

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

**THE ASSOCIATION BETWEEN SLEEP PROBLEMS, LEARNING
DISABILITIES AND SUBSTANCE USE IN ADOLESCENCE**

NURAAN FAKIER

[Student number: FKRNUR001]

A minor dissertation submitted in partial fulfillment of the requirements for the
award of the degree of

Master of Arts in Psychological Research

Supervised by Dr Lauren G. Wild

Faculty of Humanities
Department of Psychology
University of Cape Town

2007

Acknowledgements

I would like to thank the learners, educators and schools who participated in this study. A special thanks to the Western Cape Education Department (WCED) for granting permission to conduct this study in schools.

I would like to acknowledge the support of the staff at the Medical Research Council's Alcohol and Drug Abuse Research Unit.

A special thank you to Dr Colin Tredoux from the Department of Psychology, University of Cape Town, for providing statistical advice.

I would like to express my sincere gratitude to my supervisor, Dr Lauren G. Wild, for her guidance and invaluable input. Thank you for your patience and many hours of consultation.

Lastly, I would like to acknowledge the organisations that provided funding for this study. Funding for this Master's study was received from the University of Cape Town's Postgraduate Funding Office. The financial assistance of the National Research Foundation (NRF) towards this research is hereby acknowledged. Opinions expressed and conclusions arrived at, are those of the author and are not necessarily to be attributed to the NRF.

Declaration

1. I know that plagiarism is wrong. Plagiarism is using another's work and to pretend that it is one's own.
2. I have used the American Psychological Association (APA) convention for citation and referencing. Each significant contribution to, and quotation in, this dissertation from the work(s), of other people has been attributed, and has been cited and referenced.
3. This dissertation is my own work.
4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.
5. I acknowledge that copying someone else's project, or part of it, is wrong, and declare that this is my own work.

Signature: signature removed

Date: 28 MARCH 2007

Table of Contents

	Page
Acknowledgements	i
Declaration	ii
Table of Contents	iii
ABSTRACT	1
INTRODUCTION	3
CHAPTER 1: LITERATURE REVIEW	10
1.1 Are Learning Disabilities Associated with Substance Use?	10
1.1.1 Definition of learning disability	11
1.1.2 Learning disabilities and substance use	12
1.1.3 ADHD and substance use	14
1.1.4 Explaining the links between learning disabilities, ADHD and substance use	19
1.1.4.1 Peer group affiliation	20
1.1.4.2 Externalising behaviour problems	20
1.1.4.3 Poor attention	21
1.1.4.4 Self-medication with substances	22
1.1.4.5 Stimulant medication as a gateway drug	24
1.2 Are Sleep Problems Associated with Substance Use?	29
1.2.1 Definition of sleep problems	30
1.2.2 Sleep problems and alcohol consumption	31
1.2.3 Sleep problems and tobacco use	32
1.2.4 Sleep problems and illicit substances	34
1.2.5 Explaining the links between sleep problems and substance use	35

1.3 Are Sleep Problems Associated with Learning Disabilities?	37
1.3.1 Learning disabilities and sleep problems	37
1.3.2 ADHD and sleep problems	38
1.3.3 Explaining the links between learning disabilities and sleep problems	43
1.3.4 Explaining the links between ADHD and sleep problems	44
1.3.4.1 Overlap of symptoms between ADHD and sleep problems	47
1.4 Conclusions	51
CHAPTER 2: AIMS AND METHOD	53
2.1 Aims	53
2.2 Sample	54
2.3 Instruments	57
2.4 Procedure	59
CHAPTER 3: RESULTS	62
3.1 Are Learning Disabilities Associated with Substance Use?	62
3.2 Are Sleep Problems Associated with Substance Use?	65
3.3 Are Sleep Problems Associated with Learning Disabilities?	68
3.4 Independent Contributions of Sleep Problems and Learning Disabilities to Predicting Substance Use	69
CHAPTER 4: DISCUSSION	73
4.1 Learning Disabilities and Substance Use	73
4.2 Sleep Problems and Substance Use	79
4.3 Sleep Problems and Learning Disabilities	80

4.4 Independent Contributions of Sleep Problems and Learning Disabilities	81
4.5 Limitations of the Study	81
4.6 Suggestions for Future Research	85
4.7 Implications for Intervention	87
4.8 Conclusions	88
REFERENCES	90
APPENDIX 1	113
APPENDIX 2	116

ABSTRACT

The current study focused on investigating the relationship between sleep problems, learning disabilities and substance use in adolescence. The literature suggests that adolescents with learning disabilities are more vulnerable to engaging in risk behaviours than adolescents who do not have learning disabilities. Early childhood sleep problems also seem to be a robust marker for substance use in adolescence. The prevalence of sleep problems among adolescents is increasing and is particularly high among those with learning disabilities. The sample consisted of 427 learning-disabled learners (283 males, 143 females, 1 no response, *M* age = 16 years) attending remedial schools and 276 non-learning disabled learners (129 males, 147 females, *M* age = 15 years) attending mainstream schools in Cape Town, South Africa. Participants were in grades 9, 10 and 11 at their respective schools. A survey design was employed with anonymous self-report questionnaires administered to participants. Survey instruments included a demographic questionnaire as well as questions about substance use, sleep problems and types of learning disability. In the context of the current study, substance use refers to alcohol consumption, use of illicit drugs or inhalants and tobacco usage. Statistical analyses included logistic regression and chi-square. Results indicated that adolescents without learning disabilities were more likely to smoke tobacco, and to use methamphetamine (tik-tik) as well as marijuana (dagga). Adolescents in the learning-disabled group engaged in significantly more inhalant (glue, petrol or thinners) use than their non-learning disabled counterparts. After controlling for gender and age, adolescents who had more sleep problems were significantly more likely to use tobacco, alcohol, methamphetamine, marijuana, inhalants, cocaine, ecstasy and any other type of

illegal drug. Adolescents with learning disabilities had more sleep problems than adolescents who did not have a learning disability. However, sleep problems remained significantly independently associated with tobacco, marijuana and inhalant use when learning disabilities were taken into account. The results of this study suggest that addressing sleep problems in adolescents with and without learning disabilities may reduce the risk of substance use.

INTRODUCTION

Substance abuse has reached epidemic proportions among adolescents, particularly in South Africa (Flisher, Parry, Evans, Muller, & Lombard, 2003). In a comparative study between adolescents in Cape Town, Harare and Dar es Salaam, it was found that the Cape Town learners used more cigarettes, alcohol and cannabis than their counterparts in the other cities (Flisher, 2003). Cigarettes are the most frequently used daily substance by adolescents and alcohol is the most commonly used and abused substance by adolescents (Guo, Hawkins, Hill, & Abbott, 2001; Sells & Blum, 1996). The substance use literature shows strong associations between academic failure and substance use (Hawkins, Catalano, & Miller, 1992). For instance, Myers and Parry (2002) note that substance abuse by South African adolescents has been associated with truancy, declining grades and academic difficulties. Hanna, Yi, Dufour and Whitmore (2001) found that smokers and drug users were more likely to have school problems as well as abuse alcohol in comparison to their non-using counterparts.

Adolescence is a period of time characterised by extensive psychological, physiological and sociological changes and spans the period of time from puberty – often generalised as beginning around age 12 – to incorporation of an adult identity, which occurs between the late teens into the 20s (Muisener, 1994). Past studies have identified adolescence as a time in which children are at greatest risk for using and developing problems associated with tobacco, alcohol and other substances. It is during adolescence when substance use behaviours are often initiated, patterns of use are initially formed and the risk of use consequences begins to accrue. Young people have greater vulnerability to addiction and they

become addicted in a shorter time than adults as a result of the immaturity of their nervous systems (Fox & Forbing, 1991). It should be noted that most substance use is both initiated and stopped before the late 20s (Chen & Kandel, 1995). Past research has identified a peak in substance use during adolescence and young adulthood. This raises the question of what is it about the period of adolescence that makes young people use substances more heavily than any other group. From the statistics, it is clear that many adolescents use illicit substances and therefore substance use may be regarded as largely normative in later adolescence. However, adolescents with learning disabilities may not necessarily have a higher rate of substance use in later years, but may be more likely to develop substance use problems that are not normative in adolescence and adulthood (Beitchman, Wilson, Douglas, Young, & Adlaf, 2001). Effective interventions are needed to combat substance use problems. However, before feasible solutions are sought, an advanced understanding of the predictors of substance use is needed.

Researchers have identified a number of individual and environmental predictors of substance use in adolescence. Intrapersonal factors (the relatively stable characteristics that lie within the adolescent) have been linked to substance use (Carvajal, Wiatrek, Evans, Knee, & Nash, 2000). Previous research has proposed that individuals who have low self-esteem as well as strong feelings of self-rejection will most probably seek the companionship of deviant peers, which increases the likelihood of them using substances (Carvajal et al., 2000; Wild, Flisher, Bhana, & Lombard, 2004). Kandel and Raveis (1989) found that individuals who used drugs for psychopathological or psychological reasons were less likely to abstain from substance use than those who used drugs for social reasons, such as peer pressure.

Researchers have hypothesised that adolescents' involvement in risky behaviours may be attributed to factors, such as negative emotions, academic influences, negative family influences, peer influences, a sense of invulnerability or attempts to achieve goals related to

the transition into adulthood (Caffray & Schneider, 2000). A number of researchers have reported that poor school performance is a common antecedent of substance use (Fleming, Kellam, & Brown, 1982). Emotional distress has been associated with adverse outcomes, including cigarette smoking, alcohol and other drug use as well as suicide attempts among adolescents (Fidler, Michell, Raab, & Charlton, 1992; Harrison & Luxenberg, 1995). High rates of co-existing problems are often seen in adolescents in treatment for substance use problems, including poor self-image, learning difficulties, social alienation, antisocial behaviour and histories of sexual and physical abuse victimisation (Harrison & Luxenberg, 1995).

Hawkins et al. (1992) summarised a number of environmental risks for early substance abuse by adolescents. These risks include low commitment to school, persistent behaviour problems, delinquency, school misbehaviour, peer rejection, experiences of school failure and drop out. Epstein, Botvin, Baker and Diaz (1999) concluded that among a large inner-city sample of Hispanic and black adolescents, social influences to drink and problem behaviours were the primary determinants of adolescent alcohol use. Borowsky and Resnick (1998) found that several environmental stressors and psychosocial factors, especially poor emotional health, are associated with a history of special class placement for learning problems. This particular study showed that a significantly greater proportion of adolescents who had been in special education classes lived in single-parent and non-traditional households. A large number of these adolescents indicated that a family member had a substance use problem and had witnessed or experienced physical abuse. In a South African sample of 1468 adolescents, Brook, Morojele, Pahl and Brook (2006) determined the association of frequency of illegal drug use with the following factors: parental drug use, parental child rearing, environmental stressors, peer drug use and adolescent personal attributes. Personal attributes and peer substance use accounted for the largest percentage of

the variance in the participants' frequency of substance use. However, such influences cannot fully explain substance use by adolescents.

Currently, no studies have been conducted that associate these factors with substance abuse for adolescents who have a learning disability. However, the literature has indicated that more adolescents with a learning disability have school problems and lower self-esteem than adolescents who do not have a learning disability (Karacostas & Fisher, 1993).

Therefore, to the degree that individuals with learning disabilities experience more of these problems, it may be that they are at greater risk for substance abuse (Fox & Forbing, 1991). The education sector has a special responsibility with regard to the substance use behaviour of learners. Factors that are environmental risks for individuals with learning disabilities are, in many instances, the same as those that exist for individuals without learning disabilities. However, the potential for risk may be exacerbated by the presence of a learning disability.

Previous research conducted in North America has found higher levels of substance use amongst adolescents with learning disabilities. Adolescents, who present with substance use and frequent intoxication, exhibit behavioural changes, which may include hyperactivity or agitation (American Academy of Child & Adolescent Psychiatry, 2005). In addition, changes in cognition may manifest in the form of impaired concentration and changes in attention span. It is evident that individuals who have a learning disability display many of the symptoms that are observed in adolescents who use psychoactive substances. Due to the intertwined relationship between substance use and learning disabilities, it is difficult to isolate which variable causes the other or if there is, in fact, another unknown factor contributing to the relationship. One such possible factor is sleep problems. Early childhood sleep problems seem to be a robust marker for substance use in adolescence (Wong, Brower, Fitzgerald, & Zucker, 2004). The prevalence of sleep problems among adolescents is increasing and is particularly high among those with learning disabilities (Quine, 1992).

Currently, there is no uniform theoretical framework explaining substance use in adolescence. Various approaches and models attempt to account for this rife phenomenon in adolescence. Sleep problems as a predictor for substance use in adolescence offers a fresh perspective in understanding and preventing substance use. As a potential indicator of adolescents at high risk for substance use, sleep problems among adolescents has public health importance. Additionally, sleep problems have health and development consequences for adolescents, primarily through excessive daytime sleepiness, which increases learning difficulties (Wolfson & Carskadon, 1998), and poorer coping behaviours (Morrison, McGee, & Stanton, 1992).

There is a dearth of literature on the relationship between sleep problems and substance use in adolescence. This is a particularly interesting developmental period because changes in both sleep / sleep habits and alcohol use occur during this time. Sleep problems have been shown to predict subsequent onset of alcohol disorders among some adults (Wong et al., 2004). However, the possibility that sleep problems may play a role in the onset of alcohol problems, alcoholism and other drug involvement has been largely overlooked in the child and adolescent literature. There are fundamental differences in addictive vulnerability and substance abuse patterns in adolescents and adults. For instance, an important difference between adolescent and adult substance abusers is the relative cognitive immaturity of the adolescent. Additional differences between adolescent and adult substance abuse include the increased importance of the peer group for the adolescent and differences in physiology.

Sleep problems are also associated with learning disabilities (Quine, 1992; Mercier, Pivik, & Busby, 1993). There is substantial evidence that attention problems are a risk factor for precocious substance use (Pihl & Peterson, 1991). Attention difficulties are one of the problems that characterises the learning-disabled population and attention problems are associated with sleep problems (Wong et al., 2004). Therefore symptoms of learning

disabilities, sleep problems and substance use frequently overlap (e.g. in the case of poor attention), making it difficult to determine the nature and direction of the relationships among these variables. Unfortunately, as reviews of the literature show, studies have not adequately evaluated the putative link between sleep problems, learning disabilities and substance use.

In general, adolescent substance abuse extracts a high cost in health care, educational failure, drug and alcohol treatment, mental health services and juvenile crime for society at large. Despite concern over the growing substance abuse problem in South Africa, basic prevalence data are sparse or non-existent for alcohol and other drug use by adolescents in the various disability categories. In particular, little attention has been focused on the use of substances by adolescents who have been identified as having a learning disability.

Researchers (such as, Kress and Elias, 1993) have noted that there is a dearth of literature on prevalence rates of substance abuse among adolescents with learning disabilities. Adolescents with learning disabilities often do not attend the mainstream classes where most learners are surveyed and therefore learning-disabled adolescents are often excluded from surveys on substance use behaviours. A survey on substance use amongst adolescents with special educational needs might identify adolescents who are particularly at risk of becoming drug users and might throw further light on the substance use patterns of “normal” adolescents. Individuals with disabilities encounter problems of personal adjustment, socialisation and normalisation more frequently than most members of society.

The aim of the study was to examine whether there is an association between learning disabilities, sleep problems and substance use in adolescence. Participants were compared on rates of alcohol consumption, tobacco use, use of illicit drugs and inhalants. The study aimed to answer the following research questions:

- (1) Are learning disabilities associated with substance use?
- (2) Are sleep problems associated with substance use?

(3) Are sleep problems associated with learning disabilities?

(4) Do sleep problems and learning disabilities make an independent contribution to predicting substance use?

Chapter 1 reviews the available literature in relation to the above three research questions. Each research question is divided into different sub-sections, such as definitions of key terms and explanations of the links between the variables. Learning disabilities and attention deficit hyperactivity disorder (ADHD) are discussed separately in relation to substance use and sleep problems since they are regarded as distinct disorders. Each section reviews research relating to adolescents, followed by studies that have been conducted with adults. Chapter 2 proceeds by outlining the aims and method of the study. Chapter 3 presents the results of the study in relation to the four research questions. Details of the statistical analyses performed are provided. Chapter 4 is a discussion of the findings of the study and the implications thereof for each of the research questions. A discussion follows on the limitations of the study, suggestions for future research and implications for intervention.

CHAPTER 1: LITERATURE REVIEW

This chapter provides a review of the available literature in relation to the study's three research questions. Definitions of key terms discussed in this dissertation are provided. A discussion on learning disabilities and ADHD follows and, given that these disorders are conceptually distinct, they are each discussed separately in relation to substance use and sleep problems. Possible explanations for the links between learning disabilities, ADHD and substance use are discussed, such as peer group affiliation, externalising behaviour problems, poor attention, self-medication and stimulant medication as a gateway drug. Prevalence rates for sleep problems among the adolescent population are provided. Evidence on the association between sleep problems and alcohol consumption, tobacco use and illicit substances is presented. Possible reasons for the relationship between sleep problems and substance use are given. The third research question reviews studies on associations between learning disabilities, ADHD and sleep problems. The overlap of symptoms between ADHD and sleep problems is discussed.

1.1 Are Learning Disabilities Associated with Substance Use?

Previous research has been equivocal concerning whether the rates of substance use and abuse among adolescents with learning disabilities differ from that of adolescents who do not have a learning disability. Many of the risk factors for substance abuse, such as impulsivity, poor school performance, problems with peer relationships, depression and low self-esteem are common among adolescents with learning disabilities (Karacostas & Fisher,

1993). It is therefore reasonable to ask if having a learning disability places adolescents at risk for specific developmental sequences of substance use and abuse.

1.1.1 Definition of Learning Disability

There is no general consensus in the literature on a scientific definition of learning disabilities. According to the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition, text revision (DSM-IV-TR) (American Psychiatric Association, 2001), a learning disability is diagnosed when academic achievement in a distinct sphere, as measured by standardised achievement tests, is considerably below the standard expected for the child's measured intellectual abilities. The below-normal academic performance may not be attributed to mental retardation nor does it relate to primary emotional problems, and appears to be due to subtle deficits in nervous system performance (Silver, 1989). Learning disabilities include reading disability or dyslexia (reading is primarily affected), dyscalculia (arithmetic disability), dysgraphia (handwriting disability) or spelling disabilities (Shaywitz, Fletcher, & Shaywitz, 1995).

According to some frameworks, ADHD can also be considered a sub-category of learning disabilities (McCann & Roy-Byrne, 2000). According to the DSM-IV-TR, ADHD is a disruptive behaviour disorder characterised by ongoing inattention and / or hyperactivity-impulsivity. DSM-IV-TR treats ADHD and learning disabilities as distinct disorders, with the former defined as affecting primarily the behavioural domain, whereas the latter is defined as a disorder of cognitive functioning (McCann & Roy-Byrne, 2000; Shaywitz et al., 1995). However, the literature reports a widely variable overlap ranging from 10% to 92% between ADHD and learning disability (Semrud-Clikeman et al., 1992), suggesting that the two disorders may either be causally related, or associated to a common background variable.

In the review of the literature that follows, learning disabilities and ADHD are treated as conceptually distinct disorders as defined by the DSM-IV-TR. However, because of the high degree of association and possible co-morbidity between the two disorders, and the fact that both are often associated with poor school performance, the review will include research linking substance use in adolescents to ADHD as well as to learning disabilities per se.

1.1.2 Learning Disabilities and Substance Use

Several studies suggest that substance use may be particularly salient in the population with learning disabilities. Karacostas and Fisher (1993) investigated whether adolescents with learning disabilities demonstrated a higher frequency of “chemical dependency” than adolescents who did not have learning disabilities. In the sample comprising 88 adolescents with learning disabilities and 103 non-learning disabled adolescents, 30 participants were classified as “chemically dependent”, of which 70% were learning-disabled. A discriminant analysis indicated that the presence or absence of a learning disability was a better predictor of classification as “chemically dependent” or “not chemically dependent” than age, ethnicity, gender, family composition or socio-economic status. Maag, Irvin, Reid and Vasa (1994) investigated the comparative prevalence of tobacco, marijuana and alcohol use among a sample of 123 adolescents with learning disabilities receiving special education and 138 adolescents without learning disabilities. Rates of tobacco and marijuana use were “proportionally higher” for adolescents with learning disabilities (Maag et al., 1994, p. 223). Other research suggests that adolescents with limited attentional abilities may be at risk for developing more problematic alcohol and drug involvement (Tapert, Baratta, Abrantes, & Brown, 2002). In a study of inner city alcohol-dependent men, Rhodes and Jasinski (1990) found that a high incidence of persistent learning disabilities, concurrent with educational difficulty and a history of special education,

preceded alcohol use and family histories of alcoholism. The authors concluded that childhood learning disorders might be related to the development of alcoholism, particularly when alcoholism is in the family. However, the study was limited in a number of ways: the sample size was small (25 participants) and the population was all male and from the inner city. In addition, education opportunities may have been limited by environmental problems that disrupted school attendance.

Although the above studies conducted in North America found higher levels of substance use amongst learning-disabled adolescents, a pilot study conducted by the author in Cape Town failed to find this effect (Fakier, 2003). Some international studies have also found similar rates of substance use among adolescents with and without learning disabilities. For instance, Elmquist, Morgan and Bolds (1992) assessed the incidence rates of alcohol and other drug use among a sample of five groups of adolescents: non-learning disabled learners, learning-disabled learners, behaviourally disordered / less aggressive learners, behaviourally disordered learners and behaviourally disordered / self-contained learners. The investigators found that the learning-disabled, behaviourally disordered / less aggressive and non-disabled learners reported similar alcohol and other drug use rates. Maag et al. (1994) found no differences in rates of alcohol use among adolescents with and without learning disabilities. In contrast, other international studies found lower rates of substance use amongst learning-disabled adolescents. For instance, Fidler et al. (1992) compared the smoking behaviour of 665 adolescents with special educational needs to that of 842 adolescents attending mainstream schools. These investigators found that adolescents with emotional and behavioural problems had the highest smoking rates. In contrast, adolescents with learning disabilities had slightly lower smoking rates than those in the control group.

The contradictory findings reviewed above may reflect methodological problems regarding identification of learning disabilities and substance abuse, which include

overlapping symptoms of learning disabilities and substance abuse, memory loss, withdrawal, concentration or attention deficits, motor / physical extremes, poor co-ordination, poor academic performance, inappropriate social skills, low self-esteem and delayed maturation (Fox & Forbing, 1991). The majority of studies reviewed operationally defined learning disabilities as students receiving special education services (Elmquist et al., 1992; Karacostas & Fisher, 1993; Maag et al., 1994). In addition, many education districts in the United States specify criteria by which learning disabilities are diagnosed and these criteria were also applied in some studies (Karacostas & Fisher, 1993; Maag et al., 1994). In other studies participants were classified as learning-disabled on the basis of scores obtained on certain measures, such as intelligence scales (Maag et al., 1994; Rhodes & Jasinski, 1990). Variable definitions of learning disabilities might be one potential explanation for why different studies have found contradictory results. It is thus unclear to what extent findings can be attributed to learning disabilities per se. Overall, the lack of available data regarding prevalence rates of substance abuse by individuals with learning disabilities is further evidence of the relative lack of attention given to this problem by researchers.

1.1.3 ADHD and Substance Use

Since the 1970's, researchers have hypothesised a link between later development of substance abuse and childhood hyperactivity. A number of researchers (for example, Horner & Scheibe, 1997) have suggested that children with ADHD are more likely to have problems with substance abuse in adolescence and adulthood than are those without a history of the disorder. Researchers have suggested that ADHD by itself is a risk factor for substance abuse in general (Biederman et al., 1995; Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1993; Schubiner et al., 1995; Wilens, 1998; Wilens, 2004). Several studies and reviews of the research support an association between substance abuse and childhood ADHD. This

hypothesis is partially supported by studies demonstrating that ADHD in participants with substance use disorders increases the severity and chronicity of the substance use disorders, increases the risk of treatment difficulties and worsens outcomes (Carroll & Rounsaville, 1993).

Many investigators have noted that ADHD occurs in substance users at a rate significantly higher than in the general population. There is evidence that adults with persisting ADHD symptoms have an increased risk for developing a substance use disorder (Johann, Bobbe, Putzhammer, & Wodarz, 2003). A systematic investigation of the adult outcome of a clinic sample of hyperactive children found that formerly hyperactive individuals, compared with controls, showed significantly higher rates of ADHD and drug abuse and antisocial disorders with co-morbidity among them (Mannuzza et al., 1993). As adults, these same hyperactive children continued to exhibit specific functional deficits. It seems that ADHD is highly underestimated in adulthood, but is nonetheless an important risk factor for the development of substance dependence (Johann et al., 2003). Pihl and Peterson (1991) note that many male alcoholics have a childhood history of ADHD. This finding presents the possibility that the presence of untreated ADHD in childhood may have resulted in alcohol abuse, which has seemingly escalated into adulthood. Evidence suggests that individuals who have ADHD and do not seek treatment are at two-fold risk for the development of nicotine and substance abuse throughout their life (Biederman et al., 1995). Biederman, Wilens, Mick, Faraone and Spencer (1998) found that adults with ADHD, in comparison to adults who do not have ADHD, are more likely to transition from an alcohol use disorder to a drug use disorder as well as continue to abuse substances following a period of substance dependence.

In North America, higher than expected rates of co-occurring ADHD have been found in adolescents in treatment for a substance use disorder (Gordon, Tulak, & Troncale, 2004).

One study reported that 32% of patients with a substance use disorder met the criteria for ADHD (Clure et al., 1999). Murphy, Barkley and Bush (2002) found that young adults (ages 17 – 27) with ADHD presented with a greater likelihood of cannabis and alcohol dependence / abuse. Carroll and Rounsaville (1993) reported a 35% prevalence of ADHD in treatment-seeking cocaine-abusers. In a longitudinal study of 177 boys, Burke, Loeber and Lahey (2001) examined the relationship between ADHD and substance use, taking into consideration other psychopathology. Findings revealed that 78% of participants reported use of alcohol, tobacco, marijuana or other illicit substances during adolescence. However, the Burke et al. (2001) study only provides an indication of the prevalence of substance use in a sample of adolescents with ADHD. Furthermore, the study did not include a comparison group and only males participated.

Molina and Pelham (2003) conducted a more rigorous study. The investigators prospectively monitored children with ADHD into adolescence to evaluate their risk for elevated substance use relative to adolescents of the same age who did not have ADHD. Participants with ADHD reported higher levels of tobacco, alcohol and illicit drug use than the control group. Childhood ADHD was associated with earlier first use of cigarettes, earlier progression to daily smoking and earlier use of illicit drugs. A shortcoming of the Molina and Pelham (2003) study is that the mean age of the sample was 15 and the findings are therefore pertinent for understanding initiation and emergence of substance use as opposed to substance abuse. Early substance use is a well-established predictor of later problematic substance use, but has largely been excluded in ADHD studies (Grant & Dawson, 1997).

In the study conducted by Barkley, Fischer, Edelbrock and Smallish (1990a), adolescents with childhood hyperactivity reported alcohol, tobacco and marijuana use more often and had more negative academic outcomes in comparison to the control participants. At least a third of the study's hyperactive participants had received some form of special

educational assistance in the form of learning disabilities or behaviour disorder programmes. Horner and Scheibe (1997) found that adolescents diagnosed with ADHD, and in treatment for substance use, first used alcohol at a significantly younger age than their counterparts that did not have ADHD. They also found that individuals with ADHD used more lysergic acid diethylamide (LSD) and inhalants than the control group. In addition, individuals with ADHD experienced more negative affective responses related to substance use, more drug craving and more attentional difficulties than adolescents who did not have ADHD. During the month preceding treatment, adolescents with ADHD also experienced drug-use related sleeplessness significantly more than the control participants. Researchers have found that ADHD is associated with a higher rate of cigarette smoking, an earlier age of onset of smoking and greater levels of nicotine dependence (Milberger, Biederman, Faraone, Chen, & Jones, 1997). Carroll and Rounsaville (1993) concluded that cocaine abusers with ADHD who sought treatment had a more chronic addiction course and a higher relapse rate with treatment in comparison to those without ADHD. Cocaine abusers with childhood ADHD were younger at presentation for treatment and reported more severe substance use, earlier onset of cocaine abuse, more frequent and intense cocaine use, intranasal as opposed to intravenous use of cocaine, higher rates of alcoholism and more previous treatment (Carroll & Rounsaville, 1993). Most of the research in this area has found increased rates of substance use among individuals with ADHD. Some studies have, however, found no differences in the rates of alcohol or drug abuse between groups with ADHD and without (Biederman et al., 1997).

Sex may also be a deciding factor in determining which co-morbid diagnoses are present. For instance, Quinn (2005) has noted that co-existing disorders in females who have ADHD are often different from those in males with ADHD. This author further asserts that higher rates of mood, anxiety, substance disorders and learning disabilities often complicate

treatment. Furthermore, studies suggest that adolescent females who have undiagnosed ADHD are susceptible to engaging in “at risk” behaviours, including substance abuse and promiscuity, at a greater rate than their male counterparts. This may partially be explained by theories suggesting that ADHD may lead to substance use disorders and sexual “acting out” as females enter adolescence (Quinn, 2005). Substance and alcohol use disorders have been reported in women who have ADHD – the problems often beginning at an early age. One study found that women with ADHD, in comparison with women without ADHD, had a higher number of treatments for alcohol abuse (Schubiner et al., 2000). Previous research has found that ADHD in girls was a more serious risk factor for substance use disorder than it was in boys (Biederman et al., 2002).

In addition to physiology, psychological experiences may also be implicated in substance use. An individual’s subjective experience of having ADHD may make them more susceptible to engaging in substance use. For instance, for some adolescents having ADHD may be a more salient aspect of their lives and the nature as well as severity of the disorder should be considered. Having ADHD may not necessarily be traumatic, but rather how it is perceived may be critical. One study, using experience sampling methodology, examined the everyday lives of 153 adolescents who were classified with low, middle or high ADHD characteristics (Whalen, Jamner, Henker, Delfino, & Lozano, 2002). As part of the longitudinal study on stress and health risks, participants recorded their moods, behaviours and social contexts. The authors found that adolescents with high, in contrast to low, ADHD symptom levels recorded lower alertness, more negative and fewer positive moods, more time with friends and less time with family as well as more alcohol and tobacco use. It may be deduced that adolescents with more severe ADHD symptoms may experience their disorder as more debilitating and may consequently engage in a greater degree of substance use. However, these conclusions are tentative and more evidence is warranted.

It is important to view the findings from the studies cited above in relation to its methodological limitations, namely that accurate estimates of the overlap of ADHD in individuals with psychoactive substance use disorders are confounded by the limited recall of childhood symptoms in adults, inconsistent diagnostic criteria, a dearth of adolescent studies and a lack of control participants (Wilens, Biederman, & Spencer, 1996). It should be noted that very little is known about the relationship between ADHD and substance use in developing countries.

1.1.4 Explaining the Links Between Learning Disabilities, ADHD and Substance Use

There is a paucity of evidence elucidating the relationship between learning disabilities and substance use. It has been proposed that there may be some risk factors for substance abuse that are specific to individuals with learning disabilities. For instance, it has been "... hypothesised that neurological substrates, similar to those that put one at risk for developing learning disabilities, may also be related to the development of substance abuse" (Cosden, 2001, p. 356). The relationship between ADHD and substance use has received greater research attention. A number of potential explanations for the association of ADHD and psychoactive substance use disorders have been proposed. A behavioural linkage between these two conditions may exist (Schubiner et al., 2000). For instance, individuals with ADHD may be more susceptible to experimenting with drugs or alcohol as a result of the impulsivity inherent in ADHD. Genetic heritability may also play a role in predicting substance use (Schubiner et al., 2000). However, most of the explanations of the association between ADHD and substance use have focused on deviant peer group affiliation, co-morbid behavioural problems, attention difficulties, self-medication, and stimulant medication as a gateway drug.

1.1.4.1 Peer group affiliation.

In identifying potential high-risk pathways from childhood ADHD to substance use in adolescence, one such study evaluated deviant peer group affiliation as a risk factor for substance use in adolescents with ADHD. Marshal, Molina and Pelham (2003) demonstrated that deviant peer affiliation mediated the relationship between ADHD and substance use, thereby proposing that children with ADHD are more likely than children who do not have ADHD to become involved with deviant peers and, consequently, are more likely to engage in substance use. It is important to note that deviant peer group affiliation is regarded as the strongest and most consistent correlate of adolescent substance use (Hawkins et al., 1992). According to Marshal et al. (2003), deviant peer affiliation may operate as a risk factor for substance use in two ways. Firstly, children with ADHD probably affiliate more with deviant peers in comparison to children who do not have ADHD. Secondly, after adolescents are involved with a deviant peer group, the adolescents with ADHD might be at higher risk for substance use because they are more susceptible to the influences of the deviant peer culture. In these contexts, adolescents with ADHD may be more likely to use maladaptive strategies such as drugs and alcohol to maintain status within their peer group.

1.1.4.2 Externalising behaviour problems.

Much of the research in this area suggests that ADHD's relation to substance abuse is an artefact of the overlap of ADHD with other behavioural problems of childhood, particularly conduct disorder. Flory, Milich, Lynam, Leukefeld and Clayton (2003) investigated whether ADHD and conduct disorder interact to produce substance use problems and found that the two disorders interacted to predict hard drug use (cocaine, heroin and LSD) as well as marijuana dependence symptoms. Other studies found that after controlling for conduct disorder and ADHD, the relationship with substance use is no longer significant.

For instance, Lynskey and Fergusson (1995) studied the relationship between conduct problems, ADHD and substance use in a birth cohort of over 900 New Zealand children. Participants were assessed at ages 8 and 15 years. The authors found that early conduct problems were significantly associated with later substance use; however, there were no significant associations between early attention deficit behaviours and later substance use once the correlations between conduct problems and attention deficit behaviours were taken into account. Lynskey and Fergusson (1995) concluded that attention deficit behaviours, in the absence of conduct problems, are not associated with later substance use. Barkley et al. (1990a) and August et al. (2006) similarly found that ADHD, in the absence of a co-morbid externalising disorder (such as conduct disorder), was not associated with later substance use. In a review of the literature in this area, Lilienfeld and Waldman (1990) concluded that the weight of the available evidence favours the conclusion that ADHD in the absence of conduct disorder is unrelated to increased risks of future substance use.

Chilcoat and Breslau (1999) investigated whether ADHD increases the risk of early drug initiation and found that the relationship between ADHD and substance use varied by the level of associated externalising problems. Regardless of ADHD status, children with a low level of externalising problems had a low risk of drug use while those with the highest level of externalising problems had a high risk. At the middle level of externalising problems, ADHD increased the incidence of drug use to the magnitude observed at the high level of externalising problems. In addition, children with ADHD were at significantly higher risk than those who did not have ADHD.

1.1.4.3 Poor attention.

Inattention has also been identified as a factor influencing substance use. Tapert et al., (2002) followed 66 youths without ADHD at high risk for substance use over a period of 8

years to examine if attentional symptoms at baseline predicted later substance abuse. The results indicated that poor attention and executive functioning at baseline predicted substance abuse at follow-up, even after analyses controlled for substance involvement (at intake), socio-economic status, conduct disorder, learning disabilities and gender. These findings suggest that adolescents with limited attentional abilities, but not necessarily ADHD, may be at risk for developing more problematic alcohol and drug use and related problems. In a sample of community adolescents, Tercyak, Lerman and Audrain (2002) found that ADHD symptoms were a useful indicator of adolescents at risk to smoke, as those with inattention problems were significantly more likely to experiment with cigarette smoking and to become regular tobacco users. On the basis of developmental trajectories of ADHD and cigarette use, it is likely that inattention precedes smoking (Tercyak et al., 2002). However, prospective follow-ups are needed to comprehensively answer this question.

It is important to note that attention dysfunction (associated with learning disabilities) is a common symptom in other psychiatric conditions, including anxiety, depression and psychosis. The symptoms of alcohol or drug use and withdrawal may also mimic those of attention dysfunction. It may be that some of the characteristics observed in individuals with learning disabilities, for example poor school performance and impulsivity, predispose the use of any substance.

1.1.4.4 Self-medication with substances.

Adolescents with learning disabilities and ADHD may use psychoactive substances as a form of self-medication. There is limited evidence available suggesting that adolescents with ADHD turn to drugs to self-medicate more than adolescents without ADHD (Horner & Scheibe, 1997). The number of minor substances used (such as cigarettes) has been found to lead to the use of “harder” substances among the general adolescent population. Generally,

individuals with learning disabilities and ADHD have been found to be more vulnerable to stress than individuals without these disorders. Depending on the particular type of presenting symptomatology, research has proposed that both cocaine and nicotine are used for self-medicating purposes (Lambert & Hartsough, 1998; Pomerleau, Downey, Stelson, & Pomerleau, 1995). Weiss and Mirin (1986) reported that some adults who had ADHD used cocaine for the purpose of reducing motor restlessness and increasing attention span. The self-medication hypothesis of psychoactive substance use disorders proposes that "... some individuals may use substances to ameliorate psychiatric symptoms and their associated distress" (Biederman et al., 1995, p. 1656). Thus, the use of substances may act as a mediator of stressful life events, reducing their effects on the individual.

Studies chronicling the development of drug use consistently demonstrate that the majority of individuals who use illicit substances had earlier used tobacco or alcohol (Lewinsohn, Rohde, & Brown, 1999). Tobacco, therefore, may be considered a gateway drug to the development of other dependencies. As a result, the evidence for significantly higher rates of cigarette use among individuals who have been diagnosed with ADHD suggests that this group is more likely to initiate smoking at an early age (Lambert & Hartsough, 1998). This, in turn, makes this particular group susceptible to later developing higher rates of other substance dependence in adulthood. This proposition suggests that adolescents who have ADHD will therefore develop more problematic substance use problems in comparison to adolescents who do not have ADHD. Prior studies have found that smoking is the drug dependence most highly correlated with ADHD (Hughes, 1997). The beneficial effects of nicotine, such as reduced restlessness, improved concentration and improvement on vigilance tasks, masks as well as improves the major symptoms of ADHD. Therefore the higher rate of smoking among adolescents with ADHD may be a form of self-medication. Cocaine induces a constellation of beneficial effects in the ADHD population, such as mood stabilisation,

relaxation, increased capacity to engage in productive activity as well as improved focus and ability to think (Carroll & Rounsaville, 1993; Castaneda, Levy, Hardy, & Trujillo, 2000). Cocaine and various formulations of stimulants can therefore alleviate ADHD symptoms, however, these agents present varying levels of susceptibility for abuse.

1.1.4.5 Stimulant medication as a gateway drug.

According to a National Institute on Drug Abuse (NIDA) research report on methamphetamine abuse and addiction (2002), methamphetamine is an acceptable medical treatment for ADHD; however, this use is limited. The most robust treatment for ADHD is stimulant medication (Wilson & Levin, 2001). Some researchers have argued that stimulant medication (usually methylphenidate hydrochloride, commonly known as Ritalin) fosters future illicit drug and tobacco use (Daw, 2001). For instance, Lambert and Hartsough (1998) found that tobacco and cocaine abuse were found to be associated with previous stimulant treatment. A recent study examined current ADHD symptoms, stimulant treatment and substance use patterns in a sample of 334 college students (Upadhyaya et al., 2005). It was found that participants with ADHD and using stimulant treatment had greater past-year tobacco and marijuana use. Ritalin has to a certain extent been successful in treating ADHD (Pihl & Peterson, 1991). Recent advanced imaging research has revealed that Ritalin “acts much like cocaine” (Vastag, 2001, p. 905). Cocaine has pharmacological actions that are very similar to those of Ritalin. Taken orally in pill form, Ritalin rarely produces a high and, as shown by previous research, has not been reported to be addictive. However, injected as a liquid, Ritalin produces a similar effect to cocaine in those who take it. This evidence suggests that the mode in which Ritalin is consumed or ingested affects its addictive propensity.

The evidence demonstrating that individuals with ADHD often respond positively to psychoactive medication has resulted in a number of secondary concerns. For instance, objections have been raised that stimulants may prepare adolescents for alcohol and other substance abuse later in life, which may be attributed to the individual associating the use of psychoactive drugs with the improvement of their symptoms or because the use of certain substances may be experienced as physiologically rewarding (Pihl & Peterson, 1991). This may normalise and make the use of medication and illicit substances seem acceptable to adolescents with ADHD. Some authors have argued that the use of stimulants to treat early ADHD causes later substance misuse because early stimulant use acts as a “gateway” drug (much like tobacco and alcohol) to subsequent substance use and misuse (Goldman, Genel, Bezman, & Slanetz, 1998). This is known as the neuroadaptational sensitisation hypothesis, which predicts that “... stimulant treatment in childhood confers increased risk for substance use and abuse later in life regardless of the mental status of the child” (Mannuzza, Klein, & Moulton, 2003, p. 278). It is evident that there is widespread speculation and controversy on the use of prescription drugs, as treatments for individuals with ADHD, and the nature of their relationship to substance use in adolescence. The results of different studies are contradictory, with some showing increased incidence of substance use in individuals receiving stimulant therapy for ADHD, while others show a decreased risk or no difference between those receiving pharmacotherapy or no pharmacotherapy. The contradictory nature of the results is not surprising given that, for ethical reasons, such studies with adolescents who have ADHD are naturalistic and therefore participants are not randomised for treatment. Factors such as severity of illness and whether there is a family history of substance use, may influence whether participants receive stimulant therapy or not and these factors could bias results for either group.

Biederman (2003) compared 19 unmedicated and 56 medicated adolescents with ADHD who were using illicit substances. The control group constituted 137 participants who did not have ADHD. Of the unmedicated adolescents with ADHD, 75% were using substances, 25% of the medicated adolescents with ADHD were users and 20% of the control group. This author concluded that individuals with untreated ADHD are 3 to 4 times at risk for developing substance use disorder compared to those who are using medication prescribed for the treatment of ADHD. In order to confirm the findings, the same participants from the three different groups were compared according to specific drugs of abuse, including cocaine, marijuana, alcohol, hallucinogens and other illicit stimulants. On all the substance use variables, unmedicated ADHD adolescents were at significantly increased risk for substance use disorder in comparison to the medicated adolescents who had ADHD and the control group. These findings purport that instead of causing drug addiction, psychostimulant medication for ADHD acts as a beneficial protective buffer against developing substance abuse. Biederman, Wilens, Mick, Spencer and Faraone (1999) similarly concluded that pharmacotherapy for ADHD was found to protect children with ADHD from substance use. It should be noted that, generally, many other researchers have also found no conclusive evidence thus far to corroborate the claims that stimulant therapy for ADHD is harmful (Barkley, Fischer, Smallish, & Fletcher, 2003; Chilcoat & Breslau, 1999; Faraone & Wilens, 2003; Fischer & Barkley, 2003; Katusic et al., 2005; McCabe, Teter, & Boyd, 2004). In total, twelve previous studies have found no compelling evidence that stimulant treatment of children with ADHD leads to an increased risk for substance use. A pilot study conducted by Castaneda et al. (2000) also supports available evidence that Ritalin might reduce cocaine use and ADHD symptoms although this study was an open trial and double blind controlled trials are warranted. Fischer and Barkley (2003) go so far as to conclude that stimulants for the treatment of ADHD in childhood are not linked to an increased risk of adolescent

experimentation with substance use, the frequency of such use or the risk of developing substance use disorders by young adulthood. In a meta-analytic review of the literature, comprising six studies, Wilens, Faraone, Biederman and Gunawardene (2003) found that stimulant therapy in childhood decreases the risk for subsequent development of alcohol and drug use disorders in adolescence and young adulthood.

Mannuzza et al. (2003) did not find that childhood stimulant treatment provided a protective effect against later substance abuse as Biederman et al. (1999) suggested, but found evidence that refutes the sensitisation hypothesis. In their study, children (ages 7 – 12 years) with learning disabilities were randomly assigned to Ritalin treatment or matching placebo (proband group). A third, comparison group, was also included in the study. At 16-year follow-up, there were no significant differences between the three groups on the prevalence of substance abuse or dependence for any of the seven drug categories studied (including, alcohol, marijuana, cocaine, heroin, inhalants and other illicit substances). With regard to rates of substance use, Ritalin-treated and placebo probands did not differ (46% and 41% respectively), however, the comparison group had a significantly higher rate (60%) than both proband groups. This randomised, placebo-controlled, longitudinal study design provides strong evidence that stimulant treatment in childhood does not lead to substance abuse later in life. Overall, the empirical research thus provides strong evidence that stimulant treatment is not a risk factor for substance abuse later in life, and may even be protective with regard to substance use. It has been proposed that the presence of Ritalin in the brain reduces the effects of illicit substances (Fone & Nutt, 2005).

Non-therapeutic use of Ritalin has been reported in rare case studies, including injecting and snorting of crushed, heated tablets (Garland, 1998; Jaffe, 1991; Poulin, 2001). Jaffe (1991) described a rare case where a 16-year-old male adolescent with childhood ADHD subsequently developed alcohol and drug abuse and later also developed intranasal

Ritalin abuse and dependence. Street names for Ritalin include, “the smart drug”, “vitamin R” and “poor man’s cocaine” (Greydanus, Sloane, & Rappley, 2002; Parran & Jasinski, 1991). In this case, addiction to prescribed Ritalin developed in an adolescent with ADHD in whom substance use already existed. Garland (1998) reported a similar case of a 15-year-old male with ADHD who engaged in intranasal abuse of Ritalin. His euphoric state was characterised by increased activity and insomnia. The adolescent and his friends also experimented with alcohol, marijuana and hallucinogens. In the study conducted by Upadhyaya et al. (2005), 25% of participants using prescribed medication for ADHD reported ever using their medication to “get high”. Intravenous injection of Ritalin has received more attention in the literature, with many case reports associated with lethal outcomes (Parran & Jasinski, 1991). Information from these case studies should, however, be interpreted with caution. The findings from case reports cannot be generalised and should therefore not be given much weight. The authors of the case studies themselves have acknowledged that these are isolated cases of Ritalin misuse. These case studies were presented since they provide background information on the context in which abuse of psychostimulant medication occurs. Anecdotal reports from clinicians indicate that their patients who have ADHD rarely, if ever, experience a “high” or other stimulant effects while taking Ritalin (Kollins, 2003). However, information obtained in this manner should be carefully interpreted and evidence from scientific studies is warranted before significant conclusions may be made. It should be noted that systematic studies of stimulant abuse are few and existing studies are inconclusive (Upadhyaya et al., 2005).

In summary, past research on the relationship between learning disabilities, ADHD and substance use revealed contradictory findings, which may be attributed to methodological problems. The majority of studies focused on the relationship between ADHD and substance use. Possible links explaining the relationship between learning disabilities, ADHD and

substance use were explored, with the weight of the available evidence on the self-medication hypothesis and the use of stimulant medication as a gateway drug for illicit substances. After carefully reviewing the evidence, it was concluded that stimulant medication for ADHD does not lead to the use of illicit substances.

1.2 Are Sleep Problems Associated with Substance Use?

Sleep problems are common in adolescents. Vignau et al. (1997) assessed the prevalence and correlates of sleep problems in a sample of 763 adolescents. The investigators found that 40.5% of the participants reported at least one of five sleep-related problems examined in the study (namely, difficulties falling or staying asleep, a need for more sleep, early awakenings and chronic sleeping pill intake). However, among adolescents, the epidemiology of sleep problems has received little attention (Johnson & Breslau, 2001). Adolescents often complain of tiredness and it seems that they have an increased need for sleep at this age (Morrison, McGee, & Stanton, 1992). Data obtained from sleep laboratories confirms that older adolescents may actually have a physiological need for more sleep than younger adolescents (Carskadon, 1990). Sleep-research confirms that adolescents require 9 to 10 hours of sleep per night (Millman, 2005). In adolescents, however, the increased physiologic need for sleep comes in conflict with heightened academic, social and work demands. Disordered sleep may affect multiple aspects of an adolescent's life, such as peer relationships, parental interactions and academic performance. It is important to note that sleep problems tend to decrease with age; however, most children do not outgrow these problems (Robinson & Richdale, 2004). Sleep problems are reported to be more frequent in older than in younger adolescents. Research on sleep problems is important in so far as untreated sleep problems may lead to substance use. Virtually all substance use disorders are associated with sleep disruption (Teplin, Raz, Daiter, Varenbut, & Tyrrell, 2006). There is a

growing body of evidence suggesting that there is a significant relationship between substance use and sleep problems.

1.2.1 Definition of Sleep Problems

For the purposes of this dissertation, the term “sleep problems” is used interchangeably with the terms “sleep disturbances”, “sleep abnormalities”, “impaired sleep”, “sleep difficulties” and “disrupted sleep”. All of these terms refer both to subjective complaints about sleep, such as insomnia, and to objectively measured abnormalities in sleep, which can be determined using a procedure called polysomnography.

Sleep problems are the most persistent of all child behavioural disturbances. In the International Classification of Sleep Disorders (American Sleep Disorders Association, 1990), which is the most comprehensive classification available, sleep disturbances are classified into two categories, namely the dyssomnias (disorders of initiating or maintaining sleep or of excessive sleepiness) and the parasomnias (disorders that disrupt sleep after it has been initiated). The most common sleep problems experienced by both typically developing children as well as children with an intellectual disability include night waking, co-sleeping and night settling (Robinson & Richdale, 2004). In adolescents, the most common sleep problems are delayed sleep phase syndrome (DSPS) and insomnia (Halbower & Marcus, 2003; Rosen, 1997). Psychophysiologic insomnia (difficulty initiating or maintaining sleep) primarily occurs in adolescents and adults (Owens & Witmans, 2004). Some researchers have suggested that clinically significant sleep problems may more appropriately be viewed as “... more loosely occurring along a severity and chronicity continuum that ranges from a transient and self-limited disturbance to a disorder that meets specific diagnostic criteria” (Owens & Witmans, 2004, p. 162).

1.2.2 Sleep Problems and Alcohol Consumption

Relatively little is known about the relationship between sleep problems and alcohol use (or substance use in general) in adolescence (Wong et al., 2004). One such study conducted by Tynjälä, Kannas and Levalahti (1997) found an association between later and more irregular sleep schedules, perceived daytime tiredness and increased use of alcohol among Finnish adolescents. Other studies similarly found an association between sleep problems and alcohol use among adolescents (Johnson & Breslau, 2001; Vignau et al., 1997). Wong et al. (2004) concluded that sleep problems significantly increased the likelihood of early onset of alcohol use in adolescence. Research with adults has shown that sleep disturbance is a risk factor for developing alcohol-use disorders, namely alcohol abuse and alcohol dependence. The study by Breslau, Roth, Rosenthal and Andreski (1996) reported an increased risk for alcohol abuse / dependence associated with insomnia. Alcohol is a sedative and can induce rapid onset of sleep, which leads to it being (mis)used to self-medicate for treatment of stress and insomnia. Studies have estimated that 15 to 28 percent of individuals with insomnia have used alcohol to promote sleep (Johnson, Roehrs, Roth, & Breslau, 1998). Johnson et al. (1998) found that difficulty falling asleep was the factor most strongly associated with use of substances to improve sleep. Results of previous studies have suggested that insomnia precedes the development of alcohol problems in some adults (Gillin, 1998). Some individuals commonly use alcohol to self-medicate for sleep problems – this is even more common among alcoholics. Studies indicate that sleep pattern irregularities and sleep problems may be associated with increased alcohol use. Brower, Aldrich, Robinson, Zucker and Greden (2001) established that between 44 and 60 percent of alcoholic patients report using alcohol to help them sleep prior to entering treatment. However, alcohol is not a reliably effective sedative among alcoholic individuals. For example, in alcoholics, alcohol may decrease total sleep time. In addition, alcoholic patients may rapidly develop

tolerance to alcohol's sedative effects, thus rendering it ineffective as a sleep aid. Crum, Storr, Chan and Ford (2004) assessed the risk of alcohol-related problems among individuals with self-reported sleep disturbances attributed to worry. The authors found that participants with sleep disturbances because of worry had a two-fold higher risk for developing an alcohol-related problem relative to those who did not have sleep disturbances. Self-medication of insomnia with alcohol, even if reinforcing, may paradoxically worsen insomnia. At the same time, alcohol consumption, through its effects on brain chemicals, may lead to sleep disturbance.

The relationship between sleep disturbance and alcohol use is complex and interactive (Vitiello, 1997). There is evidence that alcohol use affects the sleep of healthy individuals who do not have alcohol problems. Sleep disturbance is one of the most common complaints of alcoholic patients (Benca, Obermeyer, Thisted, & Gillin, 1992; Brower, 2001). During both drinking periods and withdrawal, alcohol dependent individuals report difficulty falling asleep and decreased total sleep time. Even alcoholics who have been abstinent for short periods of time (for example, several weeks) or extended periods (for example, several years) may experience persistent sleep abnormalities. It has been suggested that sleep problems may increase the risk of relapse among abstinent alcoholics. Mounting evidence indicates that alcoholic individuals with good prognoses sleep better than patients at high risk for relapse. Researchers have also found that alcoholics are more likely to suffer from particular sleep disorders, such as sleep apnea. Some sleep problems could precede the development of alcoholism and therefore persist into abstinence.

1.2.3 Sleep Problems and Tobacco Use

Researchers have reported a relationship between sleep problems and cigarette use among adolescents (Johnson & Breslau, 2001; Tynjälä et al., 1997; Vignau et al., 1997). In a

longitudinal study of 13 831 adolescents, the use of cigarettes was associated with adolescents' reports of having frequent sleep problems, after adjusting for age, race, sex and family income (Johnson & Breslau, 2001). Wong et al. (2004) found that sleep problems in childhood significantly increased the likelihood of early onset of occasional or regular cigarette use in adolescence.

The studies that have examined the relation between smoking and sleep in adults have produced mixed results. Some studies have indicated greater sleep disturbance among individuals who smoke (Lexcen & Hicks, 1993; Patten, Choi, Gillin, & Pierce, 2000; Phillips & Danner, 1995; Wetter & Young, 1994) or were diagnosed with nicotine dependence (Breslau et al., 1996). The Phillips and Danner (1995) study included a wide age range sample (14 to 84 years) and they suggested that cigarette smoking is associated with poor sleep quality, poor sleep habits as well as impairment of daytime functioning. Due to the broad age range, it is interesting that the results are consistent from adolescence to old age. After controlling for demographic, psychological, behavioural and health variables, it was found that light smoking (less than 15 cigarettes per day), but not heavier smoking was associated with self-reported chronic insomnia among an adult population (Riedel, Durrence, Lichstein, & Taylor, 2004). Breslau et al. (1996) found a significant relationship between insomnia and cigarette use. Individuals with insomnia were 2.4 times more likely to experience the onset of nicotine dependence. Breslau et al. (1996) concluded that insomnia might contribute to the development of substance use disorders. However, other investigations did not find greater sleep disturbance in smokers relative to individuals who do not smoke (Kim et al., 1999; Newman, Enright, Manolio, Haponik, & Wahl, 1997). Other studies have reported mixed results. For instance, among an adult population, one study found a correlation between smoking and sleep disturbance in two of the three samples

surveyed (Foley et al., 1995). Another study reported increased sleep latency, but decreased nocturnal awakenings among adult smokers (Janson et al., 1995).

Smoking may also be related to sleep disturbance due to the stimulant properties of nicotine. Nicotine affects sleep on a pharmacologic basis. Nicotine increases sleep latency and reduces rapid eye movement sleep as well as total sleep time (Phillips & Danner, 1995). In addition to smoking causing sleep disturbance, sleep disturbance could also play a role in the motivation to smoke (Wetter & Young, 1994). The symptoms of sleep disturbance, such as cognitive impairment, fatigue and depression, resemble those of nicotine withdrawal and these symptoms may motivate the desire to smoke. Therefore the relationship between smoking and sleep disturbance may be reciprocal, where smoking causes sleep disturbance and where sleep disturbance promotes smoking in response to disturbances in mood and sleepiness. The degree to which these associations with sleep problems extend to the use of illicit drugs has largely not been investigated, but is receiving increasing attention.

1.2.4 Sleep Problems and Illicit Substances

A few epidemiologic studies have examined illicit substance use and sleep in adolescents. Cross-sectional studies suggest that sleep problems are positively related to substance use in adolescence (Johnson & Breslau, 2001; Tynjälä et al., 1997; Vignau et al., 1997). Breslau et al. (1996) found that a history of sleep disturbance signalled an increased risk for new onset of illicit drug use disorder in young adults. More recently, Johnson and Breslau (2001), in a sample comprising 13 381 adolescents, found a positive relationship between self-reports of often having difficulty sleeping and use of any illicit drug. The use of these substances did not occur in isolation, for instance, participants who used illicit drugs often also used cigarettes and / or alcohol. The authors concluded that their findings may

reflect the tendency for sleep problems and substance use to co-occur in the same individuals during adolescence.

Vignau et al. (1997) examined a sample of French secondary school learners, comparing “good sleepers” and “poor sleepers” (this category included “needing more sleep”, insomnia and use of sleeping pills). The investigators reported associations between being a “poor sleeper” and use of illicit drugs. Wong et al. (2004) examined whether sleep problems in early childhood predicted the onset of other drug use in adolescence and whether such a relationship was mediated by other known predictors of the relationship, namely aggression, anxiety / depression and attention problems. This study is part of an ongoing longitudinal study of the development of risk for substance use disorders. The sample included 257 boys, which limits the extent to which the findings are generalisable to females. Wong et al. (2004, p. 583) concluded that sleep problems significantly increased the likelihood of early onset of marijuana and illicit drug use, and suggested that “... sleep difficulties early in the life of a child are a marker of an independent contributor to early substance involvement”. However, the existence of these relationships do not articulate the underlying mechanisms producing the problem outcome.

1.2.5 Explaining the Links Between Sleep Problems and Substance Use

The relationship between substance use and sleep problems is bidirectional – not only does substance use lead to sleep problems, but sleep problems can lead to substance use (Bootzin & Stevens, 2005). However, the mechanism by which sleep problems and substance use may be related has largely not been examined. Johnson and Breslau (2001) proposed that since both sleep problems and substance use are associated with psychiatric problems; it may be that any association between sleep problems and substance use may be due to their association with psychiatric problems. Johnson and Breslau (2001, p. 6) further asserted that

it may be that "... substance use causes sleep problems and / or that sleep problems are early indicators of psychiatric problems and substance use". Among adults, it appears that substance use can produce insomnia through pharmacological effects, but that insomnia is also an early indicator of increased risk for substance abuse (Johnson & Breslau, 2001). The association between poor sleep and cigarette smoking has been attributed to a more disturbed personality type, general unhealthy approach to lifestyle, the stimulant effects of nicotine as well as a pharmacologic effect of tobacco smoke (Janson et al., 1995; Phillips & Danner, 1995). It should be pointed out that among the adolescent population, the reasons for the relationship between sleep problems and substance use has largely not been examined.

Carskadon (1990) concluded that many adolescents do not get enough sleep and that the consequences of a chronic pattern of insufficient sleep include mood and behaviour problems, daytime sleepiness as well as increased vulnerability to drugs and alcohol. She notes that alterations in waking and sleeping patterns are a normative part of adolescence and further attributes these changes to a number of sources, including involvement in part-time employment, changing academic demands and increased access to drugs and alcohol. In her study, Carskadon (1990) found that adolescents who were engaged in more part-time employment work reported a chronic pattern of extremely short sleep along with greater use of caffeine, tobacco and alcohol. Adolescents may thus abuse drugs in an attempt to increase alertness by self-medication with caffeine and other more potent stimulants. Evidence also suggests that, in adolescents, increased alcohol use is associated with insufficient sleep. This relationship may have particularly detrimental consequences for adolescents due to the well established link between this age group and experimentation with alcohol and other risk-taking behaviours.

It is important to acknowledge that a shortage of sufficient sleep is a potentially serious problem. The magnitude of the problem has been largely ignored; perhaps because

adolescent sleepiness is so widespread that it almost seems normal. It is evident from an empirical observation of secondary school classrooms that many adolescents struggle with daytime wakefulness. Yet the consequences of chronic sleep deprivation, even if sometimes subtle, are very real especially since it may lead to the development of lifetime patterns of substance use. To the extent that an adolescent is excessively sleepy, they may therefore have an increased vulnerability to a number of poor outcomes, including adolescent substance use. Although the majority of past studies have focused on the adult population, they provide preliminary evidence for a relationship between sleep problems and the use of alcohol, tobacco and illicit substances.

1.3 Are Sleep Problems Associated with Learning Disabilities?

Given the prevalence of sleep disturbance noted above, there has, however, been a paucity of adequate data on the co-morbidity of learning disabilities and sleep problems.

1.3.1 Learning Disabilities and Sleep Problems

Persistent sleep problems have been associated with learning difficulties throughout the school years (Quine, 1992). Quine (2001) compared primary school children (aged 4 – 12) who did not have an intellectual disability (attending mainstream schools) and children with an intellectual disability (attending special schools) and found that children from special schools had higher rates of night waking (45%) and night settling (41%) in comparison to their mainstream counterparts where prevalence rates were 13% and 27% respectively. Richdale, Francis, Gavidia-Payne and Cotton (2000) similarly found that children with an intellectual disability had higher rates of both past (66.7%) and present (57.7%) sleep problems in comparison to typically developing children where prevalence rates were 16% and 33.3% respectively. Mercier et al. (1993) examined the sleep patterns in reading disabled

and a control group of children. They found that reading disabled children demonstrated significantly more stage 4 sleep, less REM sleep, a longer REM onset latency and, related to this, an extended initial non-REM cycle. The authors speculated that maturational delay and chronic sleep deprivation are important factors that could result in such variations in sleep architecture and that these factors, alone or in combination, could impair information processing and contribute to the cognitive deficits noted in reading disabled children. Sleep problems have been consistently identified to negatively influence learning rate and cognitive importance in both typically developing youngsters and adults. It is important to note that the relationship between learning disabilities and sleep problems has, however, received little clinical and research attention and remains to be elucidated.

1.3.2 ADHD and Sleep Problems

The relationship between neuro-developmental disorders and sleep has been most extensively studied in children with ADHD. Even then, there is only a small collection of empirical literature addressing the relationship between ADHD and sleep. The majority of these studies relied on parental perception of sleep quality in children and few studies surveyed children directly on their sleep problems or used objective assessments, such as polysomnography, which presents shortcomings in the available literature. Other methodological limitations of these studies include selection bias, small sample sizes, variability in diagnostic criteria for ADHD, across-study differences in diagnostic procedures, failure to document pubertal status (which may affect circadian timing of sleep / wake cycles) and variability in control groups (Millman, 2005; Owens, 2005). In addition, even though parental assessment of their children's sleep behaviour may be regarded as more subjective, relatively objective methods may not accurately portray "real-world" conditions. Adults are regarded as poor raters of their own sleep and the reliability of parental reports of their

children's sleep problems is therefore questionable (Pearl, Efron, & Stein, 2002). It is important to note that the definition of a "sleep problem" by parents is often highly subjective and is frequently determined by the amount of disruption caused to parents' sleep (Owens & Witmans, 2004). Many of these studies have also not considered the effects of medication and the presence of co-morbid psychiatric conditions as well as learning disabilities and academic failure (Owens, 2005). The majority of the studies are cross-sectional surveys in selected populations that provide important data regarding sleep in discrete age groups, but cannot describe the persistence of sleep / wake patterns over time. Most previous studies of sleep disturbances in adolescence have examined wide age ranges rather than specific ages. The relationship between sleep problems and ADHD in children has been examined in multiple studies, utilising a number of approaches, although comparable data for adolescents and adults are largely unavailable (Ball, Tiernan, Janusz, & Furr, 1997; Brown & McMullen, 2001; Corkum, Moldofsky, Hogg-Johnson, Humphries, & Tannock, 1999; Day & Abmayr, 1998; Marcotte et al., 1998; Owens, Maxim, Nobile, McGuinn, & Msall, 2000a; Ring et al., 1998; Trommer, Hoepfner, Rosenberg, Armstrong, & Rothstein, 1988). Reviews of ADHD in adolescents include some anecdotal references to sleep problems, however, studies of childhood ADHD and sleep are rare (Brown & McMullen, 2001).

Previous studies that focused on parental ratings of sleep behaviour have more consistently supported an increased prevalence of sleep problems, including poor sleep quality, delayed sleep onset and more frequent night wakings, in children diagnosed as having ADHD in comparison to the control group or children with other learning or behavioural problems (Ball et al., 1997; Ball & Koloian, 1995; Day & Abmayr, 1998; Kaplan, McNicol, Conte, & Moghadam, 1987; LeBourgeois, Avis, Mixon, Olmi, & Harsh, 2004; Marcotte et al., 1998; Owens et al., 2000a; Ring et al., 1998; Trommer et al., 1988). Sleep disturbance among children with ADHD has been so widely presumed that the DSM-

III listed sleep disturbance as one of the defining characteristics of ADHD (American Psychiatric Association, 1980). However, none of the more recent diagnostic manuals have included sleep disturbance as a criterion symptom of ADHD, which may be attributed to the realisation that sleep problems are not necessary for the diagnosis of ADHD (American Psychiatric Association, 1994). Sleep problems are also included on a number of child rating scales that are used as part of the diagnostic procedures for ADHD, such as the Conner's Parent Rating Scale (Goyette, Conners, & Ulrich, 1978). The rationale for including these items seems to be based on clinical observations that identified an association between sleep disturbances and ADHD, rather than a theory involving sleep disturbances in ADHD (Corkum, Tannock, & Moldofsky, 1998). Complaints of sleep disturbance from adolescents with ADHD warrant clinical attention since inadequate sleep or alertness may significantly exacerbate behavioural and cognitive symptoms associated with ADHD. A wealth of previous research has demonstrated the harmful effects of sleep deprivation on the cognitive functioning of individuals who do not have ADHD. It is, however, acknowledged that behavioural manifestations of daytime sleepiness may vary according to a multitude of factors, such as individual sensitivity to sleep deprivation, developmental level, setting and motivation level (Owens, Spirito, McGuinn, & Nobile, 2000b).

Sleep disturbance is even more common than ADHD in the general population (Brown & McMullen, 2001). It is therefore not surprising that there exists some degree of overlap between these two disorders. However, the rate of sleep disturbance in children with ADHD is higher than among children in the general population who do not have ADHD. For instance, Ball et al. (1997) found that more than 50% of children with ADHD experienced difficulty falling asleep. In addition, the parents of children with ADHD also reported a greater intensity of sleep difficulty experienced by their children. In a five-year prospective study, Thunström (2002) compared a group of children with severe sleep problems in infancy

with a control group on the development of ADHD symptoms and concluded that approximately one in four children with severe sleep problems in infancy will later qualify for the diagnosis of ADHD. However, the small sample size (25 participants in each group) limits the extent to which conclusions can be drawn. Tynjälä et al. (1997) concluded that among adolescents, poor or insufficient sleep and its associated tiredness are related both to behavioural problems and emotional disorders, resulting in lack of concentration and problems with academic work. Mick, Biederman, Jetton and Faraone (2000) addressed many of the weaknesses noted above in other studies investigating ADHD and sleep problems through examining the impact of psychiatric co-morbidity and pharmacotherapy on sleep disturbances associated with ADHD. The sample comprised 122 youths with ADHD and 105 non-ADHD comparison youths. Results indicated that ADHD was associated with 10 of the 19 sleep problems assessed. It should be noted that there are, however, relatively few large-scale epidemiologic studies available that systematically define normal sleep patterns and sleep duration in adolescents (Owens & Witmans, 2004).

Many adults and adolescents with ADHD similarly report chronic difficulties with falling asleep, difficulties in awakening as well as difficulties in maintaining adequate daytime alertness for effective functioning (Brown & McMullen, 2001). A caveat is that many children and adolescents have more than one sleep problem (Rosen, 1997). Morrison et al. (1992) surveyed 943 adolescents from the general population on sleep problems and found that the adolescents who reported sleep problems showed more inattentive and anxious behaviours than those who had no (or only occasional) sleep problems. In addition, those who reported no problems with their sleep had lower anxiety and ADHD scores than those with sleep problems. Evidence indicates that inattentive and hyperactive children have more frequent snoring as well as more severe daytime sleepiness (Chervin et al., 2002).

Wakefulness is essential to rapid learning and excessive daytime sleepiness therefore hinders

the learning process, posing significant challenges for the adolescent with ADHD. In a survey of sleep habits that comprised a sample of 46 children with ADHD and 46 controls, it was found that children with ADHD scored significantly higher on all sleep sub-scales and also reported more sleep disturbance than controls (Owens et al., 2000). Gruber, Sadeh and Raviv (2000) compared the sleep patterns of children with ADHD and a non-ADHD control group and found increased instability in sleep onset and sleep duration in the ADHD group. Another study found that adolescent students with more irregular sleep schedules had more behaviour problems and lower academic achievement in comparison to students with stable sleep schedules (Wolfson & Carskadon, 1998). Paavonen, Solantaus, Almqvist and Aronen (2003) assessed the course of sleep disturbances in pre-adolescents during a four-year follow-up. The authors found that the children's reports on their current sleep problems were associated with a higher total score in attention symptoms. It may be concluded that within the clinical entity of attention problems, sleep complaints are frequent. Irregularities in the quality and quantity of sleep could be a mediating factor that either exacerbates or directly contributes to the problems of adolescents with ADHD.

Sleep problems are common and chronic in adolescents with ADHD, however, parents may not recognise their child's sleep as a problem, often do not seek treatment for their child's sleep problems and treatment advice and effectiveness is very variable. There can be long-term consequences of untreated childhood sleep problems that affect the adolescent. For instance, a methodologically rigorous longitudinal study spanning an 11-year period in a sample of 490 children, from ages 4 to 15, found that sleep problems at age 4 predicted behavioural / emotional problems in mid-adolescence (Gregory & O'Connor, 2002). The correlation of sleep problems with depression, anxiety and attention problems increased with time (Gregory & O'Connor, 2002).

1.3.3 Explaining the Links Between Learning Disabilities and Sleep Problems

There are many possible reasons for the greater prevalence of sleep problems among adolescents with learning disabilities. For instance, individuals with learning disabilities learn at a much slower rate than their non-learning disabled counterparts and often have limited command and understanding of language (Quine, 2001). This may make it more difficult for individuals with a learning disability to learn the “rules” of appropriate night-time behaviour. In addition, physical impairments may contribute to the difficulty by reducing the opportunities for learning. Previous studies have examined the relationship between the consistency of hand use and insomnia. (Individuals with learning disabilities often experience difficulties with hand co-ordination, such as difficulties in holding a pen.) For example, Hicks, DeHaro, Inman and Hicks (1999) found that inconsistent hand use was modestly associated with the increased likelihood of a small set of insomnia-related symptoms. Sleep problems are also common in children with an intellectual disability (Robinson & Richdale, 2004). There are many individuals with learning disabilities who also have other disorders, such as epilepsy, which may disrupt sleep patterns (Quine, 2001). Parents of children with learning disabilities are often more responsive when bedtime problems occur. Consequently, anxiety about the child may sometimes result in a parent altering their usual patterns of child-rearing, which may inadvertently encourage and maintain the child’s sleep problems.

Researchers are beginning to compile evidence relating emotional well-being to sleep patterns. Previous research suggests that troubled sleep often reflects underlying emotional concerns (Dollinger, Horn, & Boarini, 1988). Learning-disabled adolescents often have concerns about their cognitive adequacy and it may be inferred that similar concerns should relate to troubled sleep. Findings indicated that sleep problems were associated with concerns about intellectual and academic adequacy and therefore the disturbed sleep experienced by learning-disabled adolescents may be related to their disability (Dollinger et al., 1988). It is

largely a clinical assumption that children's troubled sleep often reflects whatever emotional concerns are currently salient in their lives. In general, poor sleep is associated with both behavioural and emotional problems. Morrison et al. (1992) compared four groups of 13- and 15-year-olds in New Zealand: those with no sleep problems, those indicating they needed more sleep only, those reporting difficulties falling asleep or maintaining sleep and those with multiple sleep problems. These investigators found that adolescents in the sleep-problem groups were more anxious, had higher levels of depression and had lower social competence compared to those in the group who did not have sleep problems.

Researchers have observed an association between sleep problems and a number of characteristics, including poor academic skills, poor communication skills, poor self-help skills and daytime behaviour problems (Quine, 1991). Wolfson and Carskadon (1998) found that adolescents who reported disturbed or inadequate sleep were also more likely to report subjective sleepiness, mood disturbances as well as deficits in both social and academic performance.

1.3.4 Explaining the Links Between ADHD and Sleep Problems

The nature of the association between sleep problems and ADHD remains uncertain. Corkum et al. (1999) proposed four models to explain the relationship between ADHD and sleep problems. Firstly, specific sleep problems may be uniquely related to the diagnostic category of ADHD. Second, sleep problems may be associated to another disorder that often occurs with ADHD, such as anxiety. Third, sleep problems may be caused by stimulant medication used to treat ADHD. Finally, it may be that sleep problems are not related to ADHD, but that these problems are common in the general population of children. Dahl and Puig-Antich (1990) asserted that ADHD might be the result of inadequate sleep. This is reasonable since children with primary insomnia report decreased concentration and impaired

attention, mimicking the clinical features of ADHD (Dahl & Puig-Antich, 1990). Other researchers have suggested that perhaps children with ADHD are more likely than other children, even those with similar learning problems, to make their sleep problems known to parents (Cooper, Tyler, Wallace, & Burgess, 2004).

Sleep is an autonomically governed process that reflects cyclical changes in brain arousal and ADHD may result from irregular arousal functioning. It has been postulated that children with ADHD display significant alterations in their sleep patterns and that REM (rapid eye movement) sleep is affected by ADHD (O'Brien, Ivanenko, et al., 2003). However, the association between ADHD and sleep architecture abnormalities remains unclear. Disrupted sleep can be caused by pulmonary abnormalities, neurologic diseases, family problems, psychiatric problems or psychological difficulties (Dahl, 1998; Rosen, 1997). It has been suggested that the impairments in sleep / arousal may be related to the underlying pathophysiology of ADHD. According to Ball et al. (1997, p. 390), there exists a "logical association" between the physiology of sleep and the presence of sleep problems among individuals with ADHD. Mick et al. (2000) found a relationship between ADHD and sleep problems among a sample of youths. However, after controlling for pharmacotherapy with stimulants and psychiatric co-morbidity, the majority of these differences were no longer evident. The investigators concluded that although sleep problems are common in youths with ADHD, they are frequently accounted for by pharmacotherapy and co-morbidity.

Individuals may also attempt to self medicate sleep disturbance by abusing alcohol or using over the counter sleep aids, which can easily result in addiction (Brown & McMullen, 2001). These attempts are often not very effective because they may not work, may contribute to exacerbating attention problems and may alter the overall quality of sleep attained. This provides evidence of a cyclical, intertwined relationship between sleep problems, substance use and learning disabilities and may account for the co-morbidity

between the three disorders. The overlap between the three disorders makes it difficult to establish the independence of the disorders.

Insomnia is a common adverse effect of stimulant medication (Ritalin) for the treatment of ADHD (Barkley, McMurray, Edelbrock, & Robbins, 1990b; Goldman et al., 1998). It is interesting to note that Ritalin and methamphetamine were initially prescribed for the treatment of narcolepsy, another sleep disorder (National Institute on Drug Abuse, 2002). In the ADHD population, there appears to be considerable individual variation to the degree that stimulants affect sleep. Stimulants used to treat ADHD may contribute to difficulties falling asleep in two different ways (Brown & McMullen, 2001). It may be that an individual with ADHD who is responding well to stimulant medication taken during the day may experience insomnia as a result of taking a dose too close to bedtime (Brown & McMullen, 2001). The alternative is that sometimes the sleep of an individual with ADHD may also be delayed due to insufficient stimulant medication later in the day (Brown & McMullen, 2001). The fact that stimulant medications treat the core symptoms of ADHD and exhibit side effects related to reducing sleep when administered too close to bedtime suggests a common mechanism for reduced arousal as well as reduced attention. In contrast, Tirosh, Sadeh, Munvez and LaVie (1993) found that Ritalin administered late in the afternoon tended to actually improve sleep for many individuals with ADHD. Some individuals with ADHD and who have a history of chronic difficulty in maintaining alertness have reported that they are better able to maintain appropriate alertness when their ADHD is treated with stimulant medication. In children with ADHD, it has been found that the presence or absence of stimulant medication as part of the intervention for ADHD was not a mitigating factor in whether or not children had more or less prevalent sleep difficulties and did not have an effect on the intensity of the sleep problem (Ball et al., 1997). It may be deduced that the data

regarding which children may experience sleep side effects of stimulant medication is contradictory.

1.3.4.1 Overlap of symptoms between ADHD and sleep problems.

The study of sleep problems in ADHD may be particularly important because disturbances in sleep, such as sleep-disordered breathing (SDB), narcolepsy and periodic leg movements in sleep (PLMS), may present symptoms that resemble ADHD. Periodic limb movements in sleep are brief, repetitive jerks of the toes, feet, legs and / or thighs that usually occur in stages 1 and 2 of non-rapid eye movement sleep (Picchiatti, England, Walters, Willis, & Verrico, 1998). The relationship between periodic limb movements in sleep and ADHD is currently under investigation. Several studies have shown that periodic limb movements in sleep and hyperactive behaviours are closely correlated (Chervin et al., 2002). In one study by Picchiatti and Walters (1999), 15 out of 16 children with frequent periodic limb movements in sleep had ADHD. There is a high prevalence of ADHD among children diagnosed with periodic limb movements in sleep and, conversely, children with ADHD show a high prevalence of periodic limb movements in sleep (Picchiatti & Walters, 1999). The authors believe that the link between periodic limb movements in sleep and ADHD may be partially explained by the sleep fragmentation that results from periodic leg movement. Furthermore, individuals with co-morbid periodic limb movements in sleep and ADHD are significantly more likely to have arousals associated with sleep fragmentation in comparison to those individuals with periodic limb movements in sleep alone (O'Brien & Gozal, 2004). Ongoing research is examining a possible association between alcohol abuse and restless legs syndrome (RLS) and periodic limb movements in sleep.

There are close links between the regulation of sleep and the control of behaviour, emotion and attention. Sleep problems exacerbate daytime behaviour, hyperactivity and

ADHD symptoms. Parental reports of hyperactive behaviour and inattention are linked to sleep-disordered breathing (Chervin et al., 2002; Melendres, Lutz, Rubin, & Marcus, 2004). Previous studies have established a link between symptoms of sleep-disordered breathing and behaviours consistent with ADHD, such as motoric hyperactivity, difficulty focusing and inattention, and have documented improvement in ADHD symptoms after treatment for obstructive sleep apnea syndrome (OSAS).

OSAS is a more severe form of sleep-disordered breathing (O'Brien & Gozal, 2004). One study has suggested that 25% of cases of ADHD may be linked to symptoms of sleep-disordered breathing (Chervin, Dillon, Bassetti, Ganoczy, & Pituch, 1997). OSAS is associated with poor learning, behavioural problems and ADHD (Owens & Witmans, 2004). The primary symptom of OSAS is snoring. Common occurrences in habitual snorers include behavioural hyperactivity, daytime sleepiness, learning problems and restless sleep (Chervin et al., 2002). It appears that a possibly causative link seems to be present between hyperactive behaviour and fragmented sleep (O'Brien & Gozal, 2004). It is important to note that even though there is some evidence linking learning impairment and academic performance difficulties in children with OSAS, research is still needed to establish what the most vulnerable age groups are and how the consequences may be reversed (Gozal, 1998).

Narcolepsy is rarely diagnosed in children although retrospective surveys suggest it frequently presents in late childhood and early adolescence (Owens & Witmans, 2004). The cardinal feature of narcolepsy, namely repeated episodes of profound sleepiness, is likely to be confused with ADHD. Research that studied individuals who had diagnoses of both ADHD and narcolepsy has suggested that children or adolescents with narcolepsy may be misdiagnosed as having concurrent ADHD (Brown & McMullen, 2001). It is possible that individuals with ADHD as a primary diagnosis may have ongoing sleep-related problems exacerbating the ADHD symptomatology, but that are not severe enough to warrant a

primary diagnosis of a sleep disorder. Alternatively, some adolescents diagnosed with ADHD may actually have a primary sleep disorder. Such a diagnosis may parsimoniously account for symptom presentation. The overlap between a diagnosis of sleep disorders and ADHD has led to a number of case studies in which “misdiagnosis” of ADHD in children with sleep disorders has been reported. Adolescents with narcolepsy often do not seek medical attention and are frequently labelled as having mood disorders, learning problems and academic failure before the underlying etiology is identified, which is often decades later (Owens & Witmans, 2004).

Gozal (1998) assessed the impact of sleep-associated gas exchange abnormalities (SAGEA), which is a form of sleep disordered breathing, on school performance in children. This study found that SAGEA is a frequent occurrence among first-grade learners in whom it adversely affects learning performance. Furthermore, Gozal (1998) found that when therapeutic intervention in the form of adenotonsillectomy is performed, in order to resolve SAGEA, subsequent school performance is significantly improved, suggesting a causal relationship between SAGEA and learning ability. This demonstrates that some component of the learning difficulties exhibited by these children is attributable to sleep-disordered breathing. Current evidence supports the notion that sleep plays a pivotal role in the regulation of mood, arousal and learning, which are three domains that are central to conceptualising symptomatology in ADHD (Dahl & Puig-Antich, 1990). Alterations in the control of attention and arousal are a possible source of overlap between the regulation of sleep and the psychobiology of ADHD. Inattention and hyperactivity were associated with sleep-related breathing disorders among children referred to sleep centres and children who were seen in child psychiatry and general pediatrics clinics (Chervin et al., 1997). Sleep disturbances seem to decrease one’s ability to regulate, control or inhibit emotion and

behaviour (Wolfson & Carskadon, 1998). Systematic studies are needed to address these questions.

Weinberg and Brumback (1990) and Weinberg and Harper (1993) proposed a novel approach to conceptualise ADHD with chronic problems in maintaining alertness. The above authors designated the term “primary disorder of vigilance” for describing a syndrome involving boredom, inattentiveness, distractibility, hyperactivity, disorganisation, sleepiness and restlessness as a replacement for the diagnosis of ADHD. They presented case studies that illustrated how individuals with this syndrome tend to be hyperactive in order to ward off drowsiness. The notion of a “primary disorder of vigilance” has, however, largely not been adopted in clinical and research literature.

The core symptoms of ADHD, such as hyperactivity, inattention and difficulty in regulating behaviour and emotions, are strikingly similar to the difficulties caused by disrupted sleep and sleep deprivation. Researchers have asserted that daytime behaviours of individuals with a wide variety of sleep disorders (such as narcolepsy, sleep apnea, periodic limb movement syndrome, insufficient sleep and sleep schedule disorders) can mimic ADHD by manifesting difficulties with focused attention, hyperactivity and impulsivity. This view is consistent with that of Dahl, Holttun and Trubnik (1994). For example, Brooks (1993) reported that sleep apnea could often be misdiagnosed as ADHD because many children with sleep apnea are often hyperactive. In fact, learning problems have been well regarded as a manifestation of obstructive sleep apnea in children for over one hundred years. Diagnostic confusion may also result from the fact that common pharmacological treatments for ADHD may also improve narcolepsy symptoms. There is a mounting body of evidence that sleep-disordered breathing and snoring are associated with hyperactivity and ADHD (O’Brien, Holbrook, et al., 2003). Dahl, Pelham and Wierson (1991) chronicled the case of a 10-year-old girl with a diagnosis of ADD (Attention Deficit Disorder) and a 5-year history of sleep

difficulties who demonstrated significant improvement of ADD and learning disability symptoms following treatment of her sleep problem. Despite the persistence of the girl's ADD symptomatology, the improvement in sleep apparently contributed to a clinically significant reduction in ADD. However, being a case study, not much weight should be given to it since findings based on a single individual may not be generalisable to others. In conclusion, it is unclear whether the overlap of ADHD with concurrent sleep disorders may be attributed to misdiagnosis, a common pathophysiology of the mechanisms for self-regulation of sleep and waking-time behaviours or to a genuine co-morbidity of ADHD with these various sleep disorders.

Problems in regulation of sleep and arousal appear to be an important feature of learning disabilities. Yet, theory and research is sparse and often contradictory with regard to sleep patterns among individuals with learning disabilities and ADHD. It appears that sleep-related problems may make important contributory roles to the behavioural presentation of learning disabilities, ADHD and substance use. The disparity in the findings discussed above is therefore difficult to reconcile and further indicates the need for additional research on the prevalence and significance of sleep problems in adolescents with a learning disability.

1.4 Conclusions

This chapter reviewed evidence on associations between learning disabilities and substance use; sleep problems and substance use as well as sleep problems and learning disabilities. The relationship between learning disabilities, ADHD and substance misuse has been well documented. However, most of these studies have been conducted in North America. ADHD is associated with learning disabilities and ADHD has also been linked to substance use – the question of a possible link between learning disabilities and substance use thus seems a natural deduction from the above equation. Interest is stimulated around

commonalities in the above relationship and speculation about possible unknown contributing factors.

It remains to be determined whether the risk for substance use in individuals with ADHD is due to biologic, psychosocial or combined influences (Wilens et al., 1996). The overlap between ADHD and substance use in adolescents is an area of increasing clinical, research and public health interest. Evidence suggests a strong relationship between sleep problems and substance use although the majority of studies available focused on adults. It is clear from clinical observations and on theoretical grounds that an association between sleep disturbances and ADHD exists and that symptoms of ADHD and sleep disorders frequently overlap. The next chapter introduces a study that was designed to investigate the relationship between learning disabilities, substance use and sleep problems in a South African sample.

CHAPTER 2: AIMS AND METHOD

2.1 Aims

The current study focused on describing the relationship between sleep problems, learning disabilities and substance use in adolescence. Adolescents with learning disabilities were operationalised as learners attending remedial schools and therefore received special education services while those without learning disabilities attended a mainstream school. Quine (2001) employed similar methods in her study by operationalising children with an intellectual disability as those attending special schools while children who did not have an intellectual disability attended mainstream schools. In the current study, learners attending remedial schools had diagnoses of ADHD as well as different types of learning disabilities, such as reading or spelling disabilities. These diagnoses were established on the basis of self-reports (see Appendix 1). Educators at remedial schools confirmed that many learners attending special schools had ADHD and learning disabilities although the learners themselves are not always knowledgeable about their diagnoses.

In this study, learning disabilities are viewed on a continuum. It is acknowledged that adolescents who have a learning disability and participated in the study may have a range of different weaknesses and co-morbid diagnoses. Their shared commonality is that they have academic learning problems, are unable to cope educationally in a mainstream school setting and receive special education services at a remedial school. Due to the exploratory nature of this study and the number of unknowns with regard to sleep problems in this population, it was decided to include this relatively heterogeneous group of adolescents with possible dual diagnoses in this study. In addition, many schools recognise and use the term learning

disability. The current study entailed working with a school system and therefore the term learning disability is used. It should be noted that uniform diagnostic or psychological tests were not conducted to classify adolescents as learning-disabled since this is beyond the scope of the study under investigation. The sample of learners from the mainstream school did not have learning disabilities. Learners from mainstream schools who indicated that they had ADHD or deficits in cognitive functioning (see Appendix 1) were excluded from the study. The learning-disabled and non-learning disabled groups completed the same questionnaire.

The aim of the study was to examine whether there is an association between learning disabilities, sleep problems and substance use in adolescence. In the context of the current study, substance use refers to alcohol consumption, tobacco use, use of illicit drugs and inhalants. The study aimed to answer the following research questions:

- (1) Are learning disabilities associated with substance use?
- (2) Are sleep problems associated with substance use?
- (3) Are sleep problems associated with learning disabilities?
- (4) Do sleep problems and learning disabilities make an independent contribution to predicting substance use?

2.2 Sample

The sample consisted of 703 participants, which included 427 participants with learning disabilities (283 males [66.3%], 143 females [33.5%], 1 no response [0.2%]) and 276 participants without learning disabilities (129 males [46.7%], 147 females [53.3%]). Morrison and Cosden (1997) note that boys are predominantly identified as having a learning disability. It may thus be deduced that the sample with learning disabilities gives an accurate reflection of the gender distribution within the population of learners classified as having learning disabilities. Participants in the study were drawn from seven co-educational remedial

secondary schools and one co-educational mainstream secondary school in Cape Town, South Africa. All participants who have a learning disability were attending remedial secondary schools and were consequently receiving special education services. Remedial schools offered speech-, physio- and occupational therapy to learners. Some remedial schools offered accommodation facilities for learners and therefore catered for a wide spectrum of adolescents from outside the greater Cape Town area. Non-learning disabled participants attended a mainstream secondary school. Participants from a number of remedial schools were included since remedial schools have smaller class sizes than mainstream schools. The average class sizes for the participants in the study were 17 at the remedial schools (minimum of 7 and maximum of 29 participants in a class) and 39 at the mainstream school (minimum of 26 and maximum of 46 participants in a class).

Learning-disabled participants were between 13 and 20 years old (*M* age = 16 years) and non-learning disabled participants were between 14 and 18 years old (*M* age = 15 years). On the basis of a pilot study, it was expected that the sample would be emotionally mature enough to complete the questionnaire. The sample with learning disabilities included 236 participants in grade 9 (55.3%), 130 participants in grade 10 (30.4%), 53 grade 11 learners (12.4%), 7 participants were completing grades 10 and 11 (1.6%) simultaneously while 1 participant (0.2%) did not provide a response to this question. The sample without learning disabilities included 162 participants in grade 9 (58.7%), 99 learners in grade 10 (35.9%) and 15 grade 11 participants (5.4%). Participants from different grades were included so as to increase the sample size. The medium of instruction at all participating schools was English.

The racial composition of the sample is presented in Table 1.

Table 1

Racial composition for learning-disabled and non-learning disabled groups

Race	Group					
	Total		Learning-disabled		Non-learning disabled	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Coloured	407	57.9	208	48.7	199	72.1
White	197	28	155	36.3	42	15.2
Black	59	8.4	41	9.6	18	6.5
Asian	10	1.4	2	0.5	8	2.9
Indian	8	1.1	2	0.5	6	2.2

Note. Twenty-two participants (3.1%) did not indicate their racial classification – 19 were learning-disabled (4.4%) and 3 were non-learning disabled (1.1%).

In terms of the racial classification under the previous apartheid government, the majority of participants indicated that they would be classified as Coloured. South Africa's population estimates are as follows: 79.5% of the total population is Black, 9.2 % White, 8.9% Coloured and 2.5% Indian / Asian (Statistics South Africa, 2006). The terms "White", "Black", "Coloured", "Asian" and "Indian" refer to demographic markers and do not signify inherent characteristics. These markers were chosen for their historical significance. During the Apartheid years, all South Africans were classified in accordance with the Population Registration Act of 1950 into "racial groups", namely "Black / African", "Coloured", "White" or "Indian". The provision of services occurred along these racially segregated lines. The disproportionate provision of services to different "race groups" resulted in inequities. Race was surveyed so as not to enforce racial categorisation, but because the concept of "race" still holds many connotations, for instance, in terms of socio-economic status. This is

accompanied by access to certain resources, such as education and health care. Ellison, de Wet, IJsselmuiden and Richter (1996, p. 1258) have asserted that despite “... population group classification and legalised discrimination” in South Africa having been abolished, the “... legacy of apartheid is likely to maintain inequalities in health for generations to come”.

Participants came from a variety of religious backgrounds. A profile of the participants’ religious affiliations is presented in Table 2.

Table 2

Participants’ religions in the learning-disabled and non-learning disabled groups

Religion	Group					
	Total		Learning-disabled		Non-learning disabled	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Christian	500	71.1	307	71.9	193	69.9
Muslim	108	15.4	47	11	61	22.1
Jewish	2	0.3	1	0.2	1	0.4
Hindu	1	0.1	--	--	1	0.4

Note. Of the learners who participated, 9 (1.3%) indicated that they do not have a religion – 7 were learning-disabled (1.6%) and 2 were non-learning disabled (0.7%). Eighty-three participants (11.8%) did not provide a response to this particular question – 65 were learning-disabled (15.2%) and 18 were non-learning disabled (6.5%).

2.3 Instruments

A survey design was employed with anonymous self-report questionnaires administered to participants. The survey instrument was a single questionnaire that included demographic information as well as questions about substance use (see Appendix 1). Selected

questions from a questionnaire developed by Flisher, Evans, Muller and Lombard (2004) were used. The questions assessing use of illicit drugs, inhalants, alcohol consumption and tobacco usage were used. These particular variables were selected because they have potential negative consequences for adolescents with learning disabilities. These questions were also used in the pilot study. This scale has previously been used in studies conducted with secondary school learners in grades 8 and 11 attending public and private schools in Cape Town and demonstrates adequate test-retest reliability (Flisher et al., 2004). The questionnaire was administered on two occasions 10 to 14 days apart. Flisher et al. (2004) calculated Cohen's Kappa, which provides an indication of the agreement between two administrations beyond that which would be expected by chance. The agreement between the two occasions was almost perfect for the question on tobacco use (Kappa = 85.4) and in the substantial range for three items, namely alcohol consumption (Kappa = 78.0), cannabis / dagga use (Kappa = 79.9) and the question assessing whether participants have ever sniffed glue, petrol or thinners (Kappa = 70.9) (Flisher et al., 2004). For the current study, due to differences in the frequency of use of the substances, the lifetime use reporting method was employed for all substances.

Additional questions were added to the questionnaire by the researcher, for example questions assessing types of learning disability were included. Items indicating sleep problems, such as overtiredness and having difficulty sleeping, were also included. These items are from the Child Behaviour Checklist-Parent Version (CBCL), which was used in the study conducted by Wong et al. (2004) to examine the relationship between sleep problems in early childhood and the onset of alcohol and other drug use in early adolescence. The CBCL is a widely used instrument that measures common behavioural problems among children and its reliability and validity have been demonstrated (Achenbach, 1991 as cited in Wong et al., 2004). Four items were used to indicate sleep problems: trouble falling asleep, trouble staying

asleep, feeling tired in the morning and having a problem with sleepiness during the day. Responses to each item were scored on a three-point rating scale: 0 = not true; 1 = somewhat or sometimes true; 2 = very true or often true. In this study, a relatively small percentage of the sample had a score of 2 on any of the four items. In accordance with previous research (for example, Wong et al., 2004) the scores on each of the four questions assessing sleep problems (Cronbach $\alpha = 0.65$) were added to obtain a continuous variable. Problems that participants may have with interpreting particular questions in the questionnaire were addressed in the pilot study and were, consequently, altered by the time the main study was conducted.

The majority of the questions on the questionnaire could be answered with “Yes” and “No” responses. The principal of one of the participating remedial schools had indicated that learners with learning disabilities respond better to “Yes” and “No” questions than to questions eliciting descriptive information and therefore, in terms of their abilities, the format of the questionnaire is best suited to the needs of individuals who have a learning disability.

2.4 Procedure

Criteria for inclusion in the study were school attendance on the day(s) of survey administration and informed consent. Permission to conduct the study was obtained from the Western Cape Education Department (WCED) and the principals of the selected schools. Learners were approached by educators and were asked to verbally consent to their participation in the study. Principals, in their capacity as learners’ guardians, provided permission for data to be collected from learners. Informed consent was also obtained from the participants themselves. Learners were informed that they could choose not to participate in the study as a whole, omit particular questions or stop at any time. Some learners opted not to participate in the study. At four of the seven schools, the researcher administered the

questionnaires to participants in a classroom setting at an appropriate time identified by the educator. At the other three schools, the school psychologist or an educator oversaw the administration of the questionnaires since it was not logistically possible for the researcher to gain access to a sample of grade 9, 10 and 11 learners at the same time. Participants at all schools received the same explanation of the study, as far as possible, as well as similar instructions to complete the questionnaire. This was done to control for any experimenter / researcher effects. The researcher had prepared a written account of the explanation and full instructions for learners to complete the study (see Appendix 2), which was read to participants at all schools before the questionnaire was administered. Learners were informed that there are no right or wrong answers to the questions. In addition, the voluntary nature of their participation in the study was stressed, as well as their anonymity and confidentiality. Instructions emphasised the importance of obtaining accurate and truthful responses. Some questions (in the questionnaire) are quite private, such as the use of illegal drugs, and therefore participants' anonymity was assured in order to encourage participants to complete the questionnaire as truthfully as possible. Many of the participating schools have a strict "zero tolerance" drug policy and therefore it was important that the questionnaire was anonymous and confidential so that anticipating legal repercussions or disciplinary action from the school did not deter participants from completing the survey. For the participant's convenience, instructions for completing the questionnaire were repeated on the front page of the questionnaire (see Appendix 1). The questionnaire was read aloud to the participants at remedial schools, who followed along on their own copy of the measures, in order to assist learners with reading problems and who may experience difficulties in completing the questionnaire.

Participants completed the questionnaire at a time that did not interfere with teaching or other academic responsibilities so that they did not feel pressurised when completing the

questionnaire. Care was taken to ensure that learners were seated so that they could not see the responses of their classmates. Participants completed the questionnaire in 15-20 minutes although, on average, participants without learning disabilities completed the questionnaire in a shorter time. The researcher advised participants, who may want to discuss issues related to substance use arising from the questionnaire, to consult the school psychologist or life skills counsellor (this service is available to participants at their respective schools). Participants were informed of how they may gain access to the results of the study. A summary of the findings of the dissertation will be given to the participating schools.

CHAPTER 3: RESULTS

Statistical analyses for each of the research questions are presented separately. Nine categories of substance use were examined for all analyses: tobacco use, alcohol consumption, methamphetamine (also known as tik-tik, tuk, meth, speed and crystal), marijuana (also known as dagga and cannabis), marijuana and mandrax (also known as methaqualone) together, cocaine, ecstasy, other illegal drugs and glue, petrol or thinners (inhalants). All statistical tests were two-tailed, with p -values of less than 0.05 considered significant. Statistical analyses were conducted using the *Statistica* (version 7) package.

The large sample size in this study raises the possibility of finding many statistically significant results that have very small effect sizes, therefore running the risk of over-interpreting inconsequential relations. To address this potential problem, an effect size criterion in addition to a statistical significance criterion was used for discussion and interpretation of those results most likely to prove meaningful in the long run.

3.1 Are Learning Disabilities Associated with Substance Use?

Rates for ever having used particular substances for adolescents with and without learning disabilities are presented in Table 3.

Table 3

Rates for ever having used substances

Substance	Learning-disabled group	Non-learning disabled group
Tobacco	59.5%	62.7%
Alcohol	71.7%	63.4%
Methamphetamine	13.1%	19.9%
Marijuana	34.4%	37%
Marijuana and mandrax together	8%	6.9%
Glue, petrol or thinners	11%	5.1%
Cocaine	5.2%	2.9%
Ecstasy	12%	12.7%
Any other type of illegal drug	6.3%	5.8%

The relationships between learning disabilities and each of the nine categories of substance use were investigated through a series of logistic regression models. Cell sizes varied slightly across analyses because of missing data. Gender and age were entered at the first step as control variables since previous research indicates that these variables have potential influences on substance use. For example, higher prevalences of usage of most drugs have been found to occur among males and older adolescents are more likely to use substances in comparison to their younger counterparts (Chen & Kandel, 1995). Learning disabilities (the predictor variable) was entered at the second step. For all analyses, the difference in chi-square results is reported, which is the difference between the explanatory model (group, gender and age) and the control model (gender and age). Results of these

analyses are presented in Table 4. Cramer's V was used to calculate the effect size since V is based on the chi-square statistic.

Table 4

Results of hierarchical logistic regression analyses predicting substance use from learning disabilities after controlling for gender and age

Substance		N	Difference in chi-square	p value	Effect magnitude
Tobacco	Group	698	4.77	0.03*	0.08
Alcohol	Group	696	0.00	1.00	0.00
Methamphetamine	Group	694	12.84	<0.005*	0.14
Marijuana	Group	693	7.87	0.01*	0.11
Marijuana and mandrax together	Group	695	2.11	0.15	0.06
Glue, petrol or thinners	Group	698	5.15	0.02*	0.09
Cocaine	Group	698	0.01	0.91	0.00
Ecstasy	Group	697	2.22	0.14	0.06
Any other type of illegal drug	Group	697	0.81	0.37	0.03

Note. The variable *group* includes the categories learning-disabled and non-learning disabled.

Significant results are denoted by *.

Tobacco, methamphetamine, marijuana and inhalant use were significantly associated with learning disabilities. Effect sizes were greatest for the relationships between learning disabilities and methamphetamine and marijuana. Results indicated that adolescents without

learning disabilities were more likely to smoke cigarettes and to use methamphetamine as well as marijuana. Adolescents in the learning-disabled group engaged in more inhalant use than their non-learning disabled counterparts. Non-significant results were obtained between learning disabilities and the following variables: alcohol, marijuana and mandrax together, cocaine, ecstasy and any other type of illegal drug. These results indicate that adolescents with learning disabilities were no more at risk of using substances than adolescents without learning disabilities, except for the use of inhalants (and were less likely to use methamphetamine, marijuana and tobacco).

3.2 Are Sleep Problems Associated with Substance Use?

The mean level of sleep problems for each of the nine categories of substance use is presented in Table 5. By effect size, the strongest associations were between sleep problems and the following substances: any other type of illegal drug, inhalants and cocaine. Medium-sized associations were found between sleep problems and the above substances.

Table 5

Mean level of sleep problems for each substance

	Substance	Has used substance		Has not used substance		Effect magnitude (<i>d</i>)
		<i>Mean</i>	<i>Standard deviation</i>	<i>Mean</i>	<i>Standard deviation</i>	
Sleep problems	Tobacco	2.94	1.92	2.59	1.89	0.25
Sleep problems	Alcohol	2.91	1.88	2.59	1.96	0.23
Sleep problems	Methamphetamine	3.16	2.17	2.74	1.86	0.30
Sleep problems	Marijuana	3.11	1.92	2.62	1.89	0.36
Sleep problems	Marijuana and mandrax together	3.06	2.20	2.79	1.89	0.20
Sleep problems	Glue, petrol or thinners	3.58	1.93	2.73	1.90	0.62
Sleep problems	Cocaine	3.55	2.56	2.77	1.87	0.57
Sleep problems	Ecstasy	3.26	2.22	2.74	1.85	0.41
Sleep problems	Any other type of illegal drug	3.65	2.54	2.75	1.86	0.65

Note. Cohen's *ds* were calculated for continuous variables as the difference between group means divided by the pooled standard deviation.

The relationship between sleep problems and each of the nine categories of substance use was investigated through a series of logistic regression models. Results of these analyses are presented in Table 6. The difference in chi-square results is reported, which is the difference between the explanatory model (sleep problems, gender and age) and the control model (gender and age).

Table 6

Results of hierarchical logistic regression analyses predicting substance use from sleep problems after controlling for gender and age

Substance		<i>N</i>	Difference in chi-square	<i>p</i> value	Effect magnitude
Tobacco	Sleep				
	problems	665	5.01	0.03*	0.09
Alcohol	Sleep				
	problems	663	4.74	0.03*	0.08
Methamphetamine	Sleep				
	problems	662	5.04	0.02*	0.09
Marijuana	Sleep				
	problems	660	12.10	<0.005*	0.14
Marijuana and mandrax together	Sleep				
	problems	662	-0.32 ^a	0.57	NA
Glue, petrol or thinners	Sleep				
	problems	665	12.43	<0.005*	0.14
Cocaine	Sleep				
	problems	665	7.88	<0.005*	0.11
Ecstasy	Sleep				
	problems	664	6.94	0.01*	0.10
Any other type of illegal drug	Sleep				
	problems	664	9.69	<0.005*	0.12

Note. Significant results are denoted by *. ^{NA}Not applicable. ^aFor this particular model, a negative value was obtained – indicating that the predictive value of the model decreased when sleep problems

were added. Cramer's V was used to calculate the effect size since V is based on the chi-square statistic.

After controlling for gender and age, adolescents who had more sleep problems were significantly more likely to use tobacco, alcohol, methamphetamine, marijuana, inhalants, cocaine, ecstasy and any other type of illegal drug. By effect size, the strongest associations were between sleep problems and marijuana, inhalants and any other type of illegal drug.

3.3 Are Sleep Problems Associated with Learning Disabilities?

The mean level of sleep problems in the groups with and without learning disabilities is presented in Table 7. A small effect size was found.

Table 7

Mean level of sleep problems for learning-disabled and non-learning disabled groups

Group	Sleep problems		Effect magnitude (<i>d</i>)
	<i>Mean</i>	<i>Standard deviation</i>	
Learning-disabled	2.90	2.02	0.17
Non-learning disabled	2.66	1.75	

Note. Cohen's *ds* were calculated for continuous variables as the difference between group means divided by the pooled standard deviation.

As shown in Table 8, the relationship between sleep problems and learning disabilities was investigated through a logistic regression model.

Table 8

Results of hierarchical logistic regression predicting learning disabilities from sleep problems after controlling for gender and age

		<i>N</i>	Difference in chi-square	<i>p</i> value	Effect magnitude
Group	Sleep problems	665	5.69	0.02*	0.09

Note. The variable *group* includes the categories learning-disabled and non-learning disabled.

Significant results are denoted by *. The difference in chi-square reported is the difference between the explanatory model (sleep problems, gender and age) and the control model (gender and age).

Cramer's *V* was used to calculate the effect size since *V* is based on the chi-square statistic.

Significant results indicated that sleep problems were associated with learning disabilities. Adolescents who had more sleep problems were more likely to have a learning disability than those with fewer sleep problems. However, the small effect size indicates that this relationship, although significant, was not very strong.

3.4 Independent Contributions of Sleep Problems and Learning Disabilities to Predicting Substance Use

The relationships between sleep problems (predictor variable), learning disabilities (predictor variable) and each of the nine categories of substance use (dependent variable) were investigated through a series of logistic regression models (as shown in Table 9). In the first step, gender and age were entered as control variables. This was subtracted from the explanatory model, comprising gender, age and learning disabilities. If this was significant, the difference between the control and explanatory models was subtracted from a third model, which included sleep problems, learning disabilities, gender and age. If the difference between the control (gender and age) and explanatory models (gender, age and learning

disabilities) was not significant, learning disabilities were then excluded from the third model and the third model therefore included sleep problems, gender and age. For some analyses, learning disabilities were therefore not part of the third model and results are only reported between the substance and sleep problems. These results were presented in Table 6 and are repeated in Table 9 for convenience.

Significant associations between both sleep problems and learning disabilities were found with tobacco, marijuana and inhalant use. For these three variables, sleep problems made an independent contribution to predicting substance use even after the presence or absence of learning disabilities was taken into account. However, sleep problems were no longer significantly associated with methamphetamine use after controlling for learning disabilities. By effect size, sleep problems were most strongly associated with marijuana and inhalant use.

Adolescents without learning disabilities were more likely than those with learning disabilities to use methamphetamine, marijuana and tobacco. However, adolescents with learning disabilities were more likely than those without learning disabilities to use inhalants. More sleep problems were associated with an increased risk of using all the substances measured except methamphetamine and marijuana and mandrax together, irrespective of the presence or absence of learning disabilities.

Table 9

Results of hierarchical logistic regression analyses predicting substance use from sleep problems and learning disabilities after controlling for gender and age

Substance		<i>N</i>	Degrees of freedom	Difference in chi-square	<i>p</i> value	Effect magnitude
Tobacco	Group and sleep problems	665	3	10.62	0.01*	0.13
Alcohol	Sleep problems	663	1	4.74	0.03*	0.08
Methamphetamine	Group and sleep problems	662	3	7.10	0.07	0.10
Marijuana	Group and sleep problems	660	3	30.02	<0.005*	0.21
Marijuana and mandrax together	Sleep problems	662	1	-0.32 ^a	0.57	NA
Glue, petrol or thinners	Group and sleep problems	665	3	25.02	<0.005*	0.19
Cocaine	Sleep problems	665	1	7.88	<0.005*	0.11

Ecstasy	Sleep					
	problems	664	1	6.94	0.01*	0.10
Any other type of	Sleep					
illegal drug	problems	664	1	9.69	<0.005*	0.12

Note. The variable *group* includes the categories learning-disabled and non-learning disabled.

Significant results are denoted by *. ^{NA}Not applicable. ^aFor this particular model, a negative value was obtained – indicating that the predictive value of the model decreased when sleep problems were added. Cramer’s *V* was used to calculate the effect size since *V* is based on the chi-square statistic. Due to the subtractions between the models, the degrees of freedom were reported separately.

CHAPTER 4: DISCUSSION

Adolescents with learning disabilities were no more at risk of using substances than adolescents without learning disabilities, except for the use of inhalants (glue, petrol or thinners) and were less likely to use tobacco, methamphetamine and marijuana. Adolescents who had more sleep problems were significantly more likely to use tobacco, alcohol, methamphetamine, marijuana, inhalants, cocaine, ecstasy and any other type of illegal drug. Adolescents with learning disabilities had more sleep problems than adolescents who did not have a learning disability. However, sleep problems remained significantly independently associated with use of all the above substances except methamphetamine when learning disabilities were taken into account.

4.1 Learning Disabilities and Substance Use

The results of this study suggest that adolescents with learning disabilities (attending remedial schools) are no more at risk for using substances than those without learning disabilities (attending mainstream schools). Similar results were obtained by Molina and Pelham (2001) who followed a sample of 109 children with ADHD into adolescence to measure the prevalence of alcohol, tobacco and illicit drug use. In addition, learning disability in childhood was examined as a predictor of adolescent substance use. Molina and Pelham's (2001) results revealed no statistically significant differences between the adolescents with learning disabilities and without learning disabilities for any of the substance use variables and there was thus a striking absence of differences between the groups. Rates for ever having used substances indicated that participants without learning disabilities were more

likely to have consumed alcohol (50% versus 42.1% in the non-learning disabled group), used marijuana (32.2% versus 21.1% in the non-learning disabled group) and any other illicit drug (22.2% versus 10.5% in the non-learning disabled group). A similar trend for “ever having used substances” emerged in the current study, with participants who do not have learning disabilities reporting more substance use in comparison to their learning-disabled counterparts on some of the variables investigated, namely marijuana, methamphetamine and tobacco.

The finding that adolescents with learning disabilities were no more likely to use substances than those without learning disabilities is also consistent with that of Elmquist, Morgan and Bolds (1992). The above authors found that adolescents with learning disabilities reported similar substance use rates to their non-learning disabled counterparts and reported that concurrent learning problems were not strongly associated with substance use. Similarly, Fidler et al. (1992) found that adolescents with learning disabilities had slightly lower smoking rates than adolescents in mainstream education. Katims, Zapata and Yin (1996) investigated the prevalence of substance use among Mexican American youths identified with learning disabilities in comparison to their counterparts who did not have a learning disability. Participants were surveyed regarding their use of tobacco, alcohol, marijuana, cocaine, amphetamines and barbiturates. No differences were found in the use of the above substances between the two groups and are similar to the results obtained in the current study. In contrast to the findings from the current study, Milberger et al. (1997) found significantly more cigarette smoking among adolescents with childhood ADHD (attending mainstream schools) than among the control group. These findings may be due to the young average age of the participants (about 15 years). The Molina and Pelham (2001) study indicated that adolescents with learning disabilities were slightly more likely to have tried cigarettes (72.2%) in comparison to those without a learning disability (52.4%). This difference

approached conventional levels of statistical significance. The above findings are intriguing because of the potentially unique mechanisms underlying addiction to nicotine versus other substances in adolescents with ADHD.

There are several possible explanations for why the learning-disabled adolescents in this study showed relatively low levels of substance use. In remedial schools, learners and educators may be more sensitive to the needs of the learning-disabled adolescent as well as accepting of the difficulties experienced by adolescents with learning disabilities than is the case in mainstream schools. These conditions may facilitate learning, thereby protecting against vulnerabilities for risk behaviours. Remedial schools are characterised by small class sizes with low learner-educator ratios, responsive educational programming, basic skill instruction, individualised attention and parental involvement. Evidence suggests that adolescents who feel that they are part of the school community are at lower risk for substance use and abuse (Brown, 2002). The remedial school environment may thus be a protective factor promoting resilience in individuals. Risk and protective factors may interact with the presence of a learning disability to facilitate or impede the societal and emotional adjustment of adolescents with learning disabilities (Morrison & Cosden, 1997). However, not all researchers have found that attending a remedial school is protective against substance use. For example, Elmquist et al. (1992) found that learners in special education settings reported a higher level of drug and alcohol use than those in mainstream schools.

Fidler et al. (1992) suggested that the adolescents with learning disabilities in their survey were not as vulnerable to the pressures to smoke that materialise at the beginning of adolescence since they were isolated in segregated schools and thus removed from “normal” peer pressure to smoke. In addition, many were developmentally young and thus less susceptible to the images of glamour and sophistication portrayed by the tobacco industry. These speculations as to the observed lower rates of smoking among adolescents in remedial

schools compared to their counterparts in mainstream schools are therefore also applicable to the current study. Perhaps the non-significant results among learning-disabled adolescents reflect something about the remedial school's particular ability to engender a comfortable, safe environment for learners.

Some of the remedial schools that participated in the study have accommodation facilities for learners. It may therefore be assumed that the sample included adolescents from areas other than Cape Town since there are a limited number of schools in South Africa that cater for individuals with a learning disability. For adolescents with learning disabilities, residing in hostel facilities may have reduced exposure to community influences and substance-using role models. Models for substance use have been identified as an important factor in adolescent substance use (Allison et al., 1999). Adolescents with learning disabilities living in hostels may also have fewer opportunities to access substances, which may account for the low usage rates of illicit substances obtained in the current study. Community standards, such as legal norms, may impact adolescent substance use (Fitzpatrick & Gerard, 1993). The substances (other than inhalants and illicit substances) examined in this study are illegal if under a certain age. For instance, it is illegal to possess or use methamphetamine, marijuana, mandrax, cocaine and ecstasy regardless of age; it is illegal to purchase or smoke cigarettes under the age of 16 and it is illegal to purchase or consume alcohol under the age of 18. In comparison, glue, petrol and thinners are relatively inexpensive, easily and legitimately obtainable regardless of age and living arrangements. Research has shown that learners within schools tend to be more like each other in their substance use behaviour in comparison to learners attending other schools (Ennett, Flewelling, Lindrooth, & Norton, 1997). Remedial schools typically have fewer substance users since substance use may be viewed as less acceptable / normative. There is a positive correlation between rates of substance use and the availability of substances (Ennett et al.,

1997). Thus the low rates of substance use among adolescents with learning disabilities may be accompanied by diminished access to substances.

Substance use typically peaks around the late teens or early 20s (Kandel & Raveis, 1989; Chen & Kandel, 1995). The mean age of the learning-disabled group was 16 years and the mean age of the non-learning disabled group was 15 years. Adolescents who have a learning disability may take longer than their non-learning disabled counterparts to reach emotional maturity. For example, hyperactive children are considered to experience maturational delay (Mercier et al., 1993). It is possible that an association between learning disabilities and substance use does not emerge until individuals mature. Adolescence is often the period of onset of substance use and it is noted that the participants in the current study had not yet surpassed the period of risk for the onset of substance use. There is evidence that delayed onset of substance use may be a predictor of consequent heavy use (Moore & Polsgrove, 1991). This particular aspect of substance use may be salient for individuals who have a learning disability and experience developmental or social delays in maturation.

The current findings revealed that inhalants were the most common drug of abuse amongst the group with learning disabilities. In addition, inhalants were the only substance used significantly more often by learning-disabled adolescents than those without learning disabilities. Matsumoto, Kamijo, Yamaguchi, Iseki and Hirayasu (2005) examined childhood histories of ADHD in methamphetamine and inhalant abusers and found that inhalant abusers had a higher incidence of childhood ADHD than methamphetamine abusers. Horner and Scheibe (1997) found that individuals with ADHD used more inhalants in comparison to their counterparts without ADHD, which is consistent with the results obtained in the current study. This may be attributed to these inhalants being regarded as “softer” drugs and therefore a more likely and convenient drug of choice for adolescents with learning disabilities. The speed at which a drug is delivered to the brain affects its reinforcing

properties (Kollins, 2003). This explains why drugs that are inhaled or administered intravenously are, generally, abused more often. The propensity for drugs that are inhaled to be abused in addition to the likelihood that inhalants are regarded as a “drug of choice” may account for the prevalence of this drug among adolescents who have a learning disability. According to a National Institute on Drug Abuse (NIDA) research report on inhalant abuse (2005), research on factors contributing to inhalant abuse suggests that adverse socio-economic conditions, poor academic performance and dropping out of school are all associated with inhalant abuse. Perhaps the academic difficulty experienced by adolescents with learning disabilities predisposes them to use inhalants as a “drug of choice”.

It may be that adolescents with and without learning disabilities have different use and abuse patterns for different substances. According to Schiffman (2004), the prevalence rates for the lifetime use of inhalants (sometimes referred to as volatile substances of abuse), in comparison to almost all other drugs and substance use, is generally higher among younger adolescents. One explanation is the widespread availability of inhalants, particularly to younger adolescents who may have limited access to other substances (Kurtzman, Otsuka, & Wahl, 2001). In addition, the purchase and possession of inhalants are not illegal. The availability of drugs is partially dependent on the laws and norms of society (Hawkins et al., 1992). Social influences to use drugs also play a significant role. The influence of availability and opportunity cannot be ruled out, both of which make it possible for one young group to engage in self-medication while another is more subject to peer influence. It is a common perception that individuals with ADHD abuse stimulants preferentially (Biederman et al., 1995).

Cosden (2001) reviewed five studies on the co-occurrence of substance abuse and learning disabilities and two general findings emerged: the majority of individuals who have a learning disability do not abuse substances and, secondly, that certain substances are used

and abused by a greater proportion of individuals who have a learning disability than by individuals who do not have a learning disability. The findings from this review are in contrast to studies where individuals with learning disabilities report higher levels of substance use. However, the findings by Cosden (2001) are consistent with the findings in the current study, which also found that adolescents with learning disabilities use inhalants preferentially. Conflicting findings indicate the need to understand this relationship and potential risk and protective factors.

Additional research is especially needed about the degree to which adolescents with different types or severities of ADHD and learning disabilities are disadvantaged as a result of their disorder. It may also be that an individual born with a learning disability, for instance as a result of foetal alcohol syndrome, may experience the learning disability differently from someone who develops a learning disability as a result of an accident later in life. Inherited fundamental deficits in behavioural regulation (impulsivity, inattention) and in language ability are common in children of substance users. These deficits appear early in development, prior to the initiation of substance use and may affect the trajectory of using substances over time. Cosden (2001) further speculated that individuals with learning disabilities may be at greater risk for substance abuse if they do not fully understand the nature of their disability and, especially, if they are not able to identify their strengths and access help in needed areas.

4.2 Sleep Problems and Substance Use

The results indicated that sleep problems are associated with substance use; however, the current study could not establish the direction of effect between these two variables, namely whether sleep problems lead to substance use, or substance use causes sleep problems. Consistent with the results of the current study, other studies have found a relation

between smoking and sleep problems (Foley et al., 1995; Phillips & Danner, 1995; Wetter & Young, 1994). Johnson and Breslau (2001) found that adolescents who used alcohol, cigarettes or any illicit substances had substantially higher prevalence of sleep problems compared to adolescents who did not use substances. A growing body of evidence suggests a relationship between sleep problems and substance use; however, research on the nature of the relationship between sleep problems and learning disabilities has not been forthcoming.

Sleep problems are often implicated in substance use disorders (Teplin et al., 2006). However, it is difficult to determine if the disruptions in sleep were present before the initiation of illicit substances or if the sleep problems are an artefact of substance abuse. The significant relationship between sleep problems and substance use in the current study is a significant avenue of future research and presents a wealth of possibilities for understanding adolescent substance use.

4.3 Sleep Problems and Learning Disabilities

Adolescents who had more sleep problems were more likely to have a learning disability than those with fewer sleep problems. Although there is some overlap between sleep problems and learning disabilities, sleep problems appear to be related to substance use independently of the presence / absence of a learning disability.

Past studies (such as Quine, 2001) have similarly identified a relationship between sleep problems and learning disabilities although there is a paucity of research in this area. It is difficult to determine if sleep problems in early childhood are associated with learning disabilities later in life, which is a possibility not examined in the current study. It may be that the stress associated with having a learning disability (and consequent weaknesses in specific domains, such as academic work) results in sleep problems.

4.4 Independent Contributions of Sleep Problems and Learning Disabilities

Significant associations between both sleep problems and learning disabilities were found with tobacco, marijuana and inhalant use. For these three variables, sleep problems made an independent contribution to predicting substance use even after the presence or absence of learning disabilities was taken into account.

4.5 Limitations of the Study

Some limitations of the present study warrant consideration. It is acknowledged that a considerable number of statistical comparisons were made in this study and that multiple comparisons result in an inflation of the Type I error rate (i.e. inflated α). Surveys are time effective and thus cause minimal disruption to the academic schedules of learners and schools. However, with this method of data collection, it is difficult to obtain in-depth information and to establish causal relationships. School-based surveys are thought to systematically underestimate the prevalence of risk behaviours in the larger adolescent population because adolescents not in school, either through absenteeism or school dropout, are more likely to engage in substance use behaviours than are adolescents in school. The absence of these adolescents at the time of survey administration may contribute to an underestimate of substance use and sleep problems to some degree. There is evidence from other studies conducted in Cape Town that rates of substance use are higher for school dropouts and absentees (Flisher & Chalton, 1995). Learners present on the day(s) of survey administration and who consented to participate were included in the study. The data reported in this study was derived from self-reports of participants and is thus prone to reporter biases. Nevertheless, this same procedure was used in previous studies, so it is not likely to affect the comparison of these results to other studies.

This study relied on self-reported retrospective recall of lifetime use of substances. For participants with learning disabilities, such retrospective recall may be limited by memory difficulties. The true prevalence of learning disabilities among alcoholic and / or substance abusing populations is not known. Self-reports of substance use may have under-identified the true rate of substance use in this population since the illicit substances examined in the current study are illegal. Accurately assessing substance abuse among adolescents who have learning disabilities may be an even greater challenge as a result of a possible self-perceived double stigma. In South Africa, substance use is stigmatised and self-reports may therefore underestimate actual rates.

Due to the anonymous nature of the survey, certain kinds of information could not be obtained from participants. For instance, the school psychologist at one of the remedial schools indicated that many learners at that particular school were diagnosed with ADHD, but were not aware of their condition. Other researchers have similarly found that self-reports of adolescents about their ADHD symptoms frequently underestimated the actual levels of the symptoms or the degree of impairment as reported by parents and educators (Barkley, Anastopoulos, Guevremont, & Fletcher, 1991). In the sample with learning disabilities, 82 participants indicated that they have ADHD. Responses to this particular question in the survey may therefore not be an accurate reflection of the actual prevalence of ADHD among the sample of participants with learning disabilities. There is no litmus test for the diagnosis of a learning disability and therefore the learning-disabled group may contain adolescents who have been incorrectly diagnosed or have had multiple and / or different diagnoses.

This study utilised measures of current substance use and having a learning disability and having sleep problems may be linked to future substance use and misuse. This relationship is most appropriately examined through longitudinal studies. In this study,

conclusions are based on associations that are not causal in nature. Thus, it is only possible to speculate about causal relationships.

Subjective measures of sleep problems were employed in this study, which relies heavily on the individual's judgement in their perception of a sleep problem. The variability in the presence of sleep disturbances across studies underscores some of the difficulty involved in defining sleep disturbance and sleep behaviours in this age group. The definition of what constitutes the threshold for a sleep disturbance as opposed to sleep behaviour is a concern in that it also varies across studies.

Relationships may exist between substance use and other adolescent risky behaviours that were not examined in the current study. For instance, it has been found that adolescents with substance use problems are more likely to engage in risky sexual behaviours and to continue risky sexual behaviours to the extent that substance problems persist (Tapert, Aarons, Sedlar, & Brown, 2001). This phenomenon is consistent with a "syndrome of problem behaviours" that developed out of Jessor and Jessor's (1977) Problem-Behaviour Theory. This particular phenomenon refers to a co-variation among risky behaviours, suggesting that adolescents who engage in one form of problem behaviour are more likely than other adolescents to be involved in multiple problem behaviours. For example, evidence suggests that a positive association exists between tobacco use and the use of other substances, including alcohol, marijuana, cocaine and other illicit substances (Torabi, Bailey, & Majd-Jabbari, 1993).

Schools had kindly agreed to give of their teaching time so that learners may complete the questionnaire and thus the researcher was deterred from requesting more teaching periods for data collection. As stipulated in the conditions of the WCED permission letter to conduct research at schools, schools were under no obligation to assist in the investigation and therefore the co-operation of all the schools selected to participate in the study was greatly

appreciated. Ideally, educators should not have been present during the administration of the questionnaires since their presence may have influenced the responses of participants. However, in some cases, their presence was unavoidable, therefore instructions emphasised the anonymity and confidentiality of the information obtained and it was expected that this would counteract any effects that the presence of someone affiliated to the school may have had on the responses of participants. The researcher would have liked to have been present during the administration of all the questionnaires, but had to be accommodating and respectful of teaching schedules. From the pilot study, it was clear that the researcher's explanation and instructions should be sufficient in addressing questions that participants might have had about the study and that it was therefore not necessary for the researcher to be physically present when the questionnaires were administered.

Participants in both groups came from similar backgrounds in terms of socio-economic circumstances and were as similar in as many respects as possible. Logistic regression analyses controlled for age and gender. Race and religion were not controlled for and therefore the influence of these variables cannot be ruled out as potential confounders of the results. This limits the extent to which the results of the study can be generalised. The racial composition of the sample is not representative of the South African population, thereby limiting the applicability of the findings to the South African population. However, the sample is reasonably representative of the Cape Town population. Religion may have influenced the prevalence of certain substance use behaviours, such as alcohol abuse. In Islam, alcohol is strictly proscribed and therefore the results may not accurately reflect the prevalence of alcohol use among certain sectors of the population. The sample included 108 Muslim participants (47 participants in the learning-disabled and 61 participants in the non-learning disabled groups).

4.6 Suggestions for Future Research

The association between learning disabilities and substance abuse is not well documented or understood. More research is needed in comparing the age of onset of a learning disability with the age of onset of substance use or misuse. Remedial schools often cater for learners with physical disabilities, such as cerebral palsy. Questionnaires completed by learners with cerebral palsy were excluded since this presents a different area of research beyond the scope of the study under investigation. The movement of individuals with cerebral palsy is restricted, which may limit their ability to access illicit substances. There is a paucity of information on the substance misuse risks associated with specific orthopaedic disabilities, such as cerebral palsy, paraplegia and quadriplegia. The lack of information on the substance use behaviours of minority populations is reiterated. More research is needed on the substance use behaviours of learning-disabled adolescents attending mainstream schools. In South Africa, there is a move towards inclusive education, which means that learners with a learning disability will no longer be accommodated in segregated schools. This educational context will provide interesting data on substance use since remedial schools, as a possible protective factor, will be excluded from the equation.

Pharmacological studies could directly examine whether individuals with learning disabilities exhibit a unique and positive response to nicotine and other stimulant substances. Given the low frequency of use of illegal stimulant drugs among the participants, future studies should examine this question among specialised populations that exhibit greater illegal stimulant use; for instance, a clinical sample may be included. Adolescents presenting to clinics are also more likely to have more severe sleep problems than those adolescents not in need of specialty care services. Additional information in these under researched areas may contribute to more effective treatment interventions.

Future studies should include objective measures of sleep problems in diagnosing sleep disturbances, such as polysomnographic assessments. Polysomnography is the gold standard for objectively measuring sleep. Obtaining objective data on disturbed sleep is desirable even though it has not been regularly incorporated into community-based, epidemiological studies. Self-reports and interview-based measures remain the most widely used measures in assessing sleep problems and therefore it is recommended that future studies include objective data on sleep disturbances since such data would be complimentary. It is, however, important to note that there is research suggesting that subjective measures of sleep from adolescents are correlated with objective measures of disturbed sleep (Sadeh et al., 1995). Future studies will be needed to evaluate the influence of environmental factors and social influences on sleep problems. Future research can begin by addressing the question of what specific factors mediate the relation between sleep problems and substance use in adolescence.

There is a need to conduct studies aimed at identifying the protective factors for initiators and desistors of substance use to better understand the influences of having a sleep problem interacting with the characteristics of a substance abuse problem. The interaction between the regulation of sleep and clinical disorders of affect, arousal and behaviour in adolescents appears to be a promising field for future research. It would appear that there is a need for better-controlled studies addressing the reciprocal relationship between substance use and sleep regulation in adolescents. For the most part, however, the specific mechanisms underlying the relationships between neurotransmitter function, alcohol and sleep disturbances still require further elucidation. In order to obtain a more comprehensive picture of substance use, this school based survey needs to be expanded to adolescents who are outside of the school environment, for example those who are homeless or in correctional facilities. Of particular interest is the extent to which effective treatment of sleep problems

reduces concurrent and later substance use. Other sleep problems such as, environmental noise, sleeping arrangements or nightmares may also be included in adolescents' reports of trouble sleeping.

4.7 Implications for Intervention

An increased understanding of the issues surrounding the use of alcohol, tobacco and illicit substances is important to prevent their use. The high prevalence of substance abuse problems, the extensive associated morbidity and difficulties associated with treatment, such as substantial relapse rates, suggests the need for effective prevention programmes. Therefore the relationship between sleep problems and substance use needs to be thoroughly researched and understood so that interventions may be tailored accordingly. Understanding the relationship may help to better understand the motivation behind the large number of adolescents who drink alcohol, abuse drugs and smoke cigarettes. Interventions should cater for the unique needs of adolescents with a sleep problem and who use psychoactive substances. Sleep problems can be identified prior to the peak onset of substance use and therefore effective treatment of this disorder may reduce the development of substance use problems. Through addressing sleep problems, the risk for engaging in substance use may be reduced.

If there is a causal relation between smoking and sleep disturbance, it would represent another avenue whereby smoking cessation could produce significant improvement in public health. The discovery of developmental pathways might lead to improved primary prevention aimed at reducing the risk for substance use in adolescents who have a sleep problem as well as secondary prevention aimed at stopping transitions from milder to more severe substance use disorders. The prevention of initial substance use and the prevention of the transition from experimentation to regular use or abuse is an important prevention goal. Childhood

sleep problems as a predictor of later substance use should be remedied before the deviant pattern of substance use becomes more crystallised and thus harder to change. It is recommended that sleep-related symptoms should be actively sought in adolescents.

The widespread experimentation with inhalants among adolescents poses significant challenges to intervention efforts. Inhalants are both easily accessible and available to adolescents. Thus, curbing inhalant use may be a more attainable goal than preventing any use. Early interventions should be targeted at adolescents to reduce inhalant use. Even though associations between substance use and learning disabilities were largely not significant, increased attention should also be paid to preventive efforts targeted toward regular and even experimental patterns of various substance use behaviours in adolescence.

4.8 Conclusions

The current study is the first known investigation of the relationships among learning disabilities, sleep problems, and substance use in South African adolescents. Rates of lifetime use for alcohol, tobacco, marijuana, cocaine and stimulants were provided. The major findings reported from this study include the following:

- (1) Adolescents with learning disabilities (attending remedial schools) are no more at risk for using substances than those without learning disabilities (attending mainstream schools).
- (2) Sleep problems are associated with substance use; however, the current study could not establish the direction of effect between these two variables.
- (3) There is some overlap between sleep problems and learning disabilities; however, sleep problems appear to be related to substance use independently of the presence / absence of a learning disability.

This study provides support for the notion that adolescents with sleep problems are at increased risk for the development of substance use problems, which is the most interesting contribution of the study. Sleep problems are an important, potentially remediable, factor that can contribute to addictive vulnerability across the life span. In contrast, having a learning disability was not a significant risk factor for the consumption of alcohol, drugs and cigarette use. Given the extent of the substance use problem in society, it would be remiss not to take action on the current available knowledge. It is acknowledged that the direction of causality between sleep problems, learning disabilities and substance use is difficult to determine. It is hoped that the results from this study will be an impetus for further research, discussion and intervention efforts.

REFERENCES

- Allison, K. W., Crawford, I., Leone, P. E., Trickett, E., Perez-Febles, A., Burton, L. M., & Le Blanc, R. (1999). Adolescent substance use: Preliminary examinations of school and neighbourhood context. *American Journal of Community Psychology, 27*, 111-141.
- American Academy of Child and Adolescent Psychiatry (2005). Practice parameter for the assessment and treatment of children and adolescents with substance use disorders. [Electronic version]. *Journal of the American Academy of Child & Adolescent Psychiatry, 44*, 609-621.
- American Psychiatric Association (1980). *Diagnostic and statistical manual of mental disorders, 3rd edition (DSM-III)*. Washington, DC: American Psychiatric Press.
- American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders, 4th edition (DSM-IV)*. Washington, DC: American Psychiatric Press.
- American Psychiatric Association (2001). *Diagnostic and statistical manual of mental disorders, 4th edition, Text Revision (DSM-IV-TR)*. Washington, DC: American Psychiatric Press.
- American Sleep Disorders Association (1990). *International classification of sleep disorders: Diagnostic and coding manual*. Rochester: American Sleep Disorders Association.
- August, G. J., Winters, K. C., Realmuto, G. M., Fahnhorst, T., Botzet, A., & Lee, S. (2006). Prospective study of adolescent drug use among community samples of ADHD and non-ADHD participants. [Electronic version]. *Journal of the American Academy of Child and Adolescent Psychiatry, 45*, 824-832.
- Ball, J. D. & Koloian, B. (1995). Sleep patterns among ADHD children. [Electronic version].

Clinical Psychology Review, 15, 681-691.

Ball, J. D., Tiernan, M., Janusz, J., & Furr, A. (1997). Sleep patterns among children with attention-deficit hyperactivity disorder: A reexamination of parent perceptions. *Journal of Pediatric Psychology*, 22, 389-398.

Barkley, R. A., Fischer, M., Edelbrock, C. S., & Smallish, L. (1990a). The adolescent outcome of hyperactive children diagnosed by research criteria: An 8-year prospective follow-up study. *Journal of the American Academy of Child and Adolescent Psychiatry*, 29, 546-557.

Barkley, R. A., McMurray, M. B., Edelbrock, C. S., & Robbins, K. (1990b). Side effects of methylphenidate in children with attention deficit hyperactivity disorder: A systemic, placebo-controlled evaluation. [Electronic version]. *Pediatrics*, 86, 184-192.

Barkley, R. A., Anastopoulos, A. D., Guevremont, D. C., & Fletcher, K. E. (1991). Adolescents with ADHD: Patterns of behavioral adjustment, academic functioning, and treatment utilization. *Journal of the American Academy of Child and Adolescent Psychiatry*, 30, 752-761.

Barkley, R. A., Fischer, M., Smallish, L., & Fletcher, K. (2003). Does the treatment of attention-deficit / hyperactivity disorder with stimulants contribute to drug use / abuse? A 13-year prospective study. [Electronic version]. *Pediatrics*, 111, 97-109.

Beitchman, J. H., Wilson, B., Douglas, L., Young, A., & Adlaf, E. (2001). Substance use disorders in young adults with and without LD: Predictive and concurrent relationships. [Electronic version]. *Journal of Learning Disabilities*, 34, 317-332.

Benca, R. M., Obermeyer, W. H., Thisted, R. A., & Gillin, J. C. (1992). Sleep and psychiatric disorders: A meta analysis. *Archives of General Psychiatry*, 49, 651-668.

Biederman, J. (2003). Pharmacotherapy for attention-deficit / hyperactivity disorder (ADHD) decreases the risk for substance abuse: Findings from a longitudinal follow-up of youths

- with and without ADHD. [Electronic version]. *Journal of Clinical Psychiatry*, 64(Suppl. 11), 3-8.
- Biederman, J., Wilens, T., Mick, E., Milberger, S., Spencer, T. J., & Faraone, S. V. (1995). Psychoactive substance use disorders in adults with attention deficit hyperactivity disorder (ADHD): Effects of ADHD and psychiatric comorbidity. *American Journal of Psychiatry*, 152, 1652-1658.
- Biederman, J., Wilens, T., Mick, E., Faraone, S. V., Weber, W., Curtis, S., Thornell, A., Pfister, K., Jetton, J. G., & Soriano, J. (1997). Is ADHD a risk factor for psychoactive substance use disorders? Findings from a four-year prospective follow-up study. [Electronic version]. *Journal of the American Academy of Child and Adolescent Psychiatry*, 36, 21-29.
- Biederman, J., Wilens, T. E., Mick, E., Faraone, S. V., & Spencer, T. (1998). Does attention-deficit hyperactivity disorder impact the developmental course of drug and alcohol abuse and dependence? [Electronic version]. *Biological Psychiatry*, 44, 269-273.
- Biederman, J., Wilens, T. E., Mick, E., Spencer, T., & Faraone, S. V. (1999). Pharmacotherapy of attention-deficit / hyperactivity disorder reduces risk for substance use disorder. *Pediatrics*, 104, Retrieved June 6, 2005, from <http://www.pediatrics.org/cgi/content/full/104/2/e20>
- Biederman, J., Mick, E., Faraone, S. V., Braaten, E., Doyle, A., Spencer, T., Wilens, T. E., Frazier, E., & Johnson, M. A. (2002). Influence of gender on attention deficit hyperactivity disorder in children referred to a psychiatric clinic. [Electronic version]. *American Journal of Psychiatry*, 159, 36-42.
- Bootzin, R. R. & Stevens, S. J. (2005). Adolescents, substance abuse, and the treatment of insomnia and daytime sleepiness. [Electronic version]. *Clinical Psychology Review*, 25, 629-644.

- Borowsky, I. W. & Resnick, M. D. (1998). Environmental stressors and emotional status of adolescents who have been in special education classes. *Archives of Pediatric and Adolescent Medicine*, 152, 377-382.
- Breslau, N., Roth, T., Rosenthal, L., & Andreski, P. (1996). Sleep disturbance and psychiatric disorders: A longitudinal epidemiological study of young adults. [Electronic version]. *Biological Psychiatry*, 39, 411-418.
- Brook, J. S., Morojele, N. K., Pahl, K., & Brook, D. W. (2006). Predictors of drug use among South African adolescents. *Journal of Adolescent Health*, 38, 26-34.
- Brooks, L. (1993). Diagnosis and pathophysiology of obstructive sleep apnea in children. *Ear Nose Throat Journal*, 72, 58-60.
- Brower, K. J. (2001). Alcohol's effects on sleep in alcoholics. [Electronic version]. *Alcohol Research and Health*, 25, 110-125.
- Brower, K. J., Aldrich, M. S., Robinson, E. A. R., Zucker, R. A., & Greden, J. F. (2001). Insomnia, self-medication, and relapse to alcoholism. [Electronic version]. *American Journal of Psychiatry*, 158, 399-404.
- Brown, R. T. (2002). Risk factors for substance abuse in adolescents. [Electronic version]. *The Pediatric Clinics of North America*, 49, 247-255.
- Brown, T. E. & McMullen, W. J. Jr. (2001). Attention deficit disorders and sleep / arousal disturbance. [Electronic version]. *Annals of the New York Academy of Sciences*, 931, 271-286.
- Burke, J. D., Loeber, R., & Lahey, B. B. (2001). Which aspects of ADHD are associated with tobacco use in early adolescence? [Electronic version]. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 42, 493-502.
- Caffray, C. M. & Schneider, S. L. (2000). Why do they do it? Affective motivators in adolescents' decisions to participate in risk behaviours. [Electronic version]. *Cognition*

and Emotion, 14, 543-576.

- Carroll, K. M & Rounsaville, B. J. (1993). History and significance of childhood attention deficit disorder in treatment-seeking cocaine abusers. *Comprehensive Psychiatry, 34, 75-82.*
- Carskadon, M. A. (1990). Patterns of sleep and sleepiness in adolescents. [Electronic version]. *Pediatrician, 17, 5-12.*
- Carvajal, S. C., Wiatrek, D. E., Evans, R. I., Knee, C. R., & Nash, S. G. (2000). Psychosocial determinants of the onset and escalation of smoking: Cross-sectional and prospective findings in multiethnic middle school samples. *Journal of Adolescent Health, 27, 255-265.*
- Castaneda, R., Levy, R., Hardy, M., & Trujillo, M. (2000). Long-acting stimulants for the treatment of attention-deficit disorder in cocaine-dependent adults. [Electronic version]. *Psychiatric Services, 51, 169-171.*
- Chen, K. & Kandel, D. B. (1995). The natural history of drug use from adolescence to the mid-thirties in a general population sample. [Electronic version]. *American Journal of Public Health, 85, 41-47.*
- Chervin, R. D., Dillon, J. E., Bassetti, C., Ganoczy, D. A., & Pituch, K. J. (1997). Symptoms of sleep disorders, inattention, and hyperactivity in children. *Sleep, 20, 1185-1192.*
- Chervin, R. D., Archbold, K. H., Dillon, J. E., Panahi, P., Pituch, K. J., Dahl, R. E., & Guilleminault, C. (2002). Inattention, hyperactivity, and symptoms of sleep-disordered breathing. [Electronic version]. *Pediatrics, 109, 449-456.*
- Chilcoat, H. D. & Breslau, N. (1999). Pathways from ADHD to early drug use. [Electronic version]. *Journal of the American Academy of Child and Adolescent Psychiatry, 38, 1347-1354.*
- Clure, C., Brady, K. T., Saladin, M. E., Johnson, D., Waid, R., & Rittenbury, M. (1999). Attention-deficit / hyperactivity disorder and substance use: Symptom pattern and drug

- choice. [Electronic version]. *American Journal of Drug and Alcohol Abuse*, 25, 441-448.
- Cooper, J., Tyler, L., Wallace, I., & Burgess, K. R. (2004). No evidence of sleep apnea in children with attention deficit hyperactivity disorder. *Clinical Pediatrics*, 43, 609-614.
- Corkum, P., Tannock, R., & Moldofsky, H. (1998). Sleep disturbances in children with attention-deficit / hyperactivity disorder. [Electronic version]. *Journal of the American Academy of Child and Adolescent Psychiatry*, 37, 637-646.
- Corkum, P., Moldofsky, H., Hogg-Johnson, S., Humphries, T., & Tannock, R. (1999). Sleep problems in children with attention-deficit / hyperactivity disorder: Impact of subtype, comorbidity, and stimulant medication. [Electronic version]. *Journal of the American Academy of Child and Adolescent Psychiatry*, 38, 1285-1293.
- Cosden, M. (2001). Risk and resilience for substance abuse among adolescents and adults with LD. [Electronic version]. *Journal of Learning Disabilities*, 34, 352-358.
- Crum, R. M., Storr, C. L., Chan, Y., & Ford, D. E. (2004). Sleep disturbance and risk for alcohol-related problems. [Electronic version]. *American Journal of Psychiatry*, 161, 1197-1203.
- Dahl, R. E. (1998). The development and disorders of sleep. *Advances in Pediatrics*, 45, 73-90.
- Dahl, R. E. & Puig-Antich, J. (1990). Sleep disturbances in child and adolescent psychiatric disorders. [Electronic version]. *Pediatrician*, 17, 32-37.
- Dahl, R. E., Pelham, W. E., & Wierson, M. (1991). The role of sleep disturbances in attention deficit disorder symptoms: A case study. *Journal of Pediatric Psychology*, 16, 229-239.
- Dahl, R. E., Holttum, J., & Trubnik, L. (1994). A clinical picture of child and adolescent narcolepsy. [Electronic version]. *Journal of the American Academy of Child and Adolescent Psychiatry*, 33, 834-841.

- Daw, J. (2001). The ritalin debate. [Electronic version]. *Monitor on Psychology*, 32, <http://www.apa.org/monitor/jun01/ritalin.html> (accessed April 13, 2003).
- Day, H. D. & Abmayr, S. B. (1998). Parent reports of sleep disturbances in stimulant-medicated children with attention-deficit hyperactivity disorder. [Electronic version]. *Journal of Clinical Psychology*, 54, 701-716.
- Dollinger, S. J., Horn, J. L., & Boarini, D. (1988). Disturbed sleep and worries among learning disabled adolescents. *American Journal of Orthopsychiatry*, 58, 428-434.
- Ellison, G. T. H., de Wet, T., IJsselmuiden, C. B., & Richter, L. M. (1996). Desegregating health statistics and health research in South Africa. *South African Medical Journal*, 86, 1257-1262.
- Elmquist, D. L., Morgan, D. P., & Bolds, P. K. (1992). Alcohol and other drug use among adolescents with disabilities. *The International Journal of the Addictions*, 27, 1475-1483.
- Ennett, S. T., Flewelling, R. L., Lindrooth, R. C., & Norton, E. C. (1997). School and neighbourhood characteristics associated with school rates of alcohol, cigarette, and marijuana use. *Journal of Health and Social Behavior*, 38, 55-71.
- Epstein, J. A., Botvin, G. J., Baker, E., & Diaz, T. (1999). Impact of social influences and problem behaviour on alcohol use among inner-city Hispanic and black adolescents. *Journal of Studies on Alcohol*, 60, 595-604.
- Fakier, N. (2003). *A comparison of risk behaviours in adolescents with and without learning disabilities*. Unpublished honours research project, University of Cape Town, South Africa.
- Faraone, S. V. & Wilens, T. (2003). Does stimulant treatment lead to substance use disorders? [Electronic version]. *Journal of Clinical Psychiatry*, 64(Suppl. 11), 9-13.
- Fidler, W., Michell, L., Raab, G., & Charlton, A. (1992). Smoking: A special need? [Electronic version]. *British Journal of Addiction*, 87, 1583-1591.

- Fischer, M. & Barkley, R. A. (2003). Childhood stimulant treatment and risk for later substance abuse. [Electronic version]. *Journal of Clinical Psychiatry*, 64(Suppl. 11), 19-23.
- Fitzpatrick, J. L. & Gerard, K. (1993). Community attitudes toward drug use: The need to assess community norms. *International Journal of the Addictions*, 18, 947-957.
- Fleming, J. P., Kellam, S. G., & Brown, C. H. (1982). Early predictors of age at first use of alcohol, marijuana, and cigarettes. *Drug and Alcohol Dependence*, 9, 285-303.
- Flisher, A. J. (2003). The high (and dizzy) life. *MRC News*, 34, 8.
- Flisher, A. J. & Chalton, D. O. (1995). High-school dropouts in a working-class South African community: Selected characteristics and risk-taking behaviour. *Journal of Adolescence*, 18, 105-121.
- Flisher, A. J., Parry, C. D. H., Evans, J., Muller, M., & Lombard, C. (2003). Substance use by adolescents in Cape Town: Prevalence and correlates. *Journal of Adolescent Health*, 32, 58-65.
- Flisher, A. J., Evans, J., Muller, M., & Lombard, C. (2004). Test-retest reliability of self-reported adolescent risk behaviour. *Journal of Adolescence*, 27, 207-212.
- Flory, K., Milich, R., Lynam, D. R., Leukefeld, C., & Clayton, R. (2003). Relation between childhood disruptive behavior disorders and substance use and dependence symptoms in young adulthood: Individuals with symptoms of attention-deficit / hyperactivity disorder and conduct disorder are uniquely at risk. [Electronic version]. *Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors*, 17, 151-158.
- Foley, D. J., Monjan, A. A., Brown, S. L., Simonsick, E. M., Wallace, R. B., & Blazer, D. G. (1995). Sleep complaints among elderly persons: An epidemiologic study of three communities. *Sleep*, 18, 425-432.
- Fone, K. C. F. & Nutt, D. J. (2005). Stimulants: Use and abuse in the treatment of attention

- deficit hyperactivity disorder. [Electronic version]. *Current Opinion in Pharmacology*, 5, 87-93.
- Fox, C. L. & Forbing, S. E. (1991). Overlapping symptoms of substance abuse and learning handicaps: Implications for educators. *Journal of Learning Disabilities*, 24, 24-31.
- Garland, E. J. (1998). Intranasal abuse of prescribed methylphenidate. [Electronic version]. *Journal of the American Academy of Child and Adolescent Psychiatry*, 37, 573-574.
- Gillin, J. C. (1998). Are sleep disturbances risk factors for anxiety, depressive and addictive disorders? *Acta Psychiatrica Scandinavica*, 98(Suppl. 393), 39-43.
- Goldman, L. S., Genel, M., Bezman, R. J., & Slanetz, P. J. (1998). Diagnosis and treatment of attention-deficit / hyperactivity disorder in children and adolescents. [Electronic version]. *Journal of the American Medical Association*, 279, 1100-1107.
- Gordon, S. M., Tulak, F., & Troncale, J. (2004). Prevalence and characteristics of adolescent patients with co-occurring ADHD and substance dependence. *Journal of Addictive Diseases*, 23, 31-40.
- Goyette, C., Conners, C. K., & Ulrich, R. (1978). Normative data on the Revised Conners Parent and Teacher Rating Scales. *Journal of Abnormal Child Psychology*, 6, 221-236.
- Gozal, D. (1998). Sleep-disordered breathing and school performance in children. [Electronic version]. *Pediatrics*, 102, 616-620.
- Grant, B. F. & Dawson, D. A. (1997). Age at onset of alcohol use and its association with DSM-IV alcohol abuse and dependence: Results from the National Longitudinal Epidemiologic Survey. *Journal of Substance Abuse*, 9, 103-110.
- Gregory, A. M. & O'Connor, T. G. (2002). Sleep problems in childhood: A longitudinal study of developmental change and association with behavioral problems. [Electronic version]. *Journal of the American Academy of Child and Adolescent Psychiatry*, 41, 964-971.

- Greydanus, D. E., Sloane, M. A., & Rappley, M. D. (2002). Psychopharmacology of ADHD in adolescents. [Electronic version]. *Adolescent Medicine, 13*, 599-624.
- Gruber, R., Sadeh, A., & Raviv, A. (2000). Instability of sleep patterns in children with attention-deficit / hyperactivity disorder. [Electronic version]. *Journal of the American Academy of Child and Adolescent Psychiatry, 39*, 495-501.
- Guo, J., Hawkins, J. D., Hill, K. G., & Abbott, R. D. (2001). Childhood and adolescent predictors of alcohol abuse and dependence in young adulthood. [Electronic version]. *Journal of Studies on Alcohol, 62*, 754-762.
- Halbower, A. C. & Marcus, C. L. (2003). Sleep disorders in children. [Electronic version]. *Current Opinion in Pulmonary Medicine, 9*, 471-476.
- Hanna, E. Z., Yi, H., Dufour, M. C., & Whitmore, C. C. (2001). The relationship of early-onset regular smoking to alcohol use, depression, illicit drug use, and other risky behaviors during early adolescence: Results from the youth supplement to the Third National Health and Nutrition Examination Survey. [Electronic version]. *Journal of Substance Abuse, 13*, 265-282.
- Harrison, P. A. & Luxenberg, M. G. (1995). Comparisons of alcohol and other drug problems among Minnesota adolescents in 1989 and 1992. *Archives of Pediatrics and Adolescent Medicine, 149*, 137-144.
- Hawkins, J. D., Catalano, R. F., & Miller, J. Y. (1992). Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. *Psychological Bulletin, 112*, 64-105.
- Hicks, R. A., DeHaro, D., Inman, G., & Hicks, G. J. (1999). Consistency of hand use and sleep problems. *Perceptual and Motor Skills, 89*, 49-56.
- Horner, B. R. & Scheibe, K. E. (1997). Prevalence and implications of attention-deficit hyperactivity disorder among adolescents in treatment for substance abuse. [Electronic

- version]. *Journal of the American Academy of Child and Adolescent Psychiatry*, 36, 30-36.
- Hughes, J. R. (1997). Substance abuse and ADHD. *American Journal of Psychiatry*, 154, 132.
- Jaffe, S. L. (1991). Intranasal abuse of prescribed methylphenidate by an alcohol and drug abusing adolescent with ADHD. *Journal of the American Academy of Child and Adolescent Psychiatry*, 30, 773-775.
- Janson, C., Gislason, T., De Backer, W., Plaschke, P., Björnsson, E., Hetta, J., Kristbjarnason, H., Vermeire, P., & Boman, G. (1995). Prevalence of sleep disturbances among young adults in three European countries. *Sleep*, 18, 589-597.
- Jessor, R. & Jessor, S. L. (1977). *Problem behavior and psychosocial development: A longitudinal study of youth*. New York: Academic Press.
- Johann, M., Bobbe, G., Putzhammer, A., & Wodarz, N. (2003). Comorbidity of alcohol dependence with attention-deficit hyperactivity disorder: Differences in phenotype with increased severity of the substance disorder, but not in genotype (serotonin transporter and 5-hydroxytryptamine-2c receptor). [Electronic version]. *Alcoholism: Clinical and Experimental Research*, 27, 1527-1534.
- Johnson, E. O., Roehrs, T., Roth, T., & Breslau, N. (1998). Epidemiology of alcohol and medication as aids to sleep in early adulthood. *Sleep*, 21, 178-186.
- Johnson, E. O. & Breslau, N. (2001). Sleep problems and substance use in adolescence. *Drug and Alcohol Dependence*, 64, 1-7.
- Kandel, D. B. & Raveis, V. H. (1989). Cessation of illicit drug use in young adulthood. *Archives of General Psychiatry*, 46, 109-116.
- Kaplan, B. J., McNicol, J., Conte, R. A., & Moghadam, H. K. (1987). Sleep disturbance in preschool-aged hyperactive and nonhyperactive children. [Electronic version]. *Pediatrics*,

80, 839-844.

Karacostas, D. D. & Fisher, G. L. (1993). Chemical dependency in students with and without learning disabilities. *Journal of Learning Disabilities, 26*, 491-495.

Katims, D. S., Zapata, J. T., & Yin, Z. (1996). Risk factors for substance use by Mexican American youth with and without learning disabilities. [Electronic version]. *Journal of Learning Disabilities, 29*, 213-219.

Katusic, S. K., Barbaresi, W. J., Colligan, R. C., Weaver, A. L., Leibson, C. L., & Jacobsen, S. J. (2005). Psychostimulant treatment and risk for substance abuse among young adults with a history of attention-deficit / hyperactivity disorder: A population-based, birth cohort study. [Electronic version]. *Journal of Child and Adolescent Psychopharmacology, 15*, 764-776.

Kim, K., Uchiyama, M., Okawa, M., Doi, Y., Oida, T., Minowa, M., & Ogihara, R. (1999). Lifestyles and sleep disorders among the Japanese adult population. [Electronic version]. *Psychiatry and Clinical Neurosciences, 53*, 269-270.

Kollins, S. H. (2003). Comparing the abuse potential of methylphenidate versus other stimulants: A review of available evidence and relevance to the ADHD patient. [Electronic version]. *Journal of Clinical Psychiatry, 64*(Suppl. 11), 14-18.

Kress, J. S. & Elias, M. J. (1993). Substance abuse prevention in special education populations: Review and recommendations. [Electronic version]. *The Journal of Special Education, 27*, 35-51.

Kurtzman, T. L., Otsuka, K. N., & Wahl, R. A. (2001). Inhalant abuse by adolescents. [Electronic version]. *Journal of Adolescent Health, 28*, 170-180.

Lambert, N. M. & Hartsough, C. S. (1998). Prospective study of tobacco smoking and substance dependencies among samples of ADHD and non-ADHD participants. [Electronic version]. *Journal of Learning Disabilities, 31*, 533-544.

- LeBourgeois, M. K., Avis, K., Mixon, M., Olmi, J., & Harsh, J. (2004). Snoring, sleep quality, and sleepiness across attention-deficit / hyperactivity disorder subtypes. *Sleep, 27*, 520-525.
- Lewinsohn, P. M., Rohde, P., & Brown, R. A. (1999). Level of current and past adolescent cigarette smoking as predictors of future substance use disorders in young adulthood. [Electronic version]. *Addiction, 94*, 913-921.
- Lexcen, F. J. & Hicks, R. A. (1993). Does cigarette smoking increase sleep problems? *Perceptual and Motor Skills, 77*, 16-18.
- Lilienfeld, S. O. & Waldman, I. D. (1990). The relation between childhood attention-deficit hyperactivity disorder and adult antisocial behavior reexamined: The problems of heterogeneity. [Electronic version]. *Clinical Psychology Review, 10*, 699-725.
- Lynskey, M. T. & Fergusson, D. M. (1995). Childhood conduct problems, attention deficit behaviors, and adolescent alcohol, tobacco, and illicit drug use. [Electronic version]. *Journal of Abnormal Child Psychology, 23*, 281-302.
- Maag, J. W., Irvin, D. M., Reid, R., & Vasa, S. F. (1994). Prevalence and predictors of substance use: A comparison between adolescents with and without learning disabilities. *Journal of Learning Disabilities, 27*, 223-234.
- Mannuzza, S., Klein, R. G., Bessler, A., Malloy, P., & LaPadula, M. (1993). Adult outcome of hyperactive boys: Educational achievement, occupational rank, and psychiatric status. *Archives of General Psychiatry, 50*, 565-576.
- Mannuzza, S., Klein, R. G., & Moulton III, J. L. (2003). Does stimulant treatment place children at risk for adult substance abuse? A controlled, prospective follow-up study. [Electronic version]. *Journal of Child and Adolescent Psychopharmacology, 13*, 273-282.
- Marcotte, A. C., Thacher, P. V., Butters, M., Bortz, J., Acebo, C., & Carskadon, M. A. (1998). Parental report of sleep problems in children with attentional and learning

- disorders. *Journal of Developmental and Behavioral Pediatrics*, *19*, 178-186.
- Marshal, M. P., Molina, B. S. G., & Pelham, W. E. Jr. (2003). Childhood ADHD and adolescent substance use: An examination of deviant peer group affiliation as a risk factor. [Electronic version]. *Psychology of Addictive Behaviors*, *17*, 293-302.
- Matsumoto, T., Kamijo, A., Yamaguchi, A., Iseki, E., & Hirayasu, Y. (2005). Childhood histories of attention-deficit hyperactivity disorders in Japanese methamphetamine and inhalant abusers: Preliminary report. [Electronic version]. *Psychiatry and Clinical Neurosciences*, *59*, 102-105.
- McCabe, S. E., Teter, C. J., & Boyd, C. J. (2004). The use, misuse and diversion of prescription stimulants among middle and high school students. [Electronic version]. *Substance Use and Misuse*, *39*, 1095-1116.
- McCann, B. S. & Roy-Byrne, P. (2000). Attention-deficit / hyperactivity disorder and learning disabilities in adults. [Electronic version]. *Seminars in Clinical Neuropsychiatry*, *5*, 191-197.
- Melendres, M. C. S., Lutz, J. M., Rubin, E. D., & Marcus, C. L. (2004). Daytime sleepiness and hyperactivity in children with suspected sleep-disordered breathing. [Electronic version]. *Pediatrics*, *114*, 768-775.
- Mercier, L., Pivik, R. T., & Busby, K. (1993). Sleep patterns in reading disabled children. *Sleep*, *16*, 207-215.
- Mick, E., Biederman, J., Jetton, J., & Faraone, S. V. (2000). Sleep disturbances associated with attention deficit hyperactivity disorder: The impact of psychiatric comorbidity and pharmacotherapy. *Journal of Child and Adolescent Psychopharmacology*, *10*, 223-231.
- Milberger, S., Biederman, J., Faraone, S. V., Chen, L., & Jones, J. (1997). ADHD is associated with early initiation of cigarette smoking in children and adolescents. [Electronic version]. *Journal of the American Academy of Child and Adolescent*

- Psychiatry*, 36, 37-44.
- Millman, R. P. (2005). Excessive sleepiness in adolescents and young adults: Causes, consequences, and treatment strategies. [Electronic version]. *Pediatrics*, 115, 1774-1786.
- Molina, B. S. G. & Pelham, W. E. (2001). Substance use, substance abuse, and LD among adolescents with a childhood history of ADHD. [Electronic version]. *Journal of Learning Disabilities*, 34, 333-342, 351.
- Molina, B. S. G. & Pelham, W. E. Jr. (2003). Childhood predictors of adolescent substance use in a longitudinal study of children with ADHD. [Electronic version]. *Journal of Abnormal Psychology*, 112, 497-507.
- Moore, D. & Polsgrove, L. (1991). Disabilities, developmental handicaps, and substance misuse: A review. *The International Journal of the Addictions*, 26, 65-90.
- Morrison, D. N., McGee, R., & Stanton, W. R. (1992). Sleep problems in adolescence. *Journal of the American Academy of Child and Adolescent Psychiatry*, 31, 94-99.
- Morrison, G. M. & Cosden, M. A. (1997). Risk, resilience, and adjustment of individuals with learning disabilities. [Electronic version]. *Learning Disability Quarterly*, 20, 43-60.
- Muisener, P. P. (1994). *Understanding and treating adolescent substance abuse*. California: Sage Publications, Inc.
- Murphy, K. R., Barkley, R. A., & Bush, T. (2002). Young adults with attention deficit hyperactivity disorder: Subtype differences in comorbidity, educational, and clinical history. *Journal of Nervous and Mental Disease*, 190, 147-157.
- Myers, B. & Parry, C. (2002). *Fact sheet – Substance use by South African adolescents*. Retrieved April 13, 2003, from <http://www.sahealthinfo.org/sahealthinfo.htm>
- National Institute on Drug Abuse (NIDA). (2002). *Research report on methamphetamine abuse and addiction*. Retrieved May 24, 2006, from <http://www.drugabuse.gov>
- National Institute on Drug Abuse (NIDA). (2005). *Research report on inhalant abuse*.

Retrieved November 17, 2006, from <http://www.drugabuse.gov>

- Newman, A. B., Enright, P. L., Manolio, T. A., Haponik, E. F., & Wahl, P. W. (1997). Sleep disturbance, psychosocial correlates, and cardiovascular disease in 5201 older adults: The cardiovascular health study. *Journal of the American Geriatric Society, 45*, 1-7.
- O'Brien, L. M., Holbrook, C. R., Mervis, C. B., Klaus, C. J., Bruner, J. L., Raffield, T. J., Rutherford, J., Mehl, R. C., Wang, M., Tuell, A., Hume, B. C., & Gozal, D. (2003). Sleep and neurobehavioral characteristics of 5- to 7-year-old children with parentally reported symptoms of attention-deficit / hyperactivity disorder. [Electronic version]. *Pediatrics, 111*, 554-563.
- O'Brien, L. M., Ivanenko, A., Crabtree, V. M., Holbrook, C. R., Bruner, J. L., Klaus, C. J., & Gozal, D. (2003). Sleep disturbances in children with attention deficit hyperactivity disorder. [Electronic version]. *Pediatric Research, 54*, 237-243.
- O'Brien, L. M. & Gozal, D. (2004). Neurocognitive dysfunction and sleep in children: From human to rodent. *The Pediatric Clinics of North America, 51*, 187-202.
- Owens, J. A. (2005). The ADHD and sleep conundrum: A review. [Electronic version]. *Journal of Developmental and Behavioral Pediatrics, 26*, 312-322.
- Owens, J. A., Maxim, R., Nobile, C., McGuinn, M., & Msall, M. (2000a). Parental and self-report of sleep in children with attention-deficit / hyperactivity disorder. *Archives of Pediatrics and Adolescent Medicine, 154*, 549-555.
- Owens, J. A., Spirito, A., McGuinn, M., & Nobile, C. (2000b). Sleep habits and sleep disturbance in elementary school-aged children. *Journal of Developmental and Behavioral Pediatrics, 21*, 27-36.
- Owens, J. A. & Witmans, M. (2004). Sleep problems. [Electronic version]. *Current Problems in Pediatric and Adolescent Health Care, 34*, 154-179.
- Paavonen, E. J., Solantaus, T., Almqvist, F., & Aronen, E. T. (2003). Four-year follow-up

- study of sleep and psychiatric symptoms in preadolescents: Relationship of persistent and temporary sleep problems to psychiatric symptoms. [Electronic version]. *Journal of Developmental and Behavioral Pediatrics*, 24, 307-314.
- Parran, T. V. Jr. & Jasinski, D. R. (1991). Intravenous methylphenidate abuse: Prototype for prescription drug abuse. *Archives of Internal Medicine*, 151, 781-783.
- Patten, C. A., Choi, W. S., Gillin, J. C., & Pierce, J. P. (2000). Depressive symptoms and cigarette smoking predict development and persistence of sleep problems in US adolescents. *Pediatrics*, 106, Retrieved November 19, 2006, from <http://www.pediatrics.org/cgi/content/full/106/2/e23>
- Pearl, P. L., Efron, L., & Stein, M. A. (2002). Children, sleep, and behavior: A complex association. [Electronic version]. *Minerva Pediatrica*, 54, 79-91.
- Phillips, B. A. & Danner, F. J. (1995). Cigarette smoking and sleep disturbance. *Archives of Internal Medicine*, 155, 734-737.
- Picchiatti, D. L., England, S. J., Walters, A. S., Willis, K., & Verrico, T. (1998). Periodic limb movement disorder and restless legs syndrome in children with attention-deficit hyperactivity disorder. [Electronic version]. *Journal of Child Neurology*, 13, 588-591.
- Picchiatti, D. L. & Walters, A. S. (1999). Moderate to severe periodic limb movement disorder in childhood and adolescence. *Sleep*, 22, 297-300.
- Pihl, R. O. & Peterson, J. B. (1991). Attention-deficit hyperactivity disorder, childhood conduct disorder, and alcoholism. [Electronic version]. *Alcohol Health & Research World*, 15, 25-31.
- Pomerleau, O. F., Downey, K. K., Stelson, F. W., & Pomerleau, C. S. (1995). Cigarette smoking in adult patients diagnosed with attention deficit hyperactivity disorder. [Electronic version]. *Journal of Substance Abuse*, 7, 373-378.
- Poulin, C. (2001). Medical and nonmedical stimulant use among adolescents: From

- sanctioned to unsanctioned use. [Electronic version]. *Canadian Medical Association Journal*, 165, 1039-1044.
- Quine, L. (1991). Sleep problems in children with mental handicap. *Journal of Mental Deficiency Research*, 35, 269-290.
- Quine, L. (1992). Severity of sleep problems in children with severe learning difficulties: Description and correlates. *Journal of Community and Applied Social Psychology*, 2, 247-268.
- Quine, L. (2001). Sleep problems in primary school children: Comparison between mainstream and special school children. *Child: Care, Health and Development*, 27, 201-221.
- Quinn, P. O. (2005). Treating adolescent girls and women with ADHD: Gender-specific issues. *Journal of Clinical Psychology*, 61, 579-587.
- Rhodes, S. S. & Jasinski, D. R. (1990). Learning disabilities in alcohol-dependent adults: A preliminary study. *Journal of Learning Disabilities*, 23, 551-556.
- Richdale, A., Francis, A., Gavidia-Payne, S., & Cotton, S. (2000). Stress, behaviour, and sleep problems in children with an intellectual disability. [Electronic version]. *Journal of Intellectual and Developmental Disability*, 25, 147-161.
- Riedel, B. W., Durrence, H. H., Lichstein, K. L., & Taylor, D. J. (2004). The relation between smoking and sleep: The influence of smoking level, health, and psychological variables. [Electronic version]. *Behavioral Sleep Medicine*, 2, 63-78.
- Ring, A., Stein, D., Barak, Y., Teicher, A., Hadjez, J., Elizur, A., & Weizman, A. (1998). Sleep disturbances in children with attention-deficit / hyperactivity disorder: A comparative study with healthy siblings. *Journal of Learning Disabilities*, 31, 572-578.
- Robinson, A. M. & Richdale, A. L. (2004). Sleep problems in children with an intellectual disability: Parental perceptions of sleep problems, and views of treatment effectiveness.

Child: Care, Health and Development, 30, 139-150.

Rosen, C. L. (1997). Sleep disorders in infancy, childhood, and adolescence. [Electronic version]. *Current Opinion in Pulmonary Medicine*, 3, 449-455.

Sadeh, A., McGuire, J. P. D., Sachs, H., Seifer, R., Tremblay, A., Civita, R., & Hayden, R. M. (1995). Sleep and psychological characteristics of children on a psychiatric inpatient unit. [Electronic version]. *Journal of the American Academy of Child and Adolescent Psychiatry*, 34, 813-819.

Schiffman, R. F. (2004). Drug and substance use in adolescents. *MCN: American Journal of Maternal Child Nursing*, 29, 21-27.

Schubiner, H., Tzelepis, A., Isaacson, J. H., Warbasse, L. H., Zacharek, M., & Musial, J. (1995). The dual diagnosis of attention-deficit / hyperactivity disorder and substance abuse: Case reports and literature review. *Journal of Clinical Psychiatry*, 56, 146-150.

Schubiner, H., Tzelepis, A., Milberger, S., Lockhart, N., Kruger, M., Kelley, B. J., & Schoener, E. P. (2000). Prevalence of attention-deficit / hyperactivity disorder and conduct disorder among substance abusers. [Electronic version]. *Journal of Clinical Psychiatry*, 61, 244-251.

Sells, C. W. & Blum, R. W. (1996). Current trends in adolescent health. In R. J. DiClemente, W. B. Hansen & L. E. Ponton (Eds.), *Handbook of adolescent health risk behaviour* (pp. 5-34). New York: Plenum Press.

Semrud-Clikeman, M., Biederman, J., Sprich-Buckminster, S., Lehman, B. K., Faraone, S. V., & Norman, D. (1992). Comorbidity between ADDH and learning disability: A review and report in a clinically referred sample. *Journal of the American Academy of Child and Adolescent Psychiatry*, 31, 439-448.

Shaywitz, B. A., Fletcher, J. M., & Shaywitz, S. E. (1995). Defining and classifying learning disabilities and attention-deficit / hyperactivity disorder. *Journal of Child Neurology*,

- 10(Suppl. 1), 50-57.
- Silver, L. B. (1989). Learning disabilities. *Journal of the American Academy of Child and Adolescent Psychiatry*, 28, 309-313.
- Statistics South Africa. (2006). *Mid-year population estimates, South Africa*. Retrieved January 31, 2007, from www.statssa.gov.za
- StatSoft, Inc. (2004). STATISTICA (data analysis software system), version 7. www.statsoft.com.
- Tapert, S. F., Aarons, G. A., Sedlar, G.R., & Brown, S. A. (2001). Adolescent substance use and sexual risk-taking behaviour. [Electronic version]. *Journal of Adolescent Health*, 28, 181-189.
- Tapert, S. F., Baratta, M. V., Abrantes, A. M., & Brown, S. A. (2002). Attention dysfunction predicts substance involvement in community youths. *Journal of the American Academy of Child and Adolescent Psychiatry*, 41, 680-686.
- Teplin, D., Raz, B., Daiter, J., Varenbut, M., & Tyrrell, M. (2006). Screening for substance use patterns among patients referred for a variety of sleep complaints. [Electronic version]. *American Journal of Drug & Alcohol Abuse*, 32, 111-120.
- Tercyak, K. P., Lerman, C., & Audrain, J. (2002). Association of attention-deficit / hyperactivity disorder symptoms with levels of cigarette smoking in a community sample of adolescents. [Electronic version]. *Journal of the American Academy of Child and Adolescent Psychiatry*, 41, 799-805.
- Thunström, M. (2002). Severe sleep problems in infancy associated with subsequent development of attention-deficit / hyperactivity disorder at 5.5 years of age. [Electronic version]. *Acta Paediatrica*, 91, 584-592.
- Tirosh, E., Sadeh, A., Munvez, R., & LaVie, P. (1993). Effects of methylphenidate on sleep in children with attention-deficit hyperactivity disorder: An activity monitor study.

- American Journal of Diseases of Children*, 147, 1313-1315.
- Torabi, M. R., Bailey, W. J., & Majd-Jabbari, M. (1993). Cigarette smoking as a predictor of alcohol and other drug use by children and adolescents: Evidence of the “gateway drug effect”. [Electronic version]. *Journal of School Health*, 63, 302-306.
- Trommer, B. L., Hoepfner, J. B., Rosenberg, R. S., Armstrong, K. J., & Rothstein, J. A. (1988). Sleep disturbance in children with attention deficit disorder. *Annals of Neurology*, 24, 322.
- Tynjälä J., Kannas, L., & Levälähti, E. (1997). Perceived tiredness among adolescents and its association with sleep habits and use of psychoactive substances. *Journal of Sleep Research*, 6, 189-198.
- Upadhyaya, H. P., Rose, K., Wang, W., O'Rourke, K., Sullivan, B., Deas, D., & Brady, K. T. (2005). Attention-deficit / hyperactivity disorder, medication treatment, and substance use patterns among adolescents and young adults. [Electronic version]. *Journal of Child and Adolescent Psychopharmacology*, 15, 799-809.
- Vastag, B. (2001). Pay attention: Ritalin acts much like cocaine. [Electronic version]. *Journal of the American Medical Association (JAMA)*, 286, 905-906.
- Vignau, J., Bailly, D., Duhamel, A., Vervaecke, P., Beuscart, R., & Collinet, C. (1997). Epidemiologic study of sleep quality and troubles in French secondary school adolescents. *Journal of Adolescent Health*, 21, 343-350.
- Vitiello, M. V. (1997). Sleep, alcohol and alcohol abuse. [Electronic version]. *Addiction Biology*, 2, 151-158.
- Weinberg, W. A. & Brumback, R. A. (1990). Primary disorder of vigilance: A novel explanation of inattentiveness, boredom, restlessness, and sleepiness. *Journal of Pediatrics*, 116, 720-725.
- Weinberg, W. A. & Harper, C. R. (1993). Vigilance and its disorders. *Neurologic Clinics*, 11,

59-78.

- Weiss, R. D. & Mirin, S. M. (1986). Sub-types of cocaine abusers. *Psychiatric Clinics of North America*, 9, 491-501.
- Wetter, D. W. & Young, T. B. (1994). The relation between cigarette smoking and sleep disturbance. *Preventive Medicine*, 23, 328-334.
- Whalen, C. K., Jamner, L. D., Henker, B., Delfino, R. J., & Lozano, J. M. (2002). The ADHD spectrum and everyday life: Experience sampling of adolescent moods, activities, smoking, and drinking. [Electronic version]. *Child Development*, 73, 209-227.
- Wild, L. G., Flisher, A.J., Bhana, A., & Lombard, C. (2004). Associations among adolescent risk behaviours and self-esteem in six domains. [Electronic version]. *Journal of Child Psychology and Psychiatry*, 45, 1454-1467.
- Wilens, T. E. (1998). AOD use and attention deficit / hyperactivity disorder. [Electronic version]. *Alcohol Health and Research World*, 22, 127-130.
- Wilens, T. E. (2004). Impact of ADHD and its treatment on substance abuse in adults. [Electronic version]. *Journal of Clinical Psychiatry*, 65(Suppl. 3), 38-45.
- Wilens, T. E., Biederman, J., & Spencer, T. J. (1996). Attention-deficit hyperactivity disorder and the psychoactive substance use disorders. *Child and Adolescent Psychiatric Clinics of North America*, 5, 73-91.
- Wilens, T. E., Faraone, S. V., Biederman, J., & Gunawardene, S. (2003). Does stimulant therapy of attention-deficit / hyperactivity disorder beget later substance abuse? A meta-analytic review of the literature. [Electronic version]. *Pediatrics*, 111, 179-185.
- Wilson, J. J. & Levin, F. R. (2001). Attention deficit hyperactivity disorder (ADHD) and substance use disorders. [Electronic version]. *Current Psychiatry Reports*, 3, 497-506.
- Wolfson, A. R. & Carskadon, M. A. (1998). Sleep schedules and daytime functioning in adolescents. *Child Development*, 69, 875-887.

Wong, M. M., Brower, K. J., Fitzgerald, H. E., & Zucker, R. A. (2004). Sleep problems in early childhood and early onset of alcohol and other drug use in adolescence. *Alcoholism: Clinical and Experimental Research*, 28, 578-587.

APPENDIX 1: QUESTIONNAIRE

Questionnaire on health risk behaviours in adolescence

Thank you for taking part in this study. Your responses to this questionnaire are completely confidential. Your name is not required. When the study is written up, all participants' responses will be mixed so your particular responses will not be identifiable. Please try to complete the questionnaire as truthfully as possible.

Please complete the following questions. (Where boxes are provided, please tick the appropriate response):

1. Age

_____ years

2. Sex:

Male | Female

3. Religion:

4. Grade:

5. What was your racial classification under the previous government?

Asian | Black | Coloured | Indian | White

6. Which of the following languages are spoken at home? Please mark as many as necessary.

Afrikaans | English | Xhosa | Zulu

Other(s) – please specify

7. How many learners in your class (including you)?

_____ learners

8. Do you have Attention Deficit Hyperactivity Disorder (ADHD)?

Yes | No

9. Do you use prescription drugs (e.g. Ritalin)?

Yes | No

10. Do you have a particular difficulty concentrating in class (that disrupts your learning)?

Yes	No
-----	----

11. Do you have a particular difficulty paying attention in class (that disrupts your learning)?

Yes	No
-----	----

12. Do you have a particular memory difficulty (that disrupts your learning)?

Yes	No
-----	----

13. Are you hyperactive?

Yes	No
-----	----

14. Do you have specific weaknesses in any of the following? Please mark as many as necessary.

Reading
Mathematics
Spelling
Handwriting
Speech

Other(s) – please specify

15. Do you have trouble falling asleep?

not true	somewhat or sometimes true	very true or often true
----------	----------------------------	-------------------------

16. Do you have trouble staying asleep?

not true	somewhat or sometimes true	very true or often true
----------	----------------------------	-------------------------

17. Do you feel tired in the morning?

not true	somewhat or sometimes true	very true or often true
----------	----------------------------	-------------------------

18. Do you have a problem with sleepiness during the day?

not true	somewhat or sometimes true	very true or often true
----------	----------------------------	-------------------------

This part of the questionnaire is concerned with the use of tobacco, alcohol and other drugs.

19. Have you ever smoked a whole cigarette?

Yes	No
-----	----

IF YES:

a) How old were you when you smoked a whole cigarette for the first time?
_____ years

b) In the past year have you smoked a whole cigarette?

Yes	No
-----	----

c) During the past month, on how many days did you smoke cigarettes?
_____ days

d) During the past month, on the days you smoked, how many cigarettes did you smoke per day?
_____ cigarettes

20. Have you ever used alcohol (including beer and wine), other than a few sips?

Yes | No

IF YES:

a) How old were you when you used alcohol for the first time, other than a few sips?

_____ years

b) In the past year, did you use alcohol other than a few sips? Yes | No

c) During the past month, on how many days did you have at least one drink of alcohol?

_____ days

21. Have you ever used tik-tik ("speed")? Yes | No

22. Have you ever smoked dagga on its own? Yes | No

23. Have you ever smoked dagga and Mandrax together ("white pipes", "buttons")?

Yes | No

24. Have you ever sniffed glue, petrol or thinners? Yes | No

25. Have you ever used crack cocaine? Yes | No

26. Have you ever used Ecstasy? Yes | No

27. Have you ever used any other type of illegal drug, such as cocaine, heroin, stimulants, hallucinogenics such as LSD, Nexus, MDMA? Yes | No

Thank you for your assistance.

APPENDIX 2: INSTRUCTIONS TO PARTICIPANTS

Note to educators administering the questionnaire:

Please read the following instructions to the learners. Please try to stick as closely as possible to the wording of the instructions. Please be sensitive to the confidential nature of the participants' responses. Thank you very much for your assistance and your time to administer the questionnaire.

Instructions to learners:

This questionnaire is part of a Master's study in psychology at the University of Cape Town. The study is on risk behaviours in adolescence. You do not have to complete the questionnaire if you don't want to. But your help is greatly appreciated. Do not write your name on the questionnaire. When the study is written up, no identifying particulars will be given, for example no one will be able to tell who you are or which school you are from.

Nobody will see the questionnaire – your teachers, principals or the university will not look at the questionnaire. Learners at other schools will also complete the questionnaire. Please try to complete the questionnaire as truthfully as possible. There are no “right” or “wrong” answers. Again, I would like to remind you that your participation is voluntary, that your responses are anonymous and confidential. If you have any questions about risk behaviours, you may talk to the counsellor or psychologist at your school. If you would like to have a look at the completed study, you may get it from your school by June next year – a copy will be given to the headmaster / headmistress. Thank you for your time and assistance.