdrawing adult presence so Sarah learned to settle independently. Her sleep dramatically improved whereby she consistently settled alone and was quiet once in bed. However, these improvements were not maintained and her sleep disturbances re-emerged within a few months.

Procedure

Interview

At the time of referral, Sarah’s mother reported difficulties settling her to sleep in her own room and remaining in her own bed during the night. Having co-slept regularly as an infant, she now co-sleeps with her older sister or her parents 3-5 nights a week. Her mother indicated that Sarah often uses delaying tactics or engages in defiant behaviours to procrastinate with the bedtime routine. A consistent pre-bedtime routine was reported of watching TV, taking a bath and reading stories. Sarah also reported that she herself often became quite upset with her inability to initiate sleep independently within approximately 15 minutes of going to bed. This frequently resulted in repeated attempts to seek parental attention by removing herself from bed. These behaviours also occurred upon awakenings during the night. Her mother reported Sarah sought parental presence during the night
approximately 2 nights per week. Most nights she was returned to her own room and settled back to sleep with her mother present.

Functional Analysis

Sarah’s target problem behaviours comprised sleep onset delay, co-sleeping and night wakings requiring parental presence. These difficulties represented the recurrence of previously learned inappropriate sleep behaviours when Sarah was younger. The re-emergence of these behaviours following the successful completion of the previous sleep programme were reported to be caused by parental limit setting difficulties and a lack of consistent enforcement of bedtime rules and behaviours to maintain desired changes. In addition, Sarah had learned to associate certain conditions with falling asleep, which became problematic when these same setting events were required to reinitiate sleep following arousals or awakenings during the night. Although these difficulties had been previously resolved and Sarah had learned the requisite sleep self-initiation skills, subsequent inconsistencies in parental limit setting (e.g., intermittent co-sleeping, falling asleep with parental presence) provided the opportunity for Sarah to actively resume and engage in these previously acquired behaviours. Thus, former sleep onset associations involving parental presence and consequent difficulties self-soothing and resuming sleep independently resulted in the return of Sarah’s prior sleep disturbance.

Intervention

Sarah’s behavioural intervention focused on a positive reinforcement programme directed at rewarding her for settling to sleep independently and remaining in her own bed throughout the night. A star-chart was implemented for Sarah to self-monitor with parental assistance and daily incentives were provided (e.g., being read an extra bedtime story the following evening, having her nails painted by her sister). These rewards also promoted social reinforcement by engaging other family members in the reward process. Larger incentives (e.g., swimming, special foods) were reserved as rewards to reinforce several nights of desired sleep behaviours. In addition, a standard extinction programme in which parental attention was withheld following displays of disruptive night-time behaviours was recommended.

Maintenance and Follow-up

See the general procedure.
CHAPTER 4

RESULTS

Case Study 1

The mother completed a sleep diary for 7 days during the baseline phase. This was followed by a functional analysis of the sleep problems and development of an intervention plan. One training session was carried out with the mother to explain and negotiate treatment implementation. The duration of the intervention was 42 days. One home visit was carried out during the intervention phase to monitor and discuss progress. The mother recorded sleep diaries every day for the entire intervention period. Follow-up data were not collected.

On the 9th day of the intervention, Jason’s afternoon dose of methylphenidate was accidentally reduced to 10-mg due to the unavailability of a 20-mg dose. This lower afternoon dose continued for the rest of the study. The morning methylphenidate dose remained unchanged. On the 12th day of the intervention phase, Jason shifted upstairs to the bedroom he shared with his sister. He remained in this room for the rest of the intervention period. There was one period of illness for Jason occurring from the 30th to the 33rd night during the intervention.

Reliability

Telephone reliability data comparing the mother’s sleep diary and the researcher’s notes was 65%.

Estimated Procedural Reliability

There were 4 out of 42 nights (10%) during the intervention when the mother did not adhere to treatment procedures. These are indicated on the graphs in Figure 1.
Co-sleeping

Jason displayed a very high and stable rate of co-sleeping for the whole night during the baseline phase (7 out of 7 nights) (Figure 1). Upon the implementation of the intervention, there was an immediate reduction in the frequency of nights in which co-sleeping occurred, with no co-sleeping observed during the first 3 days. This was followed by a night of co-sleeping on the 11th night. Throughout the rest of the intervention period, the trend towards low levels of co-sleeping were maintained with co-sleeping observed on only 2 further occasions, on the 30th and 36th nights. One of these nights was during a brief period of illness. Overall, the proportion of nights spent co-sleeping decreased to near zero levels from baseline phase to intervention.

Night Wakings

Night wakings for Jason occurred every night during the baseline phase and were high and variable, ranging from 1 to 4 wakings per night (average of 2) (Figure 1). Wakings also showed a decreasing trend over consecutive nights during this 7 day period. When the intervention was introduced, the number of wakings continued to decrease in frequency for the first 17 days of the intervention, ranging from no wakings to 1 waking per night. This downward trend continued and stabilized over the remaining 26 days of the intervention phase with no further wakings observed. The number of nights in which Jason woke also decreased from baseline to intervention, with wakings occurring on only four occasions during the intervention phase, on the 11th, 15th, 20th and 24th nights.

Sleep Onset Delay

Prior to intervention, Jason had a high and variable sleep onset delay, ranging from 40-165 minutes (Figure 1). When the intervention was introduced, the time taken from initially being settled to bed to sleep onset immediately decreased during the first 2 nights of the intervention. Jason’s sleep onset continued to gradually decrease and remained low and stable during the remainder of the intervention period.
FIGURE 1. Sleep Related Problem Behaviours for Case Study 1
Case Study 2

The parents completed a sleep diary for 8 days during the baseline phase. This was followed by a functional analysis of the sleep problem and development of an intervention plan. One training session was carried out with the parents to explain and negotiate treatment implementation. The duration of the intervention was 42 days. Two home visits were carried out during the intervention phase to monitor and discuss progress. The mother recorded sleep diaries every day for the entire intervention period. Follow-up data were collected 3 months following completion of the intervention. Child illness was recorded on 3 nights during the intervention phase on the 24th, 25th and 26th nights as well as on 2 nights during follow-up.

Reliability

The percentage of consistency between the mother’s sleep diary and the independent sleep diary records made by the father was 90%. Telephone reliability data comparing the mother’s sleep diary and the researcher’s notes was 100%.

Estimated Procedural Reliability

There were 4 out of 56 nights (7%) during the intervention and follow-up when the parents did not adhere to treatment procedures. These are indicated on the graphs in Figure 2.

Co-sleeping

Co-sleeping was not observed during the baseline phase (Figure 2). However, there was a high and stable rate of parental presence at sleep onset occurring on 7 out of the 8 nights during this baseline period. Upon implementation of the intervention, nights spent co-sleeping remained at a low level, occurring on only the 26th, 45th and 48th nights. Parental presence at sleep onset immediately ceased when the intervention was introduced and this remained at a low and stable level throughout the entire intervention period, with the exception of the 3 nights spent co-sleeping. Low levels of co-sleeping were recorded during follow-up, occurring once out of the 14 nights.
FIGURE 2. Sleep Related Problem Behaviours for Case Study 2
Bedtime Adherence

During the baseline phase, Sam’s bedtime was variable with adherence to the desired bedtime achieved on 4 out of 6 nights when able (Figure 2). Upon implementation of the intervention, the adherence rate to the mutually agreed bedtime of 9 pm increased and remained stable during the positive reinforcement programme, with Sam complying to his bedtime every night when able (i.e., excluding nights when external circumstances prevented adherence such as family outings, scouts, school plays, discos). This trend was maintained throughout the following phase that incorporated the positive bedtime routine where Sam complied with his bedtime on 20 out of 25 nights of possible adherence. During follow-up, this trend had reversed, with bedtime adherence observed on only 1 out of 9 nights when Sam had the opportunity to comply.

Case Study 3

The parents completed a sleep diary for 14 days during the baseline phase. This was followed by a functional analysis of the sleep problem and development of an intervention plan. One session was carried out with the parents to explain and negotiate treatment implementation. The intervention was implemented 2 days before completion of the allocated 21 day baseline period at the parents’ instigation. The duration of the intervention phase was 66 days. Three home visits were carried out during the intervention phase to monitor and discuss progress. The parents recorded sleep diaries for 14 days throughout the intervention phase. Follow-up data were collected 3 months after the programme.

On the 5th night during baseline, Emily changed to a single bedroom from a room she previously shared with her younger sister. She remained in this room for the remainder of the study. Emily experienced an extended period of illness from the 36th to the 46th night during the intervention period. During the 4th and 6th weeks of the intervention phase, there were two extended-family bereavements and recording was intermittent during this period.
Reliability

The percentage of consistency between the mother’s sleep diary and the independent sleep diary records made by the father was 67%. Telephone reliability data comparing the mother’s sleep diary and the researcher’s notes was 38%.

Estimated Procedural Reliability

There were 18 out of 73 nights (25%) during the intervention and follow-up when the parents did not adhere to treatment procedures. These are indicated on the graphs in Figure 3.

Co-sleeping

Emily exhibited a high and stable rate of co-sleeping during the baseline phase (9 out of 14 nights) (Figure 3), primarily for the whole night. On the 21st night no co-sleeping was observed and no co-sleeping occurred over the next 17 days. This was followed by 2 nights of co-sleeping on the 39th and 44th nights during the period of illness. After this illness, co-sleeping returned to low levels. Overall, the proportion of recorded nights spent co-sleeping decreased from the baseline to intervention. During follow-up, a low stable rate of co-sleeping was recorded on 1 out of 7 nights. The data also showed co-sleeping for the whole night occurred on 8 nights during the baseline phase compared to 1 night during the intervention.

Night Wakings

Emily woke regularly during the baseline phase, waking once per night on 6 out of 14 nights (Figure 3). There were 8 nights during the baseline period where Emily slept through the night. Throughout the intervention phase, there was no change in the number of wakings of one per night. The number of nights in which Emily woke decreased following implementation of the intervention (3 out of 16 nights) up until a period of illness. This trend was reversed with an increase in the number of nights when waking did occur while Emily was ill (6 out of 10 nights) but was re-established to a low level during the remainder of the intervention period (7 out of 26 nights). During follow-up, the number of nights in which Emily woke remained low (1 out of 7 nights).
FIGURE 3. Sleep Related Problem Behaviours for Case Study 3
Sleep Onset Delay

During the baseline phase, sleep onset delay for Emily was very high and variable, ranging from 30-120 minutes (Figure 3). Upon implementation of the intervention programme, sleep onset decreased during the first 16 days and became more stable (ranging from 20-60 minutes) following the 29th night during the intervention. This was followed by a slight increase in the variability of sleep onset (ranging from 15-90 minutes) during a period of illness. From the 63rd night until completion of the intervention phase, Emily’s sleep onset delay was highly variable (ranging from 5-180 minutes) and displayed no trend. At follow-up, there was a high rate of sleep onset delay with extreme variability (ranging from 45-270 minutes).

Case Study 4

The mother completed a sleep diary for 14 days during the baseline phase. This was followed by a functional analysis of the sleep problem and development of an intervention plan. Two sessions were carried out with the mother to explain and negotiate treatment implementation. The implementation of the intervention was delayed by two weeks. Data collection was suspended during this period. The duration of the intervention phase was 37 days. Monitoring and discussion of sleep progress during the intervention phase was carried out by telephone. The mother recorded sleep diaries for 32 days throughout the intervention. No follow-up data were obtained.

During the 4th week of the intervention, a member of Sarah’s immediate family was reported to be experiencing serious health problems but the mother chose to continue with the sleep programme. There were two nights that were recorded with child illness for Sarah on the 29th and 30th nights during the intervention.

Reliability

Telephone reliability data comparing the mother’s sleep diary records with the researcher’s notes was 100%.
Estimated Procedural Reliability

There were 5 out of 37 nights (14%) during the intervention when the mother did not adhere to treatment procedures. These are indicated on the graphs in Figure 4.

Co-sleeping

Sarah co-slept frequently during the baseline phase (5 out of 10 nights) (Figure 4). Upon the implementation of the sleep programme, the number of nights spent co-sleeping decreased to low levels with 4 instances of co-sleeping observed throughout the entire 37 day intervention period, on the 39th, 51st, 62nd and 65th nights. One night of co-sleeping occurred during a brief period of illness. Overall, the proportion of nights spent co-sleeping decreased from baseline to intervention.

Night Wakings

Sarah displayed a stable rate of one waking per night on each night she woke during the baseline phase (3 out of 10 nights) (Figure 4). There were 7 nights during the baseline period where Sarah slept through the night. Upon implementation of the intervention, wakings decreased to and remained stable at near zero levels throughout the entire intervention phase. There were only 2 nights in which wakings were observed with the first occurring on the 38th night. There was an absence of wakings until the 63rd night, with a peak of two wakings during a night of illness. No further wakings were observed for the remaining 8 days of the intervention period.

Sleep Onset Delay

Sarah’s sleep onset delay was variable during the baseline phase (ranging between 5-90 minutes) and showed no trend (Figure 4). During the intervention phase, data was recorded intermittently but results indicated no trend in the time taken for Sarah to fall asleep, displaying a similar variable pattern of sleep onset delay (ranging between 10-60 minutes).
FIGURE 4. Sleep Related Problem Behaviours for Case Study 4
Results Across Participants

In order to assess the extent to which changes in sleep behaviours were in response to the intervention, results were analysed for each target sleep problem as a multiple baseline across participants.

Co-sleeping

All participants had a target behaviour of reducing co-sleeping and parental presence at sleep onset. Overall, the proportion of nights spent co-sleeping declined markedly from the baseline phase to intervention for Jason, Emily and Sarah (Figure 5). Intermittent nights of co-sleeping were observed across all three children throughout their respective individualized intervention phases, but in general co-sleeping levels remained relatively low and stable. Follow-up showed that reduced levels of co-sleeping had been maintained for Emily. For Sam, baseline data indicated no instances of co-sleeping. Despite this absence of co-sleeping, results indicated there was a marked reduction in the frequency of parental presence at sleep onset, decreasing immediately from the baseline phase to intervention. This low and stable trend remained relatively unchanged throughout the rest of the intervention phase and follow-up. Periods of illness for Jason, Sam and Emily also resulted in co-sleeping nights.

Night Wakings

Results in Figure 6 indicated that the number of wakings per night decreased consistently only for Jason from the baseline phase to intervention, reaching a stable rate of no wakings towards the end of the intervention phase. The variability in the number of wakings for Emily and Sarah remained unchanged (at 1 per night) upon implementation of their respective interventions, with the exception of a brief increase in wakings during a night of illness. The proportion of nights in which wakings were observed also decreased from the baseline phase to intervention for Jason, Emily and Sarah. Jason showed the greatest reduction with wakings occurring every night during the baseline phase to occurring infrequently across nights during the intervention. Sarah also showed a rapid decrease in frequency of nights with wakings from the baseline phase to intervention while Emily showed a less marked reduction. However, this downward trend was interrupted by a period of illness which temporarily increased the frequency of nights when Emily woke. Despite this, initial reductions of nights when Emily woke returned to low levels during follow-up.
Sleep Onset Delay

During the baseline phase, Jason and Emily had very long and highly variable sleep onset times which gradually reduced and became more stable upon implementation of their intervention programmes (Figure 7). However, this downward trend was not maintained for Emily following the family bereavements, showing that sleep onset delay reverted to levels higher than those recorded during the baseline phase. These increased levels had escalated further during follow-up. Results for Sarah showed minimal change in sleep onset from the baseline phase to intervention. However, the limited diary recordings for Sarah indicated a slight decreasing trend in sleep onset delay following implementation of the intervention. In addition, no extinction bursts were observed for any child upon introduction of their respective interventions, in which sleep onset exceeded those of the last nights during baseline.

Conners' Parent Rating Scale – Revised (CPRS-R)

A second administration of the CPRS-R was administered upon completion of the intervention to detect any changes in behaviours symptomatic of ADHD pre- and post the intervention phase. Following treatment, Sam, Emily and Jason continued to demonstrate active ADHD symptomatology as indicated by similar high scoring CPRS-R behavioural profiles when compared to baseline profiles. In contrast, Sarah's score on the ADHD index dropped by approximately a third, but remained very high in the clinical range at more than 2 standard deviations above the mean.
FIGURE 5. Nightly scores on the co-sleeping scale, across participants
FIGURE 6. Frequency of night wakings per night, across participants.
FIGURE 7. Sleep onset delay in minutes, across participants
Social Validity

The programme had high social validity for Jason. His mother was very satisfied with the sleep programme which met almost all of her needs. She commented that the programme procedures were easy to follow and logical and indicated that implementing the programme was non-stressful. The mother advised that the amount of telephone contact was very helpful and that keeping sleep diary records proved very useful in identifying patterns that correlated with Jason’s sleep. She also stated the sleep programme had helped a great deal in dealing more effectively with other difficult child behaviour during the day. Jason’s mother also described secondary improvements in his daytime behaviour (e.g., increased compliance and attention to task at school, a reduction in oppositionality at home). She also reported Jason was more receptive to and accepting of other family members managing his bedtime routine or that he would settle himself to bed independently without prompting.

Sam’s parents reported being mostly satisfied with the programme and indicated that the intervention had met most of their needs. They reported that the instructions and strategies were easy to follow and the telephone support was frequent but helpful. The programme was rated as somewhat stressful to implement. Sam’s parents also indicated that the quality of help was good and that they would definitely recommend the programme to a friend if they had a similar problem with a child.

The programme also had high social validity for Emily. Her parents rated the quality of help as excellent and were very satisfied with the programme. The parents indicated that the sleep programme had met almost all of their needs and that programme implementation was somewhat stressful. Telephone support was rated as very helpful. Emily’s parents also stated the sleep programme had helped a great deal in dealing more effectively with other difficult child behaviour during the day and that they would definitely come back to the programme if Emily had sleeping difficulties again.

A programme evaluation questionnaire was not completed by Sarah’s mother.
CHAPTER 5
DISCUSSION

Summary and Interpretation of Overall Results

The results of the current study show that behavioural family interventions were effective in treating the multiple sleep problems presented by four children with ADHD. Bedtime disturbances, night wakings and co-sleeping behaviours were markedly reduced as a function of their respective individual interventions. The overall general trend for co-sleeping and the number of nights with wakings decreased across all participants. However, the introduction of the behavioural intervention appeared to produce varying treatment effects on the children’s sleep onset from baseline to post-intervention. There was also a great deal of night-to-night variability observed in recorded sleep measures across participants. For some children, the frequency of nights with wakings and co-sleeping during treatment conditions showed some variability, with elevated levels of responding being partly explained by the social environment (e.g., bereavements, family turmoil) as well as temporary periods of illness. In general, sleep and behavioural improvements were mostly maintained 3 months at follow-up for Sam and Emily.

The majority of parents were able to complete the sleep diary for the entire intervention period. Notes taken during telephone conversations were used to fill in some of the missing data. In addition, some parents were unable to consistently record target behaviours independently and extenuating circumstances in Emily’s family (i.e., bereavements, shift work) and Sarah’s family (i.e., health problems) also compromised the ability of parents to fill out daily records.

In examining the outcomes for all four children, an important distinction needs to be made when evaluating the effectiveness of the intervention programmes. Parents were only able to report on behaviours which were accessible to them and thus, some changes in the children’s sleep patterns do not necessarily correspond to objective improvements per se in their sleep (e.g., number of arousals). For example, improvements in sleep may be more indicative of the child’s ability to self-soothe and reinitiate sleep independently rather than requiring a parent during nocturnal arousals or when settling to bed (France et al., 1996). Such changes in sleep related problem behaviours were the focus of the study while sleep architecture was not assessed nor targeted for treatment.
Summary and Interpretation for Individual Participants

Case Study 1

By the end of the intervention Jason had shown a treatment effect in his sleep onset delay, with no major oppositional behaviours occurring near bedtime or during the night. Jason also showed improvement in the frequency of night wakings from baseline to intervention. However, this had started to decrease during baseline and it is therefore difficult to determine if the ongoing reduction during the intervention was attributable to the implementation of the intervention or whether it represented a change in parental behaviour that occurred during baseline. The programme was particularly effective and rapid in reducing nights spent co-sleeping during the intervention phase. Jason responded extremely well to the programme and only co-slept on three nights throughout the whole intervention period. These were all instances of parental non-adherence. Furthermore, although total sleep duration was not targeted for treatment, a detailed assessment of sleep diary data also revealed a substantial change in Jason’s sleep duration patterns. Prior to intervention, Jason’s weekly average total sleep duration was 9 hours and 35 minutes. This had increased to an average of 11 hours and 5 minutes at completion of the intervention phase.

The intervention also appeared successful in promoting independent sleep behaviours early in the programme. The second component of the treatment programme, involving shifting Jason upstairs to the bedroom he shared with his sister, was unexpectedly initiated by Jason, who requested to be moved during the second week of the intervention phase. His desire to shift out of his mother’s room was immediately capitalized upon, relocating his belongings upstairs and settling him into his new bedroom. This change in bedroom arrangement helped continue to promote independent sleep behaviours and strengthen the sleep improvements already made by Jason.

After the 6 week intervention phase, Jason had achieved the identified goals of treatment and his mother felt confident to transition to the maintenance phase of the programme. Jason’s mother chose to continue with the consistent praise for good behaviour so that improvements in his sleep behaviour and sleeping independently could be consolidated. Part of the maintenance programme included encouraging Jason’s mother to problem-solve any particular difficulties or disruptions she might anticipate with his sleep progress when a
member of the immediate family was due to give birth to a baby one month following completion of the intervention. This new family addition altered sleeping arrangements, with his mother shifting upstairs to the room beside Jason. The potential disruption of this change was cause for concern due to the proximity of his mother during the night. However, the mother reported that Jason adjusted to the change and maintained his sleep schedule and behavioural improvements without difficulty. Therefore, it is likely that the consolidation of new sleep behaviours prevented Jason from reverting back to using inappropriate sleep behaviours.

Case Study 2

Sam showed a rapid improvement in adhering to his new bedtime of 9pm on nights when he was able to comply. However, these treatment gains were not maintained at 3 months follow-up. In assessing Sam’s bedtime adherence, it is evident that the family’s busy lifestyle prevented Sam from complying with his bedtime on numerous occasions and made it very difficult to establish and consolidate a consistent and structured nightly routine. It is likely that lifestyle factors disrupted Sam’s progress during the intervention phase by providing intermittent reinforcement when allowed to stay up late due to circumstances beyond his control. Irregular schedules and the lack of a consistent nightly bedtime routine may have also contributed to the deterioration in bedtime adherence during follow-up.

It is also unclear why Sam did not co-sleep at all during baseline despite this being reported as problematic by the parents. It is suggested that an increased awareness of co-sleeping behaviours may have led the parents to alter the management of this sleeping practice during baseline despite being requested to remain consistent in typical sleep management strategies. Therefore, although co-sleeping was at a low and stable level during the intervention phase, it is difficult to determine whether the intervention programme had any impact on co-sleeping in light of the absence of co-sleeping during the baseline phase. In contrast, a treatment effect was revealed in the immediate reduction of parental presence at sleep onset upon implementation of the intervention. Furthermore, the planned response cost procedure was reportedly not needed by the parents.
The structured positive bedtime routine was also effective in creating appropriate cues for sleep onset and generating additional positive reinforcement for appropriate bedtime behaviours. His parents reported that having the activities outlined on a chart beside Sam’s bed assisted in prompting him to complete the tasks while serving as a reminder of the specific requirements needed to obtain the agreed upon reward. Furthermore, in addition to the positive social attention and praise he received from his parents upon completion of each activity, his parents reported that the act of self-monitoring by marking off completed tasks served to provide Sam with internal positive reinforcement. His parents often stated that Sam showed a great deal of enthusiasm and pride in displaying to them his chart replete with stars.

The parents adhered to the programme relatively consistently throughout the intervention phase. However, there were three instances of parental non-adherence during the intervention and one instance during follow-up in which Sam was allowed to co-sleep for either the whole night or for part of the night in the parents’ bed. These instances of non-compliance with treatment procedures may be partly explained by the mother rating the programme as somewhat stressful to implement, indicating that she missed the bonding experiences that co-sleeping practices previously provided.

The transition to maintenance occurred when the parents were satisfied with Sam’s progress in sleeping independently and adhering relatively consistently to his bedtime. The parents independently decided to continue with the star-chart during maintenance so that improvements in Sam’s sleep behaviour and adherence to requisite pre-bedtime tasks could be consolidated.

Case Study 3

The decision to start the behavioural intervention early was made in consultation with the research supervisor and was based on the high levels of stress Emily’s sleep difficulties were causing her parents. Emily showed initial improvements in the number of nights she woke and a gradual decrease in sleep onset delay. The programme was also highly effective in reducing co-sleeping behaviours during the initial phase of the intervention period. However, a prolonged period of illness complicated the effectiveness of treatment for Emily and affected her sleeping patterns. This illness disrupted the progress of initial treatment gains by requiring parental attention at sleep onset and during the night to provide medication. In addition, co-
sleeping was used to manage two night wakings during this time. Consequently, the reintroduction of previously acquired inappropriate behaviours (i.e., parental attention and presence at sleep onset, co-sleeping) into newly established sleep patterns would have served as reinforcement for Emily. Therefore, it is likely that sickness rendered the parents vulnerable to the re-emergence of Emily’s sleep disturbance because of the contingencies such illnesses set up for a more stimulating and responsive parenting style. Intermittent reinforcement of undesired sleep behaviours occurred as a consequence, making it more difficult to extinguish or eliminate the behaviour.

Two extended-family bereavements within 3 weeks also disrupted Emily’s progress, as noted by her parents who observed that her sleep patterns had deteriorated substantially following the second bereavement. Although the intervention programme was suspended during this time, contact with the family was maintained upon their request. Following the second bereavement, the recurrence of previous inappropriate behaviours consequently prompted the parents to return to the sleep programme to address these re-emerging behaviours. Although co-sleeping behaviours and the number of nights with wakings returned to low levels, Emily’s sleep onset delay did not respond to the re-implementation of the sleep programme. Parental non-adherence further impeded the effectiveness of treatment procedures during this time. The transition to the maintenance phase occurred when the parents were content with Emily’s progress in achieving the identified goals and felt confident to continue with the programme independently. At three months follow-up, a marked deterioration in sleep onset delay was evident, while low levels of nights with wakings and co-sleeping practices had been maintained.

Emily’s parents experienced some difficulty complying with treatment procedures. The parents indicated that programme implementation was somewhat stressful, stating that already low physical and mental energy levels impeded their ability to remain consistent with recommended strategies during the first week of intervention. Furthermore, some instances of parental non-adherence were explained by parental exhaustion with the mother inadvertently falling asleep with Emily in her bed at sleep onset. Telephone contact at times was also difficult to co-ordinate. The parents indicated a pre-determined calling time would have been useful to avoid interrupting busy periods during the day or waking the father when sleeping between work shifts. Both parents also reported the programme assisted them in learning to apply newly learned strategies to prevent and manage similar sleep problems with Emily’s younger sibling.
Case Study 4

The intervention phase was delayed by two weeks as the researcher was away the week following completion of the baseline phase and the subsequent week Sarah was away on a family holiday. When the intervention commenced, results showed that the sleep programme was successful in reducing the number of nights with wakings and co-sleeping. Unfortunately, the lack of consistent sleep diary records pertaining to sleep onset delay prevented a conclusive interpretation of any treatment effect upon intervention implementation. In addition, the recommended standard extinction programme was reportedly not needed by the mother.

During the 4th week of the intervention, immediate family difficulties caused the mother significant stress and concern and consequently her attention and focus was swiftly directed towards ensuring the well-being of the troubled family member. Despite choosing to continue with the sleep programme, the mother’s increased stress levels and competing priorities meant maintaining sleep diary recordings became increasingly difficult. The transition to the maintenance phase of the programme occurred when the mother was satisfied that Sarah’s bedtime behaviour problems had reduced to manageable levels and she felt confident in continuing to apply the recommended behavioural strategies. The decision to move to maintenance was also based upon the mother’s ongoing difficulties maintaining sleep records. Two and a half months following completion of the intervention phase, the mother advised that family circumstances had deteriorated and that she felt overwhelmed attending to the family’s needs. After consultation with the researcher’s supervisor, the decision was made not to collect follow-up data as this would have imposed additional demands and stress on the mother.

Although a programme evaluation questionnaire was not completed by Sarah’s mother, verbal reports and incidental written comments on sleep diary records indicated she was satisfied with the programme. She also reported secondary gains, such as Sarah’s increased interest and enthusiasm towards reading as a result of listening to extra bedtime stories as part of the positive reinforcement programme. The mother indicated that telephone contact was very useful in assisting her to remain focused and consistent with programme implementation. The mother also reported that the programme had inadvertently reduced further stress during the family turmoil as Sarah had begun to independently manage her own sleep and bedtime schedule when the mother was tired or unavailable.
Summary and Interpretation of Results Across Participants

These results are consistent with previous studies reported in the literature in which behavioural management strategies carried out by the parents in the home setting have been shown to effectively treat chronic sleep problems exhibited by children with ADHD and other developmental disabilities (Bergman, 1976; Dahl et al., 1991; Didden et al., 1998; Didden et al., 2002; Didden et al., 2004; Kayser et al., 1997; Milan et al., 1982; Piazza & Fisher, 1991; Thackeray & Richdale, 2002). This study supports past findings by employing a multiple baseline research design that compares responses to behavioural interventions across participants and detects the presence of an experimental effect of treatment. This design provided an element of experimental control and demonstrated a functional relationship between the implementation of the intervention and the subsequent observed changes in the children’s respective sleep behaviours. Extinction procedures were successful in reducing the disruptive night-time behaviours for Jason and Emily, although initial treatment gains were not maintained for Emily following the bereavement period. In addition, the systematic reinforcement of positive sleep behaviours proved highly effective in fostering co-operative behaviours around bedtime and promoting appropriate sleep behaviours (e.g., settling into bed quickly, sleeping through the night, not co-sleeping) for all participants.

The successful use of extinction procedures and positive reinforcement programmes (e.g., social attention, rewards, tangible items) suggests that parental attention is likely to have controlled the problem sleep behaviour. Such strategies are viable treatment options in cases where assessment results indicate that disruptive night-time behaviours are maintained by social consequence (e.g., parental attention, comfort, play, TV watching). However, extinction procedures are often associated with a temporary increase in the frequency, intensity or duration of the target behaviour, namely the post-extinction response burst (e.g., heightened crying or signalling behaviours) (France & Blampied, 1999; France et al., 1996). Although parents were warned such a response might occur during the first few nights of treatment, the data failed to show evidence of a PERB response for any child.

In addition, non-specific effects of participation in the study (e.g., altered expectations for treatment, increased awareness and vigilance of the child’s sleep patterns during baseline recordings) may have led some of the parents to alter the management of their child’s sleep behaviour despite being requested to remain consistent in typical sleep management strategies during the baseline phase. This may help to explain the reduction in Jason’s night wakings
during the baseline phase as well as the absence of co-sleeping for Sam despite this being reported as problematic by the parents.

Comparison with the Literature

Psychosocial Influences

This study’s findings highlight the contribution of environmental variables and child-parent interactions to the development and maintenance of sleep difficulties manifested in children with ADHD. The behavioural approaches used to effectively treat the children’s sleep problems in this study suggest that the sleep difficulties of this group were substantially learned behaviours rather than due to unalterable organic abnormalities. This underscores the possibility that sleep problems in children with ADHD may not be caused by an intrinsic arousal dysfunction but rather exhibit sleep disturbances that are socially mediated.

The results of this study therefore support previous studies that have implicated extrinsic factors as playing a major role in some of the most commonly reported sleep problems in children with ADHD (Corkum et al., 2001). For example, bedtime resistance (e.g., stalling or refusal behaviours, tantrums) and sleep onset delay may not necessarily relate to a child’s inability to fall asleep but rather to behavioural issues and the parents’ inability to control bedtime, to inadequately enforce bedtime limits and provide inappropriate cues for falling asleep (France & Blampied, 1999; Mindell & Owens, 2003; Stores, 1996). This distinction is particularly important when evaluating possible causative factors related to parental descriptions of “difficulty going to sleep” in children with ADHD.

Treatment of specific sleep problems also appeared to have a co-effect on other behaviours. An interesting finding that emerged from this study was a parental report of generalized improvements in daytime behaviours that occurred concurrently with the sleep intervention. Jason’s mother, family members, teaching staff and written school reports all noted that his daytime performance and behaviour within home and classroom settings had improved substantially since participating in the programme. A similar finding between treatment of sleep problems and improvements in daytime functioning was also found by Dahl et al. (1991). It could be suggested that significant improvements in behavioural functioning resulted from Jason’s regular increased nightly sleep duration following the intervention. It
seems likely that Jason was not obtaining sufficient sleep for optimal daytime functioning as recommended according to developmental requirements. Thus, the cumulative effects of this chronic sleep deprivation could have manifested as increased oppositionality and hyperactivity. This would support clinical evidence suggesting that children receiving insufficient sleep are often irritable, restless and more likely to exhibit oppositional behaviour (Mindell & Owens, 2003; Stores, 1996). Although this is an uncontrolled pre-post case report and these subjective reports must be therefore interpreted cautiously, it should be emphasized that there are few identifiable factors that could logically account for Jason’s improved daytime behaviour and performance. One explanation could be the possibility of an intervention effect directly attributable to the implementation of the treatment phase. A second alternative explanation may be that positive reinforcement contingencies and praise employed to treat sleep problems were applied to problematic daytime behaviours, thus generalizing treatment effects. However, it remains difficult to tell whether improvements were due to changed sleeping patterns or a generalization of parent-child interactions.

A further point that deserves consideration in light of the above finding is that Jason showed no corresponding changes in his ADHD symptomatology following the intervention phase as measured by the CPRS-R. Despite this, the reported improvements in his daytime behaviour appear to support the finding that the resolution of ADHD-associated sleep disturbances and accompanying sleep deprivation may improve the clinical presentation of ADHD symptoms (Dahl et al., 1991; Mindell & Owens, 2003). The other three children also continued to demonstrate active ADHD symptomatology as indicated by similar high scoring behavioural profiles of oppositionality, cognitive problems/inattention, hyperactivity and the overall ADHD index scale when compared to baseline profiles. However, although the challenging behaviours that comprise their underlying disorder remain unchanged, this study demonstrates that effective management of problematic behaviours and behavioural improvements are possible with children with ADHD.

**Effect on Parents and Family Functioning**

The success of the behavioural interventions appeared to contribute to improvements in family and child functioning for two participants whereas for the other two families no such changes were observed. Prior to programme participation, chronic daytime fatigue, mood disturbances, high levels of stress and decreases in the level of effecting parenting were all indicated as primary negative effects of their child’s sleep disturbance by the parents of Emily
and Jason. Although these subjective reports were not formally evaluated pre- and post intervention, such accounts corroborate with studies that detail the deleterious effects a child’s sleep disturbance can have on parenting and family functioning (Mindell & Owens, 2003; Quine, 1992; Richdale et al., 2000).

Upon resolution of their child’s sleep problems, these parents frequently commented that the intervention had had a significant positive effect on the atmosphere within the family home. Such changes included alleviating parental stress, improving parental sleep, increasing parental confidence and in some cases, generalizing to improvements in parenting skills and management of daytime behaviours. The parents attributed these changes to increased sleep quality and quantity, with resultant effects on their daily functioning and ability to effectively manage disruptive child behaviours. Such improvements across social, psychological and family domains upon alleviation of the sleep problem strengthen the vast amount of research demonstrating similar findings (Mindell & Durand, 1993; Wiggs & Stores, 1998, 2001; Wilens et al., 1994). However, this study contributes important new information by providing insights into the understudied area of the impact sleep problems in children with ADHD have on parental and family functioning. Given the higher prevalence rates of sleep complaints in children with ADHD combined with the additional stress of managing their challenging daytime behaviour, this study provides initial evidence that some of their stress can be reduced by addressing and treating their child’s sleep problems.

Medication

An important issue raised from this study concerns the relationship between psycho-stimulants and their effect on the sleep characteristics of children with ADHD. Similar to earlier research, the present study’s findings are in close agreement with those studies reporting that behavioural interventions are equally effective in treating sleep problems in children with ADHD regardless of their medication status (Kayser et al., 1997). This study incorporated children who were medication free and who were currently on different pharmacologic regimes to manage their ADHD symptoms. However, the successful resolution of at least some sleep problems in all the children reinforces previous research indicating that sleep related problems cannot be entirely attributed to psychopharmacological side effects associated with medications used to treat ADHD (Marcotte et al., 1998).
Another interesting finding that emerged from this study was the effect of introducing a behavioural treatment programme to run concurrently with an already established pharmacologic intervention. Jason had previously been prescribed melatonin to treat his sleep onset difficulties prior to participating in the current study. However, although parental reports indicated that this had limited effect, fear of inducing further problems upon withholding the melatonin prevented the mother from completely ceasing this medication regime. In contrast, Jason’s long-standing sleep onset difficulties dramatically improved upon commencing the behavioural programme. This finding confirms previous studies that suggest the use of medication as an isolated method of treatment fails to address underlying behavioural factors associated with the sleep problem (Mindell & Owens, 2003). A coercive behavioural trap comprised a major part of Jason’s sleep difficulties and thus required a behavioural approach to target the inappropriate reinforcement contingencies that were operating. Furthermore, informal parental report indicated that behavioural treatment effects for Jason were maintained over time. This report is consistent with the idea that behavioural interventions are more likely to have both short and longer term efficacy and are presented as a preferable option to pharmacological treatments, especially when parental attention plays a critical role in shaping and maintaining the disruptive night-time behaviours of children (Mindell & Owens, 2003)

Co-morbidity

Recently published studies investigating the effects of co-morbidity have found no differences in subjective sleep reports for children with ADHD after controlling for other psychopathology (Corkum et al., 1999; Kuhn et al., 1998; Marcotte et al., 1998; Mick et al., 2000). Children included in this study were screened for the presence of co-morbid disorders. However, all parentally reported co-morbidities pertained to language and learning disabilities rather than to a more severe behavioural disorder (e.g., conduct disorder, oppositional defiance disorder). As such, it was decided that the existence of the children’s co-morbidities would not adversely affect nor complicate the treatment process and results indicate that it did not appear to impact on the effectiveness of the behavioural interventions. This finding suggests that the successful treatment of the sleep disturbances in this subject sample were not confounded by comorbidity.
Limitations

Reliability

The current study has several methodological issues that need to be addressed. First, an important limitation was the lack of adequate inter-rater reliability pertaining to target behaviours recorded in the sleep diary. Due to a shortage of human (i.e., reliability observers) as well as technical resources (e.g., video recordings), this research failed to collect much data on inter-rater reliability of recording and procedural integrity. In addition, the very low levels of reliability for Jason and Emily may have been caused by parents completing sleep diaries retrospectively, the inaccuracy of diary recordings or erroneous reports of sleep behaviours during telephone conversations. This challenges the validity of the conclusions and the reliability of the parents as informants of their child’s sleep behaviours. However, subjective reports are by far the most commonly used method of sleep assessment and parental sleep diaries do provide reliable and valid estimates of sleep parameters (Anders, 1979; Minde et al., 1993; Rogers et al., 1993). Despite this, it has been demonstrated that these reports are limited by the restricted and biased knowledge that parents have about their children’s sleep. Future research would be assisted by employing objective assessment measures to verify findings (i.e., time-lapse video recordings) for the purpose of reliability of parental report. This approach would also help in determining sleep difficulties and response to behavioural treatment and intervention instead of relying solely on subjective parental report.

Generalisability

A second limitation is related to the generalisation of the results. This study sample is a highly self-selected group which may not be representative of this particular population as a whole. The families who took part in this study all volunteered to help with the research and were all willing to undertake an often demanding and labour intensive behavioural intervention for their child’s sleep problem. Thus, it was likely a sample bias was introduced during the recruitment process by families who agreed and felt able to take part in the study. This makes generalization to other families with children with ADHD and sleep problems difficult as families who show reluctance to accept help or engage in a behavioural family intervention were not included.
Diagnostic Assessment

Another minor limitation of this study was that no formal clinical diagnostic assessment of child participants was performed to corroborate the reported diagnosis of ADHD in the light of DSM-IV criteria. Instead, children were selected on the basis of parental reports indicating an external professionally based diagnosis of ADHD. However, the researcher was able to confirm the presence of abnormal levels of hyperactivity using a validated rating scale (e.g., CPRS-R) and multiple informal behavioural observations of the child during assessment interviews and home visits confirmed the presence of behaviours symptomatic of ADHD, which were consistent with parental reports. In addition, this study only screened for sleep-related breathing problems. Parents were questioned extensively about their child’s medical history and current health, including a review of physical symptoms commonly associated with sleep disturbances (e.g., breathing difficulties, snoring, presence of enlarged tonsils, asthma) in an attempt to exclude any physical conditions that could explain the sleep disturbance. There was no formal assessment conducted in a sleep laboratory.

Uncontrolled Variables

A further limitation involved confounding factors that affected the efficacy of the intervention. There were indications that parental psychopathology, marital conflict, family circumstance and external stressors in some instances played a role in establishing and maintaining difficult-to-manage child behaviour and interfered with the implementation of therapeutic procedures. Although these third variables remain uncontrollable and beyond the scope of this research, it is possible that in these cases other parent-related variables not directly measured in this study were more important predictors of the child’s sleep problem. These factors have important implications in terms of the ability of parents to consistently maintain and enforce the child’s newly established sleep behaviours over time to prevent the re-emergence of previously acquired inappropriate sleep behaviours.

Lack of Longitudinal Data

A final limitation was due to time constraints in that follow-up recordings were obtained within a relatively short period of time or not at all. To evaluate the impact of treatment and establish the long term effects of the intervention, it would have been preferable to conduct further follow-up assessments for a longer period (e.g., at 1 or 2 year follow-up) to
determine the maintenance of any gains. Furthermore, the little follow-up data available from this study, suggests that improvements in sleep behaviours are not necessarily maintained through significant life changes (e.g., bereavements). However, there is anecdotal evidence from this study that the benefits are maintained after illness, family turmoil and the birth of a new family member, provided the parents continue to manage problematic sleep behaviours in a non-reinforcing manner.

Implications for Future Research

There is a clear need for further extensive research in the field of sleep disturbances pertaining to children with ADHD. First, basic prevalence rates are still not well understood and epidemiological studies would help establish the extent of sleep problems in this specific paediatric population. However, it is known that sleep disturbances are extremely common in children with ADHD and potentially disruptive to their development in various ways, including the establishment of maladaptive sleep patterns persisting into adolescence and adult life. The majority of studies to date have been primarily descriptive in terms of stating the nature and characteristics of the sleep disturbances associated with ADHD. However, what is needed are further studies probing potential effective treatments, especially those of a behavioural or psychological type. At present, there are very few results from individual case studies, randomized controlled or otherwise methodologically sound trials investigating sleep treatment efficacy in children with ADHD. The findings of this study are therefore important in providing initial experimental evidence of treatment strategies that have successfully resolved sleep difficulties in children with ADHD.

While future research should continue to explore the most appropriate approach to treating sleep problems in children with ADHD, further intervention studies are required to delineate the relative contributions of intrinsic and extrinsic influences on their sleep problems. Many studies have focused simply on the symptoms of the sleeping difficulties and topography of behaviours rather than the etiology of the problem. More attention needs to be focused on examining the functional relationship between disruptive night-time behaviours and its maintaining variables.

Other research could look to clarify any causal relationship between ADHD and the effects of sleep disturbance on the child’s cognitive functioning, mood and behaviour.
However, this could be challenging when dealing with children with ADHD, who by definition experience numerous difficulties in daytime functioning as a consequence of their disorder. Furthermore, measuring the daytime sequelae of inadequate sleep would be problematic when trying to define adequate sleep duration because of the range of individual variations in sleep requirements. Despite this, previous studies have shown sleep problems can exacerbate ADHD symptomatology and that treatment may facilitate clinically significant improvements in symptoms (Dahl et al., 1991). These findings emphasize a need to explore the generalization of improvements in sleep to improvements in daytime functioning following treatment. Such studies would need to record multiple measures of behaviour as well as assessing changes in the type, frequency and severity of daytime problems.

Further research should also investigate the inference that stimulant medication has a detrimental impact on sleep in children with ADHD. This hypothesis has recently been challenged by studies showing that sleep problems persist even in the absence of pharmacological treatment for ADHD (Ball et al., 1997; Corkum et al., 1998; Day & Abmayr, 1998; Kent et al., 1995; O'Brien et al., 2003b; Stein et al., 1996, Tirosh et al., 1993). In addition, research needs to investigate further the dosing schedules for ADHD, especially the administration of stimulant medication late in the day. As morning and afternoon doses of medication wear off, many children with ADHD show significant late afternoon and evening behavioural difficulties that can seriously compromise family relations, homework efficiency and may account for bedtime struggles (Ball & Koloian, 1995). Therefore, it has been suggested that there are important clinical advantages to nocturnal administrations of stimulants in that children may remain calmer, thus decreasing oppositional bedtime behaviour and promoting better sleep.

Research on the generalization of parenting skills and behaviour management techniques from night-time to daytime behaviours should also be more closely examined. Sleep disturbances in children with ADHD can significantly compound the stress and demands parents face when managing the already challenging daytime behaviours of these children. Therefore, research should investigate whether there are any potential benefits from participating in family behavioural interventions by helping increase parents awareness of learned behavioural patterns and responses and consequently generalize newly learned strategies to deal more effectively with other difficult child daytime behaviour.
Finally, assessing a variety of other factors that could potentially influence the efficacy of the intervention could provide valuable information to increase the likelihood of treatment success. Such variables may include individual differences in child temperament, educational level of the parent, the presence or absence of marital difficulties, or differences in intervention implementation with partner support or as a single parent.

Implications for Professional Practice

Considering the pervasiveness of the reported sleep disturbances experienced by children with ADHD, it requires much more attention in clinical practice. Parents may hesitate to seek professional help or advice for their child’s sleep disturbance, believing it to be an inevitable and untreatable part of having a child with ADHD. Such views should be discouraged in light of the current results, showing that even when the sleep problem is longstanding, good outcomes and improvements are possible with such children. As some of the significant effects of sleep disturbance in children with ADHD appear reversible, recognition and treatment of sleep problems by primary health care providers offers an important opportunity for secondary, as well as for primary prevention. For example, parents should be provided basic information about general principles pertaining to good sleep hygiene and adequate sleep amounts. Thus, there appears to be considerable room for improvement in the provision of help to parents. More effort and resources need to be directed at screening sleep problems in clinical work, helping parents to recognize the early symptoms of sleep-related disturbances and provide adequate guidance when needed. Any subsequent behavioural treatment programmes should be individually designed in the light of the particular needs and capabilities of the family.

Another point that deserves consideration concerns the parallels between the effects of sleep deprivation, sleep disorders and the core characteristic symptoms of ADHD. A comprehensive assessment of sleep patterns and possible sleep problems should be a fundamental part of the evaluation of every child presenting with behavioural and academic problems, especially ADHD. This assessment needs to cover a wide range of sleep difficulties as well as consider information concerning the child’s primary and comorbid diagnoses and medication use. It is even more critical that before a provisional diagnosis of ADHD is given, that a thorough screening battery be performed on sleep disturbances experienced by the child first to rule out this as causing the behaviours symptomatic of ADHD. The high prevalence of
sleep disturbances in children with ADHD also underscores the role of ongoing screening procedures in the management of this paediatric population as comorbid sleep problems may develop over time (e.g., OSA) (Mindell & Owens, 2003).

Practitioners also need to carefully evaluate the causes of and contributing factors to a sleep disturbance in the individual child. For example, delayed sleep onset could be related to the severity of hyperactivity, could reflect parental difficulties in setting limits and enforcing bedtime routines, or be attributable to restless legs syndrome or delayed sleep phase syndrome, all of which require very different behavioural and/or medication management strategies. The need to consider multiple factors and possible etiologies is essential and successful treatment is contingent on accurately identifying the presenting sleep problem.

Given the status of current research, assessment and treatment should address both extrinsic (i.e., behavioural) and intrinsic (i.e., physiological) components of sleep problems in children with ADHD. For example, particular attention should be directed towards the length of sleep duration, which may need to be increased, and the consistency of parental limit-setting at bedtime. The traditional approach to assessment has tended to be micro-analytic in nature in the past, emphasizing the child’s behaviour and the purported effects of stimulant medication. While it is important to retain this approach, a greater emphasis needs to be placed on other contextual variables operating over time that can exert important influences on the behaviour of concern and may relate to the onset and maintenance of the sleep problem (e.g., family systems, parenting, child-parent interactions). It is also important to determine whether the sleep disturbance is associated with a side effect of pharmacotherapy, a rebound from it or if it is due to an unrecognized medical condition.

The impact of the sleep disturbance on the child’s health and daily functioning must be carefully assessed as previous studies have documented the negative impact of sleep problems on the functioning of the child and family (Saxby & Morgan, 1995). Sleep problems may either play a causative role or exacerbate the clinical appearance of ADHD in a given child. Even though the reason and nature of sleep disturbances in ADHD remains unknown, behavioural treatment of these difficulties may provide symptom relief for children with ADHD and improve family relationships and well being. If not assessed, sleep disturbances will continue to be overlooked and its unwelcome effects will continue to permeate through families over time.
Lastly, as children with ADHD exhibit more disturbed sleep than their typically developing peers, it is necessary to improve professional teaching, training and general awareness of this neglected area of sleep medicine in clinical practice (Wiggs & Stores, 1996). Professionals also need to be aware of and maintain sensitivity to potential cultural and individual family differences in values regarding childrearing practices and the perception of sleep behaviours and take these into account in preventive and management strategies.

**Conclusion**

Considerable clinical and anecdotal evidence, as well as empirical data, support an association between sleep problems and children with ADHD. However, the magnitude, exact nature and impact on treatment outcome of sleep disorders in children with ADHD is not well understood. There is clearly a vast amount of work yet to be done examining the specifics of the relationship between ADHD and sleep disturbances, which is clearly a complex and multifactorial one. Sleep problems may be related to neurologic dysfunction intrinsic to the ADHD, comorbid psychiatric conditions, concomitant medications (especially psychostimulants), medical conditions and/or coexisting primary sleep disorders. However, debates remain on whether sleep problems are causal or maintaining factors contributing to and/or exacerbating the symptoms of ADHD, or whether sleep problems are yet another manifestation of ADHD. In some instances, the sleep disturbance may be the primary cause of the psychological disorder, rather than a complication of underlying ADHD symptomatology. However, the question of whether sleep problems are primary or secondary to the ADHD remains to be determined.

The current research highlights how critical it is to ascertain information on the behavioural aspects of sleep and identify contextual and parental variables that can influence the development and maintenance of the sleep disturbance. Reframing sleep problems as a dyadic relationship problem involving interactions between the child and parent emphasizes the pervading influence of parents in the origin, course and treatment of the child's sleep problems. However, successful treatment of paediatric sleep problems is predicated on identifying the underlying cause of the sleep disturbance, which may be related to either behavioural or medical factors. Consequently, there is a need to promote the application of a biopsychosocial model when evaluating sleep problems in children with ADHD that
encourages examination of all factors potentially contributing to their sleep disturbance (e.g., medication, psychosocial, medical, environmental).

In summary, sleep problems continue to remain prevalent and persistent in children with ADHD and constitute one of the most common parental complaints in this special needs paediatric population. More attention needs to be turned to behavioural management strategies to treat their sleeping difficulties, as the consequences of their sleep disturbances are likely to be serious in their effects on mood, behaviour, cognitive function and family well-being. Fortunately, this study offers new hope that chronic sleep problems in children with ADHD may be treated effectively with behavioural interventions and are likely to be of mutual benefit and lead to improvements for both the child and family.
REFERENCES


Appendix 1.

University Ethics Committee Approval
21 April 2004

Gillian Hardie
Department of Education
UNIVERSITY OF CANTERBURY

Dear Gillian

The Human Ethics Committee advises that your research proposal "Family Interventions with Sleeping Problems in Children with ADHD: A Multiple Baseline Study" has been considered and approved.

Yours sincerely

[Signature]
Rebekah Carson
Secretary
Appendix 2.

Advertisement for Recruitment
PARENTS OF CHILDREN WITH ADHD: Is your child currently experiencing sleep problems including difficulty settling and going to sleep, waking in the night and difficulty going back to sleep? If so, please contact Gillian Hardie (359-8820) or Dr Karyn France (364-610) at the University of Canterbury to find out more information about a project that involves helping parents overcome the sleeping problems experienced by their child with ADHD.

What is the “Family Interventions with Sleeping Problems in Children with ADHD” Research Project

This is a small scale research project which is being undertaken by Gillian Hardie who is currently being trained to be a Child and Family Psychologist. This project is part of her Master of Education course (endorsed in Child and Family Psychology) at the University of Canterbury. She will be working with parents and their child(ren) with ADHD who are currently experiencing sleep problems and having difficulties with their bedtime behaviour. The aim of this project is to provide assistance to parents to treat this behaviour (eg. difficulty settling and going to sleep, waking in the night and difficulty going back to sleep) and ultimately decrease the stress felt by parents by improving the child’s sleep patterns.

The project involves gathering information about the child’s developmental history and sleeping difficulties. Then a plan will be formulated with the parents to address these challenging behaviours. Each intervention will be carried out by the child’s parents under the guidance and direction of Gillian Hardie and her supervisor, Dr Karyn France. Frequent phone contact will be maintained with the parents and the child over a period of several weeks and a follow-up visit will be made to see how things are going.

Parents will also be asked to keep a sleep diary each night, of their child’s sleep behaviour. This involves recording the occurrence and frequency of the problem behaviours before, during and after the intervention on a standardized sheet that parents will be supplied with and shown how to use.

If you would like to find out more information about participating in this research project, please contact Gillian Hardie (359-8820) or Dr Karyn France (364-610) at the University of Canterbury.
Appendix 3.

Sleep Diary
Sleep Diary

This is your child’s sleep diary. The information that you provide here will help me gain a much better understanding of what happens on a daily basis in your home and the sleeping problems that your child experiences.

Each page is to be filled in every day to the best of your ability. Please use the back of the sheet to continue writing if there is not enough space in the box.

If you forget to record for 1-2 nights, please try and recall those days or nights events as best you can and fill them in accordingly on the appropriate day. If you forget for more than 2 nights, then leave those pages blank and continue to record from the current night.

If you cannot record information because your child is staying elsewhere overnight, please make a note of this to let me know.

If your child is sick or on medication (other than any usual prescription medication), please make a note of this.

I will collect your sleep diary recordings at the end of each week by mail. I have included stamped envelopes with my address on for their return to me. I will also ring to remind you when they should be sent.

The information you provide in this sleep diary will be kept strictly confidential. Only myself and my supervisor, Dr Karyn France, will be reading it.

Please do not hesitate to contact me at anytime if you have any questions or encounter any problems (Ph. 3598820 or gill_hardie@yahoo.co.nz).

I look forward to discussing your recordings with you.

Gillian Hardie.
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td></td>
</tr>
<tr>
<td>Time woken in morning</td>
<td></td>
</tr>
<tr>
<td>Time got up</td>
<td></td>
</tr>
<tr>
<td>Woken by: (self, parent, sibling, alarm, other)</td>
<td></td>
</tr>
<tr>
<td>Any problems on waking? Please describe. (eg. mood)</td>
<td></td>
</tr>
<tr>
<td>Times and lengths of any daytime naps.</td>
<td></td>
</tr>
<tr>
<td>What was your child doing just before the nap? (eg. in car, watching TV, in school).</td>
<td></td>
</tr>
<tr>
<td>Times during the day when your child seemed sleepy (although didn't nap).</td>
<td></td>
</tr>
<tr>
<td>What was your child doing at this time?</td>
<td></td>
</tr>
<tr>
<td>Time went to bed</td>
<td></td>
</tr>
<tr>
<td>Time your child actually fell asleep</td>
<td></td>
</tr>
<tr>
<td>Any problems going to bed / getting off to sleep (eg. activities prior to bedtime). Please describe including what you did, what your child did and how they eventually fell asleep.</td>
<td></td>
</tr>
<tr>
<td>Time and length of any night-wakings. Please describe why your child woke (if known), what your child did, what you did, and how they eventually fell asleep.</td>
<td></td>
</tr>
<tr>
<td>Anything else of importance (day or night)</td>
<td></td>
</tr>
<tr>
<td>Time woken in morning</td>
<td>7.00am</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Time got up</td>
<td>7.15am</td>
</tr>
<tr>
<td>Woken by: (self, parent, sibling, alarm, other)</td>
<td>Parent (mum)</td>
</tr>
<tr>
<td>Any problems on waking? Please describe. (eg. mood)</td>
<td>Really sleepy and irritable. Had to be dragged out of bed by mum.</td>
</tr>
<tr>
<td>Times and lengths of any daytime naps.</td>
<td>2.10-2.20pm</td>
</tr>
<tr>
<td>What was your child doing just before the nap? (eg. in car, watching TV, in school).</td>
<td>Fell asleep at school in maths lesson. Woken by teacher.</td>
</tr>
<tr>
<td>Times during the day when your child seemed sleepy (although didn’t nap).</td>
<td>3.45pm</td>
</tr>
<tr>
<td>What was your child doing at this time?</td>
<td>He seemed a bit tired when he got home after school. More lively after a little snack.</td>
</tr>
<tr>
<td>Time went to bed</td>
<td>8.15pm</td>
</tr>
<tr>
<td>Time your child actually fell asleep</td>
<td>9.30pm</td>
</tr>
<tr>
<td>Any problems going to bed / getting off to sleep (eg. activities prior to bedtime). Please describe, including what you did, what your child did and how they eventually fell asleep.</td>
<td>He read until 8.30pm. Light out. He came downstairs at 8.40pm asking for a drink. Dad gave him a drink, took him back to bed and stayed with him until he fell asleep because he got upset when Dad tried to leave the room.</td>
</tr>
<tr>
<td>Time and length of any night-wakings. Please describe why your child woke (if known), what your child did, what you did, and how they eventually fell asleep.</td>
<td>2.20am. Got up and came into our room. Climbed into bed with us because he said he couldn’t sleep. Dad tried to put him back to bed but he started crying when he left the room. Gave in and allowed him to sleep in our bed for the rest of the night.</td>
</tr>
<tr>
<td>Anything else of importance (day or night)</td>
<td>He wasn’t very well today. I think he is getting a cold.</td>
</tr>
</tbody>
</table>
Appendix 4. Method of Computing Scores on the Co-Sleeping Scale

<table>
<thead>
<tr>
<th>SCORE</th>
<th>Nightly Score on Co-Sleeping Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Fell asleep independently; stayed in own bed all night</td>
</tr>
<tr>
<td>1</td>
<td>Fell asleep with parental presence; stayed in own bed all night</td>
</tr>
<tr>
<td>2</td>
<td>Night waking (parent attempt to return to own bed); allowed to stay in parents’ bed and co-sleep part of the night</td>
</tr>
<tr>
<td>3</td>
<td>Night waking (no attempt to return); allowed to stay in parents’ bed and co-sleep part of the night</td>
</tr>
<tr>
<td>4</td>
<td>Co-sleep the whole night</td>
</tr>
</tbody>
</table>
Appendix 5.

Sleep Programme Evaluation Questionnaire
Sleep Problems in Children with ADHD: A Behavioural Family Intervention

Sleep Programme Evaluation Questionnaire

Please help us improve the sleep programme by answering some questions about the services you have received at the University of Canterbury. Please answer all of the questions. We are interested in your honest opinion, whether positive or negative. We also welcome your comments and suggestions. Thank you very much - we greatly appreciate your help.

PLEASE CIRCLE YOUR ANSWER

1. How would you rate the quality of the help you received?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>Fair</td>
<td>Good</td>
<td>Excellent</td>
<td></td>
</tr>
</tbody>
</table>

2. Did you get the kind of help (or service) you wanted?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>No, definitely not</td>
<td>No, not really</td>
<td>Yes, generally</td>
<td>Yes, definitely</td>
<td></td>
</tr>
</tbody>
</table>

3. To what extent has the Sleep Programme met your needs?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>None of my needs have been met</td>
<td>Only a few of my needs have been met</td>
<td>Most of my needs have been met</td>
<td>Almost all of my needs have been met</td>
<td></td>
</tr>
</tbody>
</table>

4. If a friend were in need of a similar help, would you recommend the programme to him/her?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>No, definitely not</td>
<td>No, I don’t think so</td>
<td>Yes, I think so</td>
<td>Yes, definitely</td>
<td></td>
</tr>
</tbody>
</table>

5. How satisfied are you with the amount of help you received?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quite dissatisfied</td>
<td>Indifferent or mildly dissatisfied</td>
<td>Mostly satisfied</td>
<td>Very satisfied</td>
<td></td>
</tr>
</tbody>
</table>

6. Have the services you received helped you to deal more effectively with other difficult child behaviour?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>No, they seemed to make things worse</td>
<td>No, they really didn’t help</td>
<td>Yes, they helped somewhat</td>
<td>Yes, they helped me a great deal</td>
<td></td>
</tr>
</tbody>
</table>
7. In an overall general sense, how satisfied are you with the service you received?

1. Quite satisfied
2. Indifferent or mildly satisfied
3. Mostly satisfied
4. Very satisfied

8. If your child had sleeping difficulties again, would you come back to the programme?

1. No, definitely not
2. No, I don’t think so
3. Yes, I think so
4. Yes, definitely

9. How stressful did you find the sleep programme?

1. Very stressful
2. Moderately stressful
3. Somewhat stressful
4. Non-stressful

COULD YOU PLEASE COMMENT ON THE FOLLOWING ASPECTS OF THE PROGRAMME

1. The instruction sheet explaining the programme procedure. (e.g. was it logical, ambiguous, hard or easy to follow, confusing, etc.)

2. The method of teaching your child to sleep alone by gradually reducing the amount of attention given. (e.g. was it too slow, too difficult to follow, seemed rational, etc.)

3. The telephone support given by the therapist. (e.g. was it too frequent, not often enough, helpful or not, etc.)

4. Keeping daily records of the sleep pattern of your child. (was it tedious, useful, etc.)

5. Any other criticisms or comments.
Appendix 6.

Parent Information Sheet
Sleep Problems in Children with ADHD: 
A Behavioural Family Intervention

Information Sheet

My name is Gillian Hardie and I am currently being trained to be a Child and Family Psychologist. As part of my Master of Education (endorsed in Child and Family Psychology) course at the University of Canterbury, I am required to undertake a research project that involves working with parents and their child(ren) and helping them to overcome some of the problems they may be having. I have chosen to focus on helping children with ADHD who experience sleep problems.

This research is focused on children with ADHD who present with disruptive night-time behaviours including difficulty settling and going to sleep, waking in the night and difficulty going back to sleep.

My supervisor, Dr Karyn France, will be helping me with this project. I will meet with you to learn about your child’s developmental history and sleeping problems. I may also ask your permission to obtain information from your child’s doctor about any medication or medical problems. I will then formulate a plan with you and keep in contact with you and your child over a period of several weeks. I will also check in with you at a later date to see how things are going for you and your child.

We will plan some strategies to help you deal with your child’s sleep problem. We try to keep programmes as positive as possible but any child management intervention may be slightly stressful. The aim is, in the longer term, to decrease the stress you are feeling about the worrying behaviour and to help your child.

I will ask you to keep a sleep diary each night, of your child’s sleep behaviour. This involves recording the occurrence and frequency of the problem behaviours before, during and after the implementation of the intervention on a standardized sheet that you will be supplied with and shown how to use.

Participation in this study is completely voluntary. You may withdraw yourself and your child from the study at any time and may do so without giving a reason. Any information that you provide is confidential. The only exception to this is if there is reason to believe that any one of you in your family is in danger. If this happens, professional ethics requires that I talk to my supervisor who will contact you and discuss what steps will be taken to ensure safety.

Thank you for considering taking part. If you have any queries or concerns, please do not hesitate to contact either myself or Dr Karyn France (senior supervisor).

Gillian Hardie  
Ph. 359 8820 (home)  
gill_hardie@yahoo.co.nz

Dr Karyn France  
Ph. 364 2610 (Uni)  
Ph. 343 2935 (home)  
karyn.france@canterbury.ac.nz
Appendix 7.

Consent Form
Parent Consent Form

I/we have read and understand the description of Gillian’s programme in the information sheet. On this basis I/we agree to being participants in this study.

In agreeing to participate in the study I/we will follow the procedures required to the best of our ability.

I/we understand that I/we may be asked to give Gillian permission to speak with our child’s doctor.

I/we consent to Gillian writing up her findings and submitting them to the University of Canterbury with the understanding that anonymity will be preserved and any notes will be destroyed when the report is submitted.

I/we consent to the discussion being audio-taped.

I/we understand that we are free to withdraw, with our child, from the programme at any point without giving a reason, including the withdrawal of any information I/we have provided.

Signed: ___________________________ Date: ___________________________

Parent Parent

Researcher

Names and Contact Details:

Child’s Consent Form

(Parent may read to the child)

Gillian has talked to me and asked if she can talk about some of my sleep problems and help me get to sleep easier. I understand that I may be asked to keep a sleep diary and keep a record of how I am feeling. I understand that I do not have to do or say anything I don’t want to.

Her teacher, Dr France, will be working with Gillian to help her, my parents, and me.

What I say and what I put in my diary will be included in Gillian’s research report but will not have my name on it and she will not keep any notes about me after her research is finished.

If I change my mind at any stage I don’t have to continue.

I know that what I say may be tape-recorded.

I agree to take part in this project.

Child’s Full Name ___________________________ Child to Sign ___________________________ Date ___________________________
Appendix 8.

Information on the Sleep Programme: Emily
Emily’s Sleep Programme

1. Tell Emily what will be happening at night.
2. Buy stickers and draw up a chart, sketching in the days.
3. Make a reward list and get a box with rewards and “vouchers”.

**GOAL:** To settle herself to sleep and stay in her own bed each night.

**BEDTIME:**

1. Remind Emily each day and evening of the new rules and rewards to be earned.

2. Usual bedtime routine, goodnight and leave her in her room to fall asleep **ALONE**.

3. If Emily gets up or calls out, ignore her or take her straight back to bed. **DO NOT ENGAGE IN CONVERSATION WITH HER**

4. If she plays with toys etc., take the materials from her.

5. Keep saying – “It is time to go to sleep Emily”. **Don’t say anything else.**

6. If she has a tantrum or gets up again, give a warning – “That is not ok. Go back to bed or we will have to shut your bedroom door”.

7. If she gets up again or continues throwing a tantrum, say – “You have chosen not to do as I’ve asked”. Return Emily to her bed and close the door for a brief period until she settles down and is quiet for 1 minute on her own. After she has been quiet, open the door.
   - If Emily is in bed, praise her
   - If Emily is up, first repeat the warning. If she does not comply, close the door again.

8. If Emily starts again, return her to the bedroom with minimal interaction.

**MORNING**

1. If she stayed in her own bed all night:
   - Praise Emily’s efforts (e.g., tell her how proud you are of her)
   - Tell her exactly what she did right and what you liked
   - Let Emily place sticker on chart / small reward given

2. If did not stay in her bed
   - Say **“I am sorry but you won’t get a reward today. We can try again tonight”**
   - Explain why no reward was given
   - Tell Emily what she needs to do to get it (e.g., fall asleep and stay in own bed all night).
   - If she has caused any mess or damage the night before she must help restore it.