A MIXED METHODS INVESTIGATION OF NON-MEDICAL PRESCRIPTION STIMULANT USE TO PROMOTE WAKEFULNESS AT AN ATLANTIC CANADIAN UNIVERSITY

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Abstract

This study is a mixed-methods investigation into the non-medical use of prescription stimulants for the purpose of staying awake among students at Memorial University of Newfoundland. The quantitative part of the study involved a comprehensive online survey, which asked for information regarding demographic characteristics and substance use, and included standardized measures of sleep, mental health and attitudes towards non-medical use of prescription drugs. A total of 3,699 participants were recruited and the clean, complete data for 3,160 participants was used for the analysis. The prevalence of non-medical use of prescription stimulants for the purpose of staying awake was 3.1%. The factors associated with such use were alcohol, tobacco and nicotine vapour use, poor sleep quality, daytime sleepiness, and more liberal attitudes towards the non-medical use of prescription drugs. The factors associated with these more liberal attitudes include male gender, non-White ethnicity, international student status, alcohol, tobacco, and nicotine use, depressive symptoms and clinical level of anxiety symptoms. Factors associated with less liberal attitudes were part-time study and borderline level of anxiety symptoms.

In order to provide more insight into why students use prescription stimulants for staying awake, ten semi-structured interviews were conducted. Participants reported obtaining the stimulants from friends who had prescriptions for ADHD, and stated that they were using them to stay awake longer in order to study, indicating that the underlying motive for misuse was academic stress.

Participants recognized that such use could impact sleep and reported using exercise and meditation as alternatives to stimulant use, but admitted that stimulants were much more effective in the short-term. Any prevention/intervention programs should involve promoting sleep hygiene and academic skills, as well as highlighting the negative effects of non-medical prescription stimulant use. These programs should be aimed at the aforementioned groups of students who are at most risk of engaging in such use.

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Chapter 1:

An Overview of the Current Literature Relating to Poor Sleep and Non-medical Use of Prescription Stimulants Among University Students

1.1 Overview

This thesis is a mixed-methods investigation comprising three different studies that will explore the non-medical use of prescription stimulants to promote wakefulness within the student population of Memorial University of Newfoundland, in Atlantic Canada. The first chapter will provide an overview of the current literature on prescription stimulant use in university students, explain why this is a pertinent topic, and end with the primary research objectives for the three studies comprising this thesis. The first study focuses on establishing the prevalence of, and the factors associated with, non-medical prescription stimulant use for the purposes of staying awake. The second study examines students' general attitudes towards the off-label use of prescription medication, and will determine what factors are associated with more liberal attitudes towards such use, in order to potentially identify students who are engaging in this use, or who may do so in the future. The third study uses qualitative methodology to investigate students' attitudes and beliefs towards misuse of prescription stimulants and caffeine pill use to promote wakefulness, focusing in particular on how they feel such use affects their sleeping patterns and what, if any, strategies they have used to mitigate this. This study will build on previous interview studies in this area, while expanding the scope to investigate how students perceive the relationship between stimulant use and sleep disturbance. The final chapter will review the results from the three studies and discuss how these findings fit into – and add to – the broader literature, particularly concerning prescription stimulant misuse and sleep among university students.

1.2 Sleep Disturbance in University Students

University students are particularly vulnerable to experiencing sleep disturbance. The prevalence of sleep disturbance appears to vary depending on the specific sleep outcome measured. In a cross-sectional study, 1,074 university students completed a survey and a week-long sleep diary to assess the prevalence and correlates of insomnia, [as defined by the DSM-5 (2013)], as three nights or more of "sleep difficulty" (issues with initiating sleep, maintaining sleep, or early awakenings) per week over a period of at least three months (Taylor, Bramoweth, Grieser, Tatum & Roane, 2013). Overall, 9.5% of participants met the DSM-5 criteria for clinical insomnia, and another 6.5% reported experiencing insomnia symptoms, but did not meet full DSM-5 criteria. The prevalence of risk for a sleep disorder (e.g., Obstructive Sleep Apnea, Insomnia Disorder, Restless Legs Syndrome, Circadian Rhythm Disorders) in university students was assessed in a study comprising 1,845 students at a US university (Gaultney, 2010). In this sample, 27% of participants were at risk for at least one sleep disorder, with 13% reporting that their sleep was poor and 19% reporting concern that they were not getting enough sleep (Gaultney, 2010).

Sleep quantity can also be assessed by comparing sleep durations to age-based recommendations for healthy sleep duration developed by public bodies such as the National Sleep Foundation, which currently recommends 7-9 hours of sleep per 24-hour period for adults aged 18 and over (Chaput, Dutil & Sampasa-Kanyinga, 2018). In a sample of 1,125 university students at a US university, 25% of students reported getting less than 6.5 hours of sleep a night and 32% of students took longer than 30 minutes to

fall asleep at least once a week (Lund et al., 2009). A similar statistic regarding delayed sleep onset was found by Forquer and colleagues, who noted that 43% of their sample of 313 university students woke more than once every night and 33% reported feeling tired during the day (Forquer, Camden, Gbariau & Johnson, 2008). Understanding that sleep is a complex, multifactorial phenomenon, efforts have been made to define characteristics of good sleep health. One such definition proposed by Buysse (2014) describes sleep which is appropriate in terms of timing (i.e., occurs at a time consistent with one's circadian rhythm), duration (i.e., between 6 and 8 hours), efficiency (i.e. not spending excessive time awake in bed), function (i.e., the ability to sustain alertness during waking hours), and satisfaction (i.e., subjective appraisal of the quality of one's sleep). For the purpose of clarity, the phrase sleep disturbance will be used subsequently to describe the experience of deviation from the above definition, unless otherwise specified.

As sleep disturbance is common in university students, it is important to consider what factors are contributing to this issue. Sleep disturbance in university students seems to be characterized by erratic sleep schedules, insufficient sleep duration, and a significant discrepancy between sleeping patterns on weeknights vs. weekends (Lund et al., 2009; Gaultney, 2010). In Lund et al.'s (2009) study, 35% of students reported that stress was a significant cause of their sleep disturbance, a factor that was also noted to be predictive of sleep disturbance (along with perseveration, rumination and negative affect) by Amaral et al. (2017) in their cross-sectional study of 549 college students in Portugal.

There are a number of adverse physical health outcomes associated with sleep disturbance, including coronary heart disease, metabolic syndrome, hypertension and

diabetes (Buysse, 2014). Furthermore, in a sample of 1,039 undergraduates, 16% reported falling asleep while driving, while 2% had been in a motor vehicle accident caused by sleepiness (Taylor & Bramoweth, 2010). Sleep disturbance can also affect psychological health. University students who met criteria for chronic insomnia had significantly worse fatigue, mood, anxiety and depressive symptoms, and quality of life, compared to students who did not meet the criteria (Taylor et al., 2013). Students' academic performance may also be affected. In a cross-sectional study involving 16,000 university students, 76% had four or fewer nights of adequate rest a week – and the minority of students who did have five or more nights of sufficient sleep a week reported higher GPAs than those who did not (Wald, Muennig, O'Connell, & Garber, 2014). Gaultney (2010) also noted that students who were at risk of developing a sleep disorder were more likely to have GPAs of less than 2.0.

Once developed, maladaptive sleep patterns established in adolescence and young adulthood can persist for years, even extending into midlife. Dregan and Armstrong (2010) examined sleep disturbance data from over 7,000 individuals in the UK, spanning almost three decades. The presence of sleep disturbances at age 16 predicted the presence of adult sleep disturbance at the age of 42 (the final data collection point). This held true even after adjusting for family, environmental, and personal characteristics. Sleep disturbance can also have a long-term impact on an individual's lifestyle and habits. In a sample of over 12,000 high-school students, 68.9% of respondents reported insufficient sleep (defined as sleeping for less than eight hours on an average school night), and these individuals were more likely to lead sedentary lifestyles, characterized by low levels of

physical activity and use of a computer for three or more hours per day for non-school purposes (McKnight-Eily et al., 2011). Participants in this same study who reported insufficient sleep were also more likely to use cigarettes, marijuana, and alcohol, as well as to consume more than one soft drink per day. Although they may not have an immediate impact on students' health, many of these behaviours have the potential to become habitual and impair health throughout adulthood.

1.3 Stimulant Use in University Students

The transition from high school to university can be challenging for many students, as it involves greater academic demands, along with increased personal responsibility for one's wellbeing, and reduced support from family and friends, if living away from home for the first time (Kabrita, Hajjar-Muça & Duffy, 2014). University students must also learn how to balance their academic schedule with the social aspect of student life, and prioritize the activities that are most important to them. During this period, students may also start engaging in (or increase their level of) risky behaviours such as substance use – often out of a desire to experiment or fit in with their peers, but sometimes as a form of self-medication, e.g., to manage stress, reduce sleep disturbance, or improve concentration when studying (McGhee & Lemire, 2005). In a sample of 1,039 university students, sleep medication and alcohol were used to promote sleep by 7% and 11% of participants respectively, while 60% of participants reported using some kind of stimulant (primarily coffee and soda) to increase alertness (Taylor & Bramoweth, 2010).

The range of substances classed as stimulants is fairly broad, encompassing caffeine (as consumed in tea, coffee, soda, energy drinks, caffeinated chocolate and

caffeine pills, among other products), street drugs (e.g., cocaine and speed), and prescription medications such as methyphenidate (e.g., Ritalin/Concerta), and amphetamines (e.g., Adderall), which are usually used to treat Attention Deficit Hyperactivity Disorder (ADHD). The current global community prevalence rate for ADHD is between 2-7%, with an average of 5%, and this appears to be increasing over time (Sayal, Prasad, Daley, Ford & Coghill, 2017). A recent study involving a comprehensive analysis of global trends of ADHD medication use reported that the regional prevalence of prescription stimulant use was highest in North America, with 4.5% of children and 1.4% of adults having a prescription for ADHD medication (Wong et al., 2019). The widespread use of such drugs to treat ADHD means that these medications are now much more likely to be diverted from their intended purpose and instead used for non-medical reasons (DeSantis & Hane, 2010; Johnston, O'Malley, Bachman, and Schulenberg, 2012).

In Canada, 72% of those who abuse prescription stimulants are 15-24 years old (Statistics Canada, 2015), indicating that it is a particular issue for adolescents and young adults. Moreover, in 2017, findings from a nationwide cross-sectional study involving approximately 2,400 participants from every cohort that has graduated high school since 1976 across the US, indicated that the current prevalence of prescription stimulant use was higher among university students than their same-aged peers who were not in a college environment (Schulenberg, Johnston, O'Malley, Bachman, Miech & Patrick, 2017). For example, the prevalence of non-medical Adderall use was 9.9% in college students and 6.2% among same-aged peers. The prevalence for Ritalin was much lower

overall, but college students (2.4%) were still more likely to use it non-medically than same-aged peers (1.6%). These statistics are striking because, in general, the prevalence of illicit substance use is lower among college students than non-college same-aged peers. It is important to note that there is considerable variability in the prevalence of non-medical prescription stimulant use across US universities, with rates ranging from 5-35% (Wilens et al., 2008). Of 492 undergraduate students surveyed at West Virginia University in the US, 14.4% reported engaging in such use (Clegg-Kraynok, McBean & Montgomery-Downs, 2011). This is similar to the prevalence rate of 11.3% reported by 372 university students at East Tennessee University (Bossaer et al., 2013). Although the overall prevalence of non-medical prescription stimulant use appears to be lower in Canada, it also seems to be increasing. In 2013, the American College Health Association published a cross-sectional study of 34,039 participants across 32 universities in Canada, which found that 3.7% of students reported engaging in the non-medical use of prescription stimulants. When this survey was repeated a few years later, and expanded to include 41 universities, the prevalence rate increased to 4.5% (American College Health Association, 2013; 2016).

In addition to the non-medical use of prescription stimulants, the use of caffeine pills is also relatively common. While the preferred method of consuming caffeine is still via beverages such as tea, coffee and energy drinks, many people are also taking caffeine in pill-form, with each pill containing around 200mg of caffeine – the equivalent of two cups of coffee (Brand & Koch, 2016). Unlike prescription medications, however, caffeine pills are widely available at drug stores and supermarkets across North America. A cross-

sectional study involving 1,053 university students in Germany found that 10% of participants reported having used caffeine pills (Mache, Eickenhorst, Vitzthum, Klapp & Groneberg, 2012). When the prevalence of caffeine pill use was assessed across 104 universities in the UK and Ireland, in a sample comprising 877 students, 10% of participants identified as current users, compared to 49.4% endorsing having used caffeine pills at some point (Singh, Bard & Jackson, 2014). Although both of these studies were conducted in Europe, the widespread availability of caffeine pills in North America suggests that the prevalence rates there may be similar to those found in Germany and the UK and Ireland.

The top reason cited by university students for using caffeine pills and prescription stimulants is neuroenhancement – in other words, to increase their ability to study and improve subsequent academic performance. In addition, students seem to use caffeine pills for coping with the effects of sleep disturbance. The four most common reasons cited by university students for using caffeine pills, methylphenidate, amphetamine and modafinil were enhance cognition, offset sleep deprivation, enhance mood, and curiosity (Singh et al., 2014). A similar study in Switzerland involving 6,275 university students found that the top two reasons for using prescription drugs and drugs of abuse were also cognitive enhancement and relaxation/sleep improvement (Maier, Liechti, Herzig & Schaub, 2013). The dual purposes of misusing prescription stimulants (to promote wakefulness and neuroenhancement) may also be conflated, as it is probable that students primarily engage in prescription stimulant misuse to "stay awake and alert,

in order to complete course work and to study for exams" (Schulenberg, Johnston, O'Malley, Bachman, Miech & Patrick, 2017; p. 372).

1.4 Negative Effects of Stimulant Use

Along with the perceived benefits that many university students experience from non-medical use of prescription stimulants, there is also the potential for serious negative outcomes. First, the act of obtaining stimulant medications from anyone other than a physician without using a prescription is illegal and thus anyone engaging in this activity could potentially face legal consequences. In addition, due to the absence of a medical prescription, users are unlikely to be aware of the risks involved in using such substances. In an interview study of 175 students in the US, students perceived prescription stimulants as being relatively safe and harmless, arguing that physicians would not prescribe them if they were as potentially dangerous as street drugs (DeSantis & Hane, 2010). Lack of awareness regarding the possible consequences of medication misuse unfortunately means that students are even more vulnerable to experiencing adverse outcomes.

The physical consequences of stimulant use vary depending on the type of substance, but common side effects listed in clinical trials include agitation, jitteriness, tachycardia, and gastro-intestinal symptoms (Franke, Lieb & Hildt, 2012). Several studies (e.g., Holick et al, 2009; Schelleman et al., 2012, as cited in Westover & Halm, 2012) have attempted to determine whether there is a link between use of prescription stimulants and cardiac issues (even among those who use such stimulants for medical purposes, such as controlling ADHD symptoms), but there has so far been little

conclusive evidence, no doubt in part due to the massive sample sizes required to generate enough power to detect such rare events. For example, a meta-analysis by Westover and Halm (2012) found no conclusive link between prescription stimulant use and adverse cardiac outcomes in six out of seven studies involving children and adolescents. However, two out of three studies with adult participants did find an association between using prescription stimulants and two particular cardiac outcomes – increased risk of transient ischemic attack and sudden death/ventricular arrhythmia. Although the overall risk of such events occurring is quite low, these findings suggest that the potential physical health effects of prescription stimulants can be extremely serious. This is supported by figures showing that US emergency department visits specifically relating to non-medical use of prescription stimulants in young adults have increased from 1,310 in 2005 to 5,766 visits in 2010 – a more than four-fold increase (SAMHSA, 2013). Furthermore, the non-medical use of prescription stimulants is associated with increased use of alcohol and other illicit substances – and individuals who use such stimulants non-medically are more likely to use them simultaneously with other drugs, which may increase their toxicity (Barrett, Darredeau, Bordy & Pihl, 2005; McCabe & Teter, 2007).

In terms of psychological effects, an interview study involving 18 students at a university in Germany identified a number of detrimental effects associated with stimulant use, including feelings of excessive tiredness following use and having unclear, "woolly" thoughts. The participants also recognized that higher frequency of usage (e.g., daily compared to monthly) was more likely to result in stronger adverse effects (Franke

et al., 2012). A similar interview study, also comprising 18 university students, found that students who used prescription stimulants non-medically reported experiencing depression, sleeplessness, and loss of energy (Hildt, Lieb, Bagusat & Franke, 2015). Participants in this study were also aware of the possibility of becoming addicted to the drugs, and took steps to minimize this risk, including only engaging in occasional use or abstaining from use for short periods.

In addition to the negative physical and psychological effects that may occur, students may also experience cognitive side effects. When assessed in 492 undergraduates, non-medical users of prescription stimulants had significantly lower GPAs than those students who did not engage in such use (Clegg-Kraynok, McBean & Montgomery-Downs, 2011). These findings seem contradictory when considering the fact that such stimulants are often taken in order to enhance academic performance. One explanation could be that although stimulants may boost energy and concentration levels for brief periods (e.g. during exams), they may still have an overall adverse effect on students' long-term academic performance. A study by Reske, Eidt, Delis and Paulus (2010) provides some support for this theory. They compared 154 infrequent stimulant users (who had a lifetime history of using cocaine and/or prescription stimulants) and 48 stimulant-naïve participants aged 18-25 on a standardized measure of verbal recall. The occasional stimulant users showed significant deficits in verbal recall compared to the group that had never used these stimulants. Furthermore, there was a cumulative effect of prescription stimulant use, such that for those who had only ever used prescription stimulants, greater lifetime use was associated with worse performance on the verbal

recall test. Interestingly, this effect was not found for those who had only used cocaine. This suggests that, although non-medical users of prescription may perceive short-term improvements in their cognitive performance, in the long-term, such use may actually impair their cognitive abilities. Dosage level may also affect whether stimulants produce beneficial or detrimental effects, with high doses of stimulants being associated with the highest likelihood of harm (Wood, Sage, Shuman & Anagnosturas, 2013). Although caffeine pills are not generally as powerful in their effects as prescription stimulants, they too have been linked to adverse cardiac events (at very high doses). They can also cause a "false sense of wakefulness", which could be dangerous if users choose to engage in activities such as driving after taking the pills (Brand & Koch, 2016).

1.5 Sleep Disturbance & Prescription Stimulant Misuse

An important factor associated with non-medical use of prescription stimulants is sleep disturbance. In a cross-sectional study of 1,125 university students, participants with poor sleep quality (as measured by the Pittsburgh Sleep Quality Index) were more than twice as likely to use over-the-counter or prescription medications at least once a month to promote wakefulness as those who reported good sleep quality (Lund et al., 2009). It is possible that students are using stimulants to counteract the daytime effects of sleep disturbance, however, it is equally probable that students experience sleep disturbance as a consequence of stimulant use. Ultimately, the relationship is likely bidirectional, in that stimulant use during the day or evening can lead to difficulty falling

asleep at night and in turn, poor sleep quality can result in people resorting to stimulant use to reduce sleepiness during the day.

Another factor that can complicate this relationship is the use of sleeping medications. Marhefka (2011) introduced the idea of the "stimulation-sedation loop", in which stimulant users take sleeping medications to offset the effects of the stimulants and help them fall asleep more easily at night. Unfortunately, the use of such sedatives, particularly long-acting ones, can lead to a "hangover effect" or daytime sleepiness on the following day, which may subsequently result in further stimulant use to help people stay awake, thus perpetuating the cycle. This theory is supported by an interview study involving 18 university students, who reported using prescription stimulants non-medically and also engaging in "opposite consumption" of other substances (e.g., alcohol, cannabis, or benzodiazepines) in order to calm themselves down again (Hildt et al., 2015). The fact that such maladaptive patterns may persist into later adulthood suggests that targeting stimulant users who are still at university might be one way of intervening and preventing long-term consequences of both sleep disturbance and stimulant use.

1.6 Other Factors Associated with Stimulant Use

Many other factors are associated with the non-medical use of prescription stimulants. A meta-analysis of 21 studies totalling 113,104 participants, found that White students are significantly more likely to engage in such use than non-Whites (Wilens et al., 2008). Later cross-sectional studies have also reported this association, which suggests that the finding is robust (Weyandt et al., 2009; DeSantis & Hane, 2010;

Gallucci, 2011; Webb, Valasek & North, 2013; McCabe, West, Teter & Boyd, 2014). Furthermore, a cross-sectional study of 10,904 participants across 119 US universities reported that students who earned a "B" or lower GPA were almost two times more likely to have misused prescription stimulants than those students who had an average grade of "B+" or higher (McCabe, Knight, Teter & Wechsler, 2005). This finding has also been supported by more recent cross-sectional studies in the US and fits with the fact that the most common reason for such misuse is to improve academic performance (Weyandt et al., 2009; Gallucci, 2011). In addition, stimulant users were more likely to have low academic self-efficacy, which may lead them to believe that they need stimulants in order to boost their academic performance (Verdi, Weyandt & Zavras, 2016). A third factor associated with non-medical prescription stimulant use is membership in fraternities and sororities, with those students who are members being more likely to engage in such use (Wilens et al., 2008).

Students who use prescription stimulants non-medically are also more likely to engage in other forms of substance use. For instance, the nationwide US cross-sectional study mentioned above found that students who reported misusing prescription stimulants were ten times more likely to have used marijuana in the past year and seven times more likely to engage in frequent binge drinking than those who did not misuse stimulants (McCabe et al., 2005). Similar associations between substance use and non-medical prescription stimulant use have been reported by subsequent studies (Bodenlos, Malordy, Noonan, Mayrsohn & Mistler (2014), Ponnet, Wouters, Walrave, Heirman & Van Hal. (2015)).

In addition to substance use, students who use prescription stimulants non-medically are more likely to experience anxiety and depressive symptoms. In a cross-sectional study of 807 graduate students from universities across the US, participants who reported engaging in non-medical prescription stimulant use endorsed higher levels of anxiety symptomatology than those who did not misuse stimulants (Verdi et al., 2016). The Fall 2008 data from the National College Health Assessment survey (N=22,783) showed that students who reported feeling depressed, or suicidal were 1.22–1.38 times more likely to report prescription stimulant misuse than those who did not (Zullig & Divin, 2012). The strong association between prescription stimulant misuse and use of other substances, along with increased anxiety and depressive symptoms among misusers indicate that students' mental health is adversely affected by such use.

Identifying the psychological characteristics of those who use prescription stimulants non-medically may help understand the reasons behind such use. In a cross-sectional study of 390 students, higher scores on the measure of prescription stimulant misuse (indicating a greater amount of stimulant misuse) were correlated with higher levels of sensation-seeking, higher psychological distress, and greater internal restlessness than non-users (Weyandt et al., 2009). Restlessness is one of the symptoms of ADHD (DSM-5, 2013), so this finding ties in with that of the meta-analysis of 21 studies by Wilens et al. (2008), which reported that students who endorsed ADHD symptoms were also more likely to use stimulants non-medically. Similarly, Webb et al. (2013) surveyed 144 medical students and found that those with a diagnosis of ADHD were also more likely to engage in non-medical stimulant use. This may be partly due to

the fact that people who have ADHD are at a higher risk of developing a substance use disorder than those without the diagnosis (Harstad & Levy, 2014). Understanding which individuals are at greater risk of engaging in prescription stimulant misuse is vital in order to reduce and prevent the initiation of such use.

1.7 Social Acceptance of Stimulant Use

Exploring attitudes and beliefs toward the use of stimulants for non-medical purposes may help to understand why it is deemed socially acceptable. DeSantis and Hane (2010) interviewed 175 undergraduate students at a university in the South-Eastern United States, all of whom endorsed misusing prescription stimulants. Participants perceived the non-medical use of prescription stimulants as being both relatively harmless and socially acceptable and used several arguments to justify their non-medical use of prescription stimulants. For example, prescription stimulants were seen as being no more harmful than caffeine and not as bad as "party" drugs, such as cocaine. Second, a significant proportion of participants also said that they used the stimulants to self-medicate for self-diagnosed ADHD. Many students also stated that they only engaged in occasional or moderate misuse, because they mainly used stimulants around times of high academic stress (e.g., midterms and finals).

One of the few Canadian studies to assess the non-medical use of prescription stimulants interviewed 36 undergraduates at the University of Toronto (Kolar, 2015). Students did not perceive the non-medical use of prescription stimulants while studying as cheating, because such drugs do not make the user smarter, they simply improve the ability to concentrate. Moreover, even those who did not currently engage in such use

said they would consider it if they were in a desperate situation, suggesting that it is viewed as an acceptable "last resort" option, even by those who identify as non-users (Kolar, 2015). The social acceptability of using prescription stimulants non-medically may, however, be contingent on the way in which such substances are obtained and used. For example, undergraduate students interviewed (N=36) described those who bought prescription stimulants as more dependent on the drug, whereas those who "scrounged" the drug for free from their friends were perceived as having more control over their use (Vrecko, 2015).

Further evidence for the social acceptability of non-medical prescription stimulant use comes from Singh et al.'s (2014) cross-sectional study of 877 university students in the UK and Ireland. Of those who were interested in using such substances but had not yet done so, the top reason cited was lack of availability, followed by potential side effects, and concerns about illegality. This suggests that if the drugs were more widely available, more students might be using them. Furthermore, those students who were current users and also those who had considered such use were more likely to disagree with the idea that using drugs for cognitive enhancement was the same as cheating. Caffeine pills were the top substance identified as a "smart drug", even above methylphenidate and amphetamine. Moreover, almost 50% of caffeine pill users said their reason for use was to enhance cognition, suggesting that this substance, too, is widely recognized and accepted as a study aid.

The Theory of Planned Behaviour (Ajzen, 1985, 2011) is particularly salient to this discussion of the social acceptance of stimulant use. This theory posits that a

person's attitude towards a particular behaviour is a predictive factor for whether they will actually engage in that behaviour at some point. A survey study involving 383 students at a university in the US found that less negative attitudes towards feigning symptoms to obtain a prescription from a physician or asking individuals with a legitimate prescription to share their medication were strongly correlated with self-reported medication-seeking behaviours (Stone & Merlo, 2012).

A later study reported on the development of the Prescription Drug Attitudes Questionnaire, which was developed to measure students' attitudes towards the non-medical use of prescription medication (Bodenlos et al., 2014). When validated using a sample of 310 students at a US college, those students who used prescription drugs non-medically during the past month had significantly more positive attitudes towards such use than non-users (Bodenlos et al., 2014). Both of these studies indicate that students' attitudes towards the non-medical use of prescription medication are highly related to whether or not they actually misuse such drugs.

Investigating students' motivation, justification and beliefs about the non-medical use of prescription stimulants can provide important insights into this behaviour. This is particularly essential when considering issues such as stimulant use, because it is necessary to understand and appreciate the relationship between individual experiences and the broader political and economic dynamics of society. The "deep" level of qualitative data provided by interview studies can also aid in the development of preventative strategies – for example, if students are more likely to consume stimulants due to the pressure of combining part-time employment and academic studies, it might be

possible to discover why students feel they need to work part-time (perhaps due to financial constraints) and thus develop a solution to the problem (e.g., increasing student grants so students receive greater financial support).

1.8 Primary Research Objectives

The primary research objectives of this thesis are as follows:

1) To establish the prevalence of non-medical prescription stimulant use for the purposes of staying awake and explore the factors associated with this use at Memorial University.
2) To examine what factors are associated with a more liberal attitude towards misuse of prescription medication.
3) To qualitatively explore why students are engaging in non-medical use of prescription stimulants to stay awake, how they feel such use affects their sleeping patterns and what, if any, strategies they have used to mitigate this.

Chapter 2:

Prevalence and Factors Associated with Non-medical Prescription Stimulant Use to Stay Awake among University Students

2.1 Abstract

INTRODUCTION: Non-medical use of prescription stimulants is a particular problem for university students, who may use such drugs for a number of reasons, including the promotion of wakefulness. In addition, one of the negative effects of stimulant misuse is sleep disturbance, which is already a significant issue for this population. This study will investigate the prevalence of prescription stimulant misuse specifically for the purpose of staying awake, as well as factors associated with this type of misuse.

METHODS: Participants were 3,160 full-time and part-time students at a Canadian university and aged 18-35 years. An online survey collected information on demographic characteristics and substance use, and also included standardized measures for assessing anxiety, depression, sleep quality, insomnia symptoms, and attitudes towards misuse of prescription medication. Descriptive statistics and chi-squared tests were used to determine sample characteristics and logistic regressions were performed to determine which factors were associated with misuse.

RESULTS: The prevalence of prescription stimulant misuse for the purpose of staying awake was 3.1%. Although several factors were significantly associated with prescription stimulant misuse at the univariate level, only the following factors were significant at the multivariate level: alcohol [Adjusted Odds Ratio, (AOR)=3.35; p=0.031], tobacco (AOR=10.11; p<.001), and nicotine vapour use (AOR=3.85; p=0.021), poor sleep quality (AOR=3.16; p=0.037), moderate daytime sleepiness (AOR=1.98; p=0.050) and positive attitudes towards the non-medical use of prescription drugs (AOR=6.72; p=<.001).

CONCLUSION: More research is needed to understand why students are misusing prescription stimulants to stay awake and what factors are associated with more positive attitudes towards prescription medication misuse. Studies are needed to develop and evaluate the efficacy of prevention programs.

2.2 Introduction

The use of prescription stimulants for non-medical purposes has risen among university students in Canada. In 2013, a national survey revealed that 3.7% of university students reported using prescription stimulants for non-medical purposes in the past year. By 2016, the prevalence rate had risen to 4.5% (American College Health Association, 2013; 2016). Unfortunately, aside from the abovementioned survey studies, much of the data on prescription stimulant misuse in university populations comes primarily from the United States and is not necessarily generalizable to Canadian students. Although the post-secondary education systems of both countries do have many similarities, there is a distinct hierarchy of American universities, resulting in increasingly competitive admission processes to obtain spots at elite institutions (Davies & Hammack, 2005). This phenomenon is much less pronounced in Canada, where the institution students choose to attend is less relevant than which program they are studying, and undergraduates are more likely to attend their local post-secondary institution, rather than moving away from their hometown (Davies & Hammack, 2005). These differences are very likely to influence the prevalence of prescription stimulant misuse in the US vs. Canada, particularly as the prevalence of such misuse seems to be much higher at more competitive universities (McCabe, Knight, Teter & Wechsler, 2005).

Another key factor that may influence prescription stimulant misuse among university students is sleep disturbance, which is relatively common in this population. Ideally, university students should be sleeping for approximately eight to nine hours per night in order to consolidate and process the information they are absorbing during their

classes and independent study (Besedovsky, Lange & Born, 2011). Regrettably, a large proportion of this population have relatively poor sleep health – which is defined by several factors, including reduced sleep quantity, delayed sleep onset and waking during the night (Buysse, 2014). For example, one cross-sectional study found that 25% of students reported getting less than 6.5 hours of sleep per night, and only 29% reported achieving 8 or more hours per night (Lund et al., 2009). Another cross-sectional study found that 33% of students reported taking 30 minutes or more to fall asleep, 43% woke at least once during the night, and 33% experienced daytime sleepiness (Forquer et al., 2008). Delayed sleep onset latency and waking during the night are both associated with hypertension, coronary artery disease and depression, among other long-term health issues (Buysse, 2014). Moreover, for university students, daytime sleepiness can result in decreased daytime brain activity (as measured by cortical oxygenation) and impaired cognitive performance (Miyata et al., 2018).

A survey study involving 877 university students in the UK and Ireland reported that offsetting the effects of sleep deprivation was the second most common reason for prescription stimulant misuse, after cognitive enhancement (Singh, Bard & Jackson, 2014). Students who report poor sleep quality are more than twice as likely to use over-the-counter or prescription stimulants in the past month to combat daytime sleepiness and twice as likely to use alcohol to induce sleep (Lund et al., 2009). Stimulant use is also associated with higher levels of sleep disturbance. Two interview studies focusing on university students in Germany found that participants who used prescription stimulants non-medically reported experiencing daytime side effects such as excessive tiredness,

sleeplessness, and lack of energy (Franke, Lieb & Hildt, 2011; Hildt, Lieb, Bagusat & Franke, 2015). University students can get stuck in a cycle of using caffeine and stimulants to stay awake during the day and using sleeping medications or depressants at night to combat the wakeful effects of stimulants. The combination has been referred to as the stimulation-sedation loop (Marhefka, 2011).

In order to deliver prevention and intervention programs to the appropriate groups, it is necessary to know which students are most likely to engage in the non-medical use of prescription stimulants to stay awake. There has already been some exploration of the factors associated with the non-medical use of prescription stimulants. To date, White ethnicity (Wilens et al., 2008; McCabe, West, Teter & Boyd, 2014), male gender (McCabe, West, Teter & Boyd, 2014), lower GPA (Wilens et al., 2008), anxiety and depression (Teter, Falone, Cranford, Boyd & McCabe, 2010; Verdi et al., 2016), substance use (Benson et al., 2015; Ponnet et al., 2015; Norman & Ford, 2018), and liberal attitudes toward prescription stimulant misuse (Singh et al., 2014; Bodenlos et al., 2014) have all been independently associated with non-medical prescription stimulant use; however, the relative impact of these factors have yet to be considered when accounting for other variables that may also contribute to the association. Moreover, it is not known to what extent the abovementioned factors are associated with prescription stimulant misuse specifically for the purpose of staying awake. Finally, given the strong relationship between stimulant use and sleep disturbance (Lund et al., 2009; Alamir et al., 2017), and that both factors can have deleterious effects on the health and wellbeing of university students, it seems prudent to investigate this relationship further.

The objectives of this study are:

1) To determine the prevalence of non-medical use of prescription stimulants to stay awake among students at Memorial University of Newfoundland.
2) To determine whether certain demographic, mental health, substance use, and sleep-related factors are associated with the non-medical use of prescription stimulants in this population.

2.3 Method

Participants

The data for this study were collected via an online survey that was available between June 2016 and May 2017. Full-time and part-time undergraduate and graduate students at Memorial University of Newfoundland aged 18-35 years were eligible to participate.

Procedure

Participants were mainly recruited for the online survey via social media (e.g. postings from the Department of Psychology's Facebook page), pamphlet recruitment on campus, and mass emails from the Registrar's Office and the Internationalization Office listserv. Classroom recruitment was also used, in order to ensure that enough participants from each faculty across the university were included to make the sample broadly representative of the entire university student population. Participants who were willing to provide their email address were also entered into a draw to win one of twelve $50 giftcards for the local mall. The survey, which was designed and made available through the

SurveyMonkey website, had an average completion time of 45 minutes. Participants were allowed to come back and finish the survey later if they did not have time to complete it at one sitting. Informed consent was required of all participants before starting the survey and the procedure was approved by MUN's Interdisciplinary Committee on Ethics in Human Research (see Appendix A).

Measures

Participants were required to submit sociodemographic information, such as gender, age, race/ethnicity and academic status (e.g. whether students were undergraduates or graduates, studying full-time or part-time, living in residence or off-campus). Participants were also asked which university faculty they were in. Due to the broad range of faculties represented, these were subsequently condensed into five categories: Humanities and Social Sciences, Engineering and Applied Sciences (including Marine Institute), Health Professions (i.e., Medicine, Nursing, Pharmacy), Science and Undeclared.

Primary Outcome Variables

Participants' prescription stimulant use was measured by their response to the following question: "Please select all of the prescription medication you currently use or have used in the past to help you stay awake. Please select all substances you have used even if they were not prescribed for you." There were six possible responses to this question: Amphetamine/Dextroamphetamine (i.e., Adderall); Methylphenidate (i.e., Ritalin, Concerta); Lisdexamfetamine (i.e., Vyvanse); Modafinil (i.e., Alertec, Provigil);

Other (please specify); or None of the above. Those participants who selected one or more of the prescription stimulant options were classified as prescription stimulant users, and those who selected "None of the above" were classified as non-users.

Covariate Factors.

Substance Use Variables

Alcohol, tobacco and nicotine vapour use were measured using the question: "How would you describe your level of use of the following substances?" There were five possible responses to this question: Do not use; Light; Moderate; Heavy; Prefer not to answer. Participants who chose "Prefer not to answer" were excluded from the data analysis for the substance use variable.

Attitudes towards non-medical use of prescription medications

Attitudes toward the non-medical use of prescription drugs were measured using the Prescription Drug Attitudes Questionnaire (PDAQ). The PDAQ is a 19-item self-report measure that asks respondents to indicate (on a Likert-type scale of 0-6) their level of agreement with statements relating to the acceptability of non-medical prescription drug use for various purposes, including study aids and pain management. The PDAQ has good internal consistency and convergent validity, with a Cronbach's alpha of .94 for the overall scale, .89 for the achievement-oriented subscale, and .92 for the recreational subscale (Bodenlos et al., 2014). There are no standardized categories for this scale, so participants were categorized into "less positive" (0-39), "average" (40-59), and "most

positive" (60+) attitudes to prescription medication misuse. Categories were determined based on ensuring a roughly equal number of participants were in each group.

Sleep quality, insomnia symptoms, and daytime sleepiness measures

Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI), which is a 26-item self-report measure examining 7 different areas of sleep quality. It has a Cronbach's alpha of 0.70 - 0.83 in clinical and community samples, along with good convergent and divergent validity (Mollayeva et al., 2016). Participants were categorized as having "good sleep" (0-4) or "poor sleep" (5+), according to the PSQI scoring criteria.

Insomnia symptoms were measured using the Insomnia Severity Index (ISI), which is a 7-item self-report measure scored on a Likert scale of 1-4. The highest possible score is 28 and a score of 8 or more indicates the presence of insomnia symptoms. It has good reliability, with a Cronbach's alpha of 0.90 in a community sample, and good criterion and convergent validity (Morin, Belleville, Bélanger & Ivers, 2011). Participants were categorized as having "none" (0-7), "mild" (8-14), moderate (15-21), or severe (22-28) insomnia according to the standardized scoring criteria.

Daytime sleepiness was measured using the Epworth Sleepiness Scale (ESS), which is an 8-item self-report measure. Questions ask how likely the respondent is to fall asleep in 8 everyday situations using a Likert scale of 0-3 (e.g. watching TV or sitting and reading). Scores range from 0-24, with scores of 10 or more indicating significant levels of daytime sleepiness. In terms of reliability, it has a Cronbach's alpha of .75 (Lund et al., 2009). Participants were characterized as having "none" (0-10), "mild" (11-12),

"moderate" (13-15), and "severe" (16-24) levels of daytime sleepiness according to the standardized scoring criteria for this scale.

Mental health measures

Anxiety and depression symptoms were measured using the Hospital Anxiety and Depression Scale (HADS), which is a 14-item self-report measure. It is divided into two 7-item subscales, one for anxiety symptoms and one for depression symptoms. Scores on each subscale range from 0-21 and scores of 11 or higher indicate the presence of anxiety/depression symptoms. The HADS has high internal consistency, with the depression subscale having a Cronbach's alpha of .80 and the anxiety subscale having a Cronbach's alpha of .76 (Bjelland, Dahl, Haug, & Neckelmann, 2002; Mykletun, Stordal, & Dahl, 2001). For this study, scores on the HADS were categorized according to the standardized scoring criteria for this scale, i.e. "normal" (0-7), "borderline" (8-10), and "clinical" (11-21) levels of anxiety/depressive symptoms.

Data Analyses

All data analyses were completed using STATA 12.0 and IBM SPSS V. 24. Before conducting the statistical procedures, the predictor and outcome variables were examined for missing values. The missing values analysis showed that 8.4% of the data were missing. While this is proportion of missing data is not unusual for psychology-based research (Dong & Peng, 2013), further analysis determined that several of the predictor variables were missing more than 25% of the expected values. Little's test was used to determine whether data are Missing Completely at Random (MCAR) and the

result was significant, indicating that the data was not MCAR. Variables with the highest proportion of missing data were at the end of the survey, whereas those with less missing data were at the beginning, indicating that the missing data followed a monotone (or univariate) missing data pattern and were not due to an observed variable, but because participants did not complete the full survey, most likely due to fatigue or boredom (Dong & Peng, 2013). Expectation maximization (EM) was chosen to address this missing data, with a single imputation of 50 iterations used to reach convergence.

The data were also examined to determine whether all the required assumptions for logistic regression were met. These tests showed that multicollinearity was not a concern, and the data also met the assumptions of independent errors and non-zero variances. Descriptive statistics and chi-square tests were used to determine the sociodemographic characteristics of the sample. In order to determine which factors were associated with prescription stimulant misuse, separate univariate logistic regressions were performed with each of the relevant demographic, clinical, and sleep-related factors. Statistical significance was set at 0.05, with any factors that were significant at the univariate level subsequently included in the multivariate logistic regression model.

2.4 Results

Participant Characteristics

Demographic characteristics are shown below in Table 1. This table also shows whether those who misused prescription stimulants differed from those who did not misuse such medication on several key demographic and substance use-related variables.

The total number of participants recruited was 3,699, however, once those outside of the 18-35 age range were excluded, the final sample was 3,160. The mean age of the sample was 22.2 and over half (54%) of participants were aged 18-21 years. In terms of gender, 70% identified as female, 28% as male and 1.4% as a gender minority (e.g. transgender, agender, genderqueer). Most participants were White (85%), and domestic students comprised 89% of the sample, compared to international students (11%). The majority of participants were full-time (92%), undergraduates (82%), and living in off-campus accommodation (86%). Finally, 65% of the sample were in the four biggest university faculties: Science (24%), Humanities (19%), Engineering and Applied Sciences (12%) and Business (11%). These figures suggest that the sample characteristics are roughly in accordance with those of the student population at MUN, based on student statistics from 2016. These statistics show that in 2016, 57% of students were female, 82% undergraduates and 14% international students. Moreover, 65% of students were in the top five university faculties: Science = 20%; Humanities = 15%; Business = 13%; Engineering and Applied Sciences = 11%; Nursing = 6% (Memorial University of Newfoundland, 2017).

Table 1. *Demographic Characteristics of Survey Participants* [a]

	N	%	**Endorsed Non-medical Use of Prescription Stimulants** N = 99 (3.1%)	**Denied Non-medical Use of Prescription Stimulants** N = 3061 (96.9%)	***p* value**
Gender					
Male	881	27.9	37 (4.2)	844 (95.8)	.095
Female	2229	70.5	61 (2.7)	2168 (97.3)	
Other	43	1.4	2 (4.7)	41 (95.3)	
Age					
18-19	866	27.4	28 (3.2)	838 (96.8)	.882
20-21	844	26.7	30 (3.6)	814 (96.4)	
22-24	736	23.3	21 (2.9)	715 (97.1)	
25-35	714	22.6	22 (3.1)	692 (96.9)	
Ethnicity					
White	2655	84.0	91 (3.4)	2564 (96.6)	.142
Non-White	470	14.9	10 (2.1)	460 (97.9)	
Citizenship					
Canadian	2731	86.4	91 (3.3)	2640 (96.7)	.638

	N	%	Endorsed Non-medical Use of Prescription Stimulants N = 99 (3.1%)	Denied Non-medical Use of Prescription Stimulants N = 3061 (96.9%)	*p* value
International	350	11.1	10 (2.9)	340 (97.1)	
Academic Status					
Undergraduate	2540	80.4	87 (3.4)	2453 (96.6)	.321
Graduate	541	17.1	14 (2.6)	527 (97.4)	
Full/Part Time					
Full Time	2837	89.8	92 (3.2)	2745 (96.8)	.708
Part Time	244	7.7	9 (3.7)	235 (96.3)	
Living Situation					
Residence	437	13.8	10 (2.3)	427 (97.7)	.233
Off-campus	2696	85.3	91 (3.4)	2605 (96.6)	
Average Grade					
0-69%	528	16.7	26 (4.9)	502 (95.1)	**.005**
70-79%	1174	37.2	44 (3.7)	1130 (96.3)	

	N	%	Endorsed Non-medical Use of Prescription Stimulants N = 99 (3.1%)	Denied Non-medical Use of Prescription Stimulants N = 3061 (96.9%)	*p* value
80-89%	1217	38.5	23 (1.9)	1194 (98.1)	
90%+	240	7.6	8 (3.3)	232 (96.7)	
Faculty					
Humanities & Social Sciences	1160	36.7	40 (3.4)	1120 (96.6)	.981
Eng. & MI	419	13.3	12 (2.9)	407 (97.1)	
Health Professions	471	14.9	15 (3.2)	456 (96.8)	
Science	733	23.2	25 (3.4)	708 (96.6)	
Undeclared	198	6.3	6 (3.0)	192 (97.0)	
Alcohol Use					
Do Not Use	577	18.3	10 (1.7)	567 (98.3)	**<.001**
Light	1496	47.3	43 (2.9)	1453 (97.1)	
Moderate	1010	32.0	36 (3.6)	974 (96.4)	
Heavy	77	2.4	12 (15.6)	65 (84.4)	
Tobacco Use					

	N	%	Endorsed Non-medical Use of Prescription Stimulants N = 99 (3.1%)	Denied Non-medical Use of Prescription Stimulants N = 3061 (96.9%)	*p* value
Do Not Use	2643	83.6	2583 (97.7)	60 (2.3)	**<.001**
Light	385	12.2	367 (95.3)	18 (4.7	
Moderate	93	2.9	81 (87.1)	12 (12.9)	
Heavy	39	1.2	28 (71.8)	11 (28.2)	
Nicotine Use					
Do Not Use	2881	91.2	2799 (97.2)	82 (2.8)	**<.001**
Light	236	7.5	225 (95.3)	11 (4.7)	
Moderate	31	1.0	24 (77.4)	7 (22.6)	
Heavy	12	0.4	11 (91.7)	1 (8.3)	

[a] Participant N for each variable may not add up to 3160 (100%) due to missing data.

Prevalence of Non-Medical Use of Prescription Stimulants

In terms of prevalence, 99 participants (3.1%) reported engaging in the non-medical use of prescription stimulants to help them stay awake (see Figure 1). The most commonly used prescription stimulant was amphetamine/dextroamphetamines (e.g., Adderall), which was used by 57 participants (51%), closely followed by methylphenidate (e.g., Ritalin), which was used by 48 participants (43%). Only 18% of the participants who misused prescription stimulants to stay awake reported using lisdexamfetamine (e.g., Vyvanse) or modafinil.

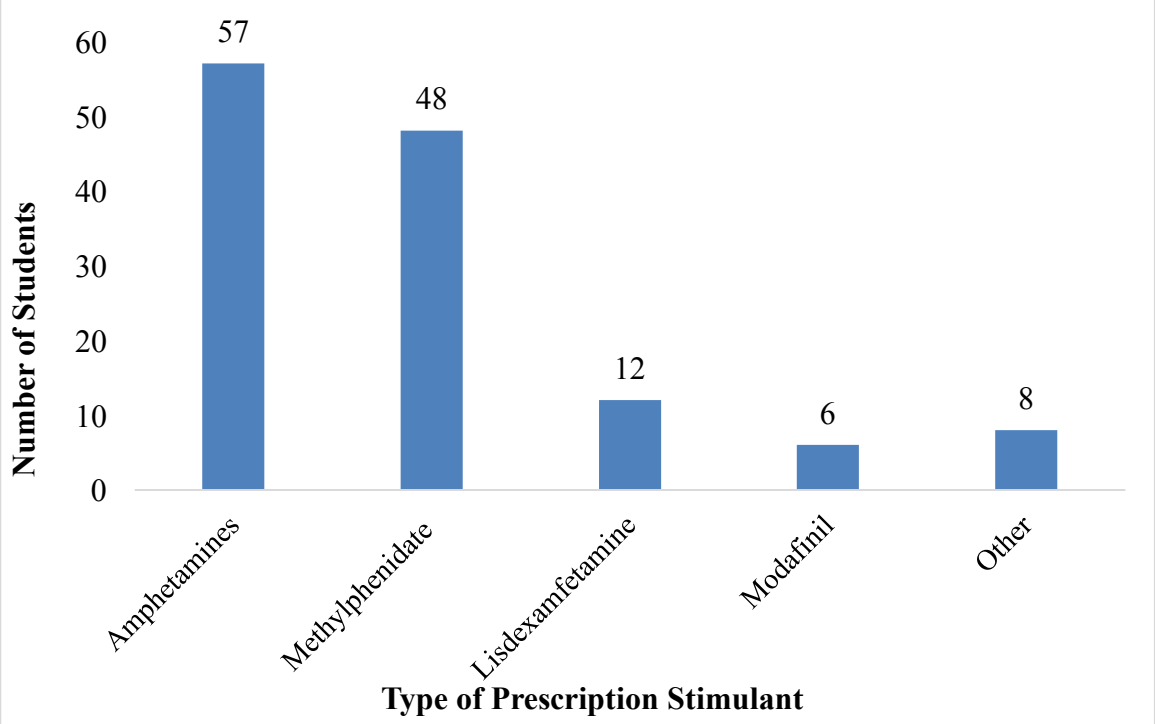

Figure 1. *Number of Students Using Each Type of Prescription Stimulant*

Factors Associated with Stimulant Use

In order to identify factors related to the non-medical use of prescription stimulants, univariate logistic regressions were performed. We included demographic factors relating to student status (e.g., part time/full time, undergraduate/graduate, domestic/international, residence/off-campus), as well as factors that had been linked to prescription stimulant use in previous research (e.g., gender, ethnicity, sleep, substance use). Factors that were significant in the univariate analysis were then included in a multivariate logistic regression (see Table 2 for logistic regression results). In the univariate analysis, gender and average grade were the only significant demographic predictors. Thus, compared to males, females are significantly less likely to misuse prescription stimulants (odds ratio [OR]=0.60; p=.037). However, those who identified themselves as outside the gender binary (Other) were not significantly more likely to misuse prescription stimulants than males (OR=1.11; p=.886). Additionally, compared to those with a GPA of 0-69%, students with a GPA of 80-89% were significantly less likely to misuse prescription stimulants (OR=0.37; p=.001). However, those with GPAs of 70-79% or 90-100% were not significantly less likely to engage in such use compared to those with the lowest GPAs. (OR=0.75; p=.260; OR=0.67; p=.323)

The next set of factors related to substance use. Participants who reported moderate-heavy use of alcohol were significantly more likely to misuse prescription stimulants than those who did not use alcohol at all (OR=2.10; p=.041; OR=10.47; p<.001). In contrast, there was no significant difference between those who engaged in "light" alcohol use and those who did not use it (OR=1.68; p=.144). For tobacco, those

who engaged in light, moderate or heavy use were all significantly more likely to engage in prescription stimulant misuse than those who did not use tobacco (OR=2.11; *p*=.006; OR=6.38; *p*<.001; OR=16.91; *p*<.001). With regard to nicotine vapours, only those who engaged in moderate use were significantly more likely to misuse prescription stimulants than those who did not use nicotine (OR=9.96; *p*<.001). Neither light or heavy nicotine use were significantly associated with prescription stimulant misuse (OR=1.67; *p*=.119; OR=3.10; *p*=.281). With regard to attitudes towards prescription medication misuse, only those who had the most positive attitudes towards such use were significantly more likely to actually engage in prescription stimulant misuse (OR=9.01; *p*=<.001), whereas those who had "average" (i.e., more balanced) attitudes were not significantly more likely to misuse prescription stimulants than those who had the least positive attitudes towards medication misuse (OR=1.64; *p*=.134).

In terms of sleep-related factors, compared to those with good sleep quality, those with poor sleep quality were more likely to misuse prescription stimulants (OR=3.77; *p*=.004). Furthermore, compared to those with no daytime sleepiness, students with moderate levels of daytime sleepiness were more than twice as likely to engage in such use than those with normal levels of daytime sleepiness (OR=2.61; *p*=.001). However, those with mild (OR=1.31; *p*=.439) or severe daytime sleepiness (OR=1.98; *p*=.117) were not significantly more likely to misuse prescription stimulants. In addition, when compared to those with no insomnia symptoms, those with moderate (OR=2.81; *p*=<.001) and severe (OR=3.89; *p*=.015) symptoms of insomnia were significantly more

likely to misuse prescription stimulants, but not those with mild insomnia symptoms (OR=1.45; *p*=.136).

With respect to depressive symptoms, compared to those with "normal" (i.e., relatively low) levels of depressive symptoms, students who had moderate i.e., borderline) or severe (i.e., clinical) levels of depressive symptoms were more than twice as likely to misuse prescription stimulants (OR=2.03; *p*=.007; OR=2.89; *p*<.001). The last significant factor in the univariate analysis was anxiety. Compared to people with "normal" (i.e., relatively low) levels of anxiety, those with severe (i.e., clinical) anxiety were more than twice as likely to use prescription stimulants non-medically (OR=2.38; *p*=.001). In contrast, students with moderate (or borderline) levels of anxiety were not significantly more likely to misuse prescription stimulants than those with a "normal" level of anxiety (OR=0.90; *p*=.741). The factors not observed to be significant in the univariate analysis were age, ethnicity, domestic vs. international, academic status, full-time vs. part-time, residence vs. off-campus, and faculty. These factors were therefore excluded from the multivariate analysis.

When the significant factors from the univariate analysis were simultaneously entered in the multivariate model, the results indicated that six factors accounted for 17% of the variance (Adjusted R^2 =.17, F(26,2842) = 139.56, *p*<.001). First, students who used heavy amounts of alcohol were more than three times more likely to misuse prescription stimulants than those who did not use alcohol at all (Adjusted Odds Ratio [AOR]=3.35; *p*=.031). Similarly, students who used heavy amounts of tobacco were almost ten times more likely to misuse prescription stimulants (AOR=10.11; *p*<.001), and

those who used moderate amounts of nicotine vapours were almost four times more likely to engage in such misuse (AOR=3.85; $p<.021$) compared to those who did not use tobacco or nicotine vapours. In addition, students with the most liberal attitudes towards the non-medical use of prescription medication remained significantly more likely to engage in stimulant misuse than those with the least liberal attitudes (AOR=6.72; $p<.001$). For the sleep-related factors, students with poor sleep quality were more than three times as likely to misuse prescription stimulants than those who had good sleep quality (Adjusted Odds Ratio [AOR]=3.16; $p=.037$). Finally, students who had moderate levels of daytime sleepiness were still significantly more likely to misuse prescription stimulants than those who had "normal" levels of daytime sleepiness (AOR=1.98; $p=.050$), with no significant association for mild or severe daytime sleepiness (AOR=1.20; $p=.634$; AOR=1.30; $p=.595$). After adjusting for the variance accounted for by the other variables, gender, average grade, insomnia symptoms, and anxiety and depression symptoms were no longer significantly associated with stimulant misuse.

Table 2. Logistic Regression of Factors Associated with Non-Medical Prescription Stimulant Use

	Univariate Analysis Odds Ratio (95% CI)	***p***	**Multivariate Analysis Adjusted Odds Ratio (95% CI)**	***p***
Gender				
Male	1			
Female	0.60 (0.42, 0.97)	**0.037**	0.92 (0.55, 1.55)	0.762
Other	1.11 (0.26, 4.78)	0.886	1.24 (0.25, 6.10)	0.790
Age				
18-19	1			

	Univariate Analysis Odds Ratio (95% CI)	*p*	Multivariate Analysis Adjusted Odds Ratio (95% CI)	*p*
20-21	1.10 (0.65, 1.86)	0.714		
22-24	0.88 (0.49, 1.56)	0.660		
25-35	0.03 (0.02, 0.05)	0.864		
Ethnicity				
White	1			
Non-white	0.61 (0.32, 1.19)	0.146		
Citizenship				
Domestic	1			
International	0.85 (0.44, 1.66)	0.639		
Academic Status				
Undergraduate	1			
Graduate	0.75 (0.42, 1.33)	0.322		
Full/Part-time				
Full-time	1			
Part-time	1.14 (0.57, 2.30)	0.708		
Residence				
On-campus	1			
Off-campus	1.49 (0.77, 2.90)	0.236		
Average Grade				
0-69%	1		1	
70-79%	0.75 (0.46, 1.23)	0.260	0.91 (0.51, 1.63)	0.750
80-89%	0.37 (0.21, 0.66)	**0.001**	0.55 (0.29, 1.06)	0.073
90-100%	0.67 (0.30, 1.49)	0.323	1.07 (0.43, 2.66)	0.878
Faculty				
Humanities & Social Sciences	1			
Eng. & Applied Sciences	0.83 (0.43, 1.59)	0.566		
Health Professions	0.92 (0.50, 1.68)	0.789		
Science	0.90 (0.59, 1.64)	0.965		
Undeclared	0.88 (0.37, 2.09)	0.764		

	Univariate Analysis Odds Ratio (95% CI)	***p***	**Multivariate Analysis Adjusted Odds Ratio (95% CI)**	***p***
Alcohol Use				
Do Not Use	1			
Light	1.68 (0.84, 3.36)	0.144	1.65 (0.76, 3.54)	0.204
Moderate	2.10 (1.03, 4.26)	**0.041**	1.31 (0.57, 2.97)	0.525
Heavy	10.47 (4.35, 25.18)	**<.001**	3.35 (1.12, 10.07)	**0.031**
Tobacco Use				
Do Not Use	1			
Light	2.11 (1.23, 3.62)	**0.006**	1.25 (0.61, 2.56)	0.548
Moderate	6.38 (3.30, 12.32)	**<.001**	2.19 (0.95, 5.03)	0.066
Heavy	16.91 (8.05, 35.55)	**<.001**	10.11 (3.87, 26.46)	**<.001**
Nicotine Use				
Do Not Use	1			
Light	1.67 (0.88, 3.18)	0.119	1.58 (0.68, 3.70)	0.291
Moderate	9.96 (4.17, 23.77)	**<.001**	3.85 (1.23, 12.10)	**0.021**
Heavy	3.10 (0.40, 24.32)	0.281	1 (empty)	-
PDAQ				
Less Positive (0-39)	1			
Average (40-59)	1.64 (0.86, 3.13)	0.134	1.98 (0.96, 4.08)	0.065
Mostly Positive (60+)	9.01 (4.99, 16.29)	**<.001**	6.72 (3.32, 13.61)	**<.001**
PSQI				
Normal Sleep (0-4)	1			
Poor Sleep (5-20)	3.77 (1.53, 9.31)	**0.004**	3.16 (1.07, 9.31)	**0.037**
ESS				
None (0-10)	1		1	
Mild (11-12)	1.31 (0.66, 2.56)	0.439	1.20 (0.57, 2.49)	0.634
Moderate (13-15)	2.61 (1.47, 4.65)	**0.001**	1.98 (1.00, 3.90)	**0.050**
Severe (16-24)	1.98 (0.84, 4.67)	0.117	1.30 (0.50, 3.39)	0.595
ISI				
None (0-7)	1		1	
Mild (8-14)	1.45 (0.90, 2.36)	0.136	0.71 (0.40, 1.28)	0.249
Moderate (15-21)	2.81 (1.58, 4.99)	**<.001**	0.88 (0.42, 1.84)	0.738
Severe (22-28)	3.89 (1.30, 11.62)	**0.015**	1.18 (0.33, 4.30)	0.800

	Univariate Analysis Odds Ratio (95% CI)	*p*	Multivariate Analysis Adjusted Odds Ratio (95% CI)	*p*
HADS Depression				
Normal (0-7)	1		1	
Borderline (8-10)	2.03 (1.21, 3.41)	**0.007**	1.17 (0.63, 2.16)	0.618
Clinical (11-21)	2.89 (1.66, 5.04)	**<.001**	1.23 (0.61, 2.46)	0.564
HADS Anxiety				
Normal (0-7)	1		1	
Borderline (8-10)	0.90 (0.49, 1.65)	0.741	0.92 (0.46, 1.82)	0.801
Clinical (11-21)	2.38 (1.43, 3.95)	**0.001**	1.38 (0.72, 2.62)	0.333

2.5 Discussion

Prevalence of Stimulant Use

This is the first study in Canada to focus on the non-medical use of prescription stimulants by university students specifically for helping them to stay awake. The prevalence of such misuse was 3.1%, which is somewhat lower than the recent Canadian cross-sectional studies conducted by the American College Health Association, which reported prevalence rates of 4.5% for prescription stimulant misuse for any purpose in 2016. This is probably because previous studies have usually focused on the non-medical use of prescription stimulants for a range of different purposes, including weight management, recreational use and study aids to improve focus and concentration, whereas in this study, students were only asked about their misuse of prescription stimulants for the purposes of staying awake. Thus, the overall prevalence of prescription stimulant misuse for any purpose in this population is almost certainly higher than 3.1%.

Factors Associated with Stimulant Use

The six main factors associated with non-medical use of prescription stimulants in this study were alcohol, tobacco and nicotine vapour use, more liberal attitudes towards the non-medical use of prescription drugs, poor sleep quality and moderate level of daytime sleepiness.

The association between substance use and prescription stimulant misuse was not unexpected, as a recent meta-analysis noted that alcohol and marijuana use (in particular binge-drinking) were correlated with prescription stimulant misuse (Benson et al., 2015). Notably, most studies in this area have examined marijuana use, rather than tobacco and nicotine use, as in the current study.

The magnitude of the effect regarding tobacco use, in particular, was somewhat alarming, with heavy tobacco smokers being more than ten times as likely to misuse prescription stimulants compared to those who did not use tobacco. It is possible that, as the well-publicized health risks of smoking and the social stigma attached to it have made smoking much less common, tobacco is perhaps now more likely to be used by those who are also using heavier or more dangerous substances. It is, however, unclear why a moderate level of nicotine use should be associated with prescription stimulant misuse, when a heavy level of nicotine use was not.

In addition to substance use, those who had the most liberal attitudes to the non-medical use of prescription drugs were almost ten times more likely to misuse prescription stimulants compared to those people with the least liberal attitudes. Although there have been mixed findings regarding the relationship between a person's attitudes

and their behaviour, on the whole, studies tend to support the notion that an individual's behaviour is usually in line with their beliefs. The Theory of Planned Behaviour is commonly used to predict health-related behaviours (Ponnet et al., 2015) and posits that a person's attitude towards a certain behaviour is a "critical factor" that influences their decision to engage in that particular behaviour (Ajzen, 1985, 2011). Singh et al. (2014) also found that students who misused prescription stimulants were more likely than non-users to believe that such use was not ethically problematic. Further, those individuals who were interested in misusing stimulants, but had not yet done so, were also more likely to believe that it was less ethically problematic than those who had never considered such use. These findings highlight the presence of an at-risk group in the student population, i.e., those who have more permissive attitudes towards the misuse of prescription stimulants and may at some point start misusing stimulants. Identifying which students are more likely to have positive attitudes towards prescription stimulant use would mean that this group could be pre-emptively targeted with a program designed to prevent students from initiating non-medical prescription stimulant use by focusing on the ethical and moral issues relating to non-medical use of prescription stimulants.

With regard to sleep-related factors, those with poor sleep quality were more than three times more likely to use stimulants to stay awake than those with good sleep quality. These data are supported by the findings of studies such as Lund et al. (2009), whose survey of 1,125 students also found that those with poor sleep quality were more likely to engage in prescription stimulant misuse than those who reported good sleep quality. It is important to note that only sleep quality (measured by the PSQI) and

moderate daytime sleepiness (ESS) were significant in the multivariate analysis, in contrast to insomnia (ISI), which was only significant at the univariate level. This suggests that sleep quality (as measured by the PSQI) may be able to provide a comprehensive assessment of sleep because it also encompasses the insomnia factor. In addition, the PSQI and the ESS capture data over a greater period of time, with the PSQI focusing on sleeping patterns over the past month and the ESS not specifying a time period at all. The ISI, however, only asks about insomnia symptoms during the last two weeks. It is not surprising, given that students were asked about prescription stimulant misuse for the purpose of staying awake, that students experiencing daytime sleepiness might be more likely to engage in such misuse. However, it is difficult to determine why only a moderate level of daytime sleepiness was significantly associated with prescription stimulant misuse, as opposed to mild/severe levels of daytime sleepiness.

It is also not clear exactly why students were using prescription stimulants to stay awake in this study, but there are three possible explanations, based on previous research. The first is that students are primarily staying awake longer at night in order to study. Most studies that have investigated reasons for prescription stimulant misuse have found the top reason cited by students is to improve academic performance (Singh et al., 2014; Benson et al., 2015). The second most common reason for stimulant misuse reported by students was to counteract the effects of sleep disturbance, such as fatigue and low energy (Singh et al., 2014). Lastly, young adults sometimes combine stimulants with alcohol when partying, in order to stay up later and party for longer periods (Brandt, Taverna & Hallock, 2014; Verdi et al., 2016).

It is possible, of course, that the participants in this study may be using prescription stimulants at different times for any or all of these purposes. Previous research indicates that when students are misusing such drugs for academic purposes, their use is likely to be more infrequent and occurs most often around midterms, final exams and assignment deadlines (DeSantis & Hane, 2010, Brandt et al. 2014). It therefore follows that, since the PSQI and ESS cover a longer time period, it is more likely that students' scores on this measure will correlate with prescription stimulant misuse. As this particular study is cross-sectional, it is not possible to determine causality and it is important to bear in mind that the relationship between prescription stimulant misuse and sleep quality/daytime sleepiness may in fact be bidirectional. Thus, students may initially engage in such misuse for academic enhancement and then find that their sleep cycle is disrupted to the extent that they keep misusing stimulants to counteract the negative effects of such use on their sleep, potentially becoming trapped in the stimulation-sedation loop, as predicted by Marhefka (2011). If this is indeed the case, it suggests that programs that teach students about sleep hygiene and the effects of prescription stimulant misuse on sleep may have a (previously unappreciated) role to play in encouraging students to reduce their misuse of such medication.

The results of this study are particularly notable because a number of previously reported factors associated with prescription stimulant misuse were no longer significant when considered alongside substance use, attitudes towards nonmedical use of stimulant medication, sleep quality, and daytime sleepiness. The fact that both substance use and sleep-related issues were associated with such misuse makes it difficult to narrow down

exactly why students might be using prescription stimulants to stay awake, as they could conceivably be trying to stay awake longer in order to study, and/or staying awake longer in order to go out and party (and probably also consume other substances). Further research is required to determine exactly why students are misusing prescription stimulants to stay awake, as understanding this may shed some light on the directionality of the relationship between prescription stimulant misuse and sleep disturbance. The main findings also indicate that aiming prevention/intervention programs at students who are more likely to be using other substances, and influencing students' attitudes towards prescription medication misuse may be an effective strategy to reduce such misuse.

Strengths and Limitations

This study has a number of strengths. First, the sample size represents around 20% of the MUN student population, meaning that this study provides an important insight into non-medical prescription stimulant use among university students in Atlantic Canada, specifically, that was previously lacking in the research literature. Moreover, the sample was, in general, highly representative of the actual student population at MUN, according to the most recent university statistics. The notable exception to this was gender, as the sample contained a greater proportion of females than males, however, the fact that our results are broadly in line with previous studies who have had a more balanced gender profile indicates that this disparity did not skew our results.

Another important strength was the comprehensive nature of the survey, which meant the data analysis was able to include a wide range of potential influencing factors, ranging from demographic and academic to sleep and mental health-related factors. In

addition, the survey included several standardized measures (e.g., ISI, ESS, PSQI, HADS) that have been validated for use in non-clinical populations. This provides a greater sense of certainty that the measures were actually gauging the factors that were being investigated (e.g. insomnia, daytime sleepiness, sleep quality, and anxiety and depressive symptoms).

This study also has some notable limitations, the first of which is its cross-sectional design, which does not allow for the determination of causality, only associations. It is possible that once students begin misusing prescription stimulants, their attitudes towards such misuse become more liberal. Similarly, the relationship between sleep and stimulant use is likely bidirectional, in that each is both a cause and a consequence. Moreover, the use of the survey format means that all data are self-reported. It is possible, particularly with an issue as sensitive as substance use, that students may have under-reported their level of substance use; however, the survey was anonymous, which should have mitigated this possibility. It is also important to reiterate that this study specifically focused on the misuse of prescription stimulants to combat the effects of sleep disturbance, and caution should therefore be advised in generalizing the results of this study to those students who misuse stimulants for other purposes. Finally, this study did not include questions regarding the frequency of prescription stimulant use. It would have been interesting to query how often students are engaging in the non-medical use of prescription stimulants, as this would help to clarify the severity of the issue.

Conclusion

This cross-sectional study of students at a Canadian university established that 3.1% of students were using stimulant medication for the non-medical purpose of staying awake and found that substance use, more liberal attitudes to the non-medical use of prescription drugs, poor sleep quality and daytime sleepiness are the factors most strongly associated with this use. This suggests that any prevention or intervention programs organized on campus should focus on those who engage in heavier levels of substance use, and include sleep education (e.g., improving sleep hygiene and more adaptive strategies for managing sleep disturbance), as well as highlighting some of the issues involved with non-medical use of drugs (e.g., increased risk of serious side effects and/or the ethical and moral issues relating to stimulant misuse).

Future research could focus on evaluating the impact of such intervention programs in terms of improving sleep hygiene or raising awareness of the dangers of non-medical use of prescription stimulants. It is also important to understand which students are likely to have more positive attitudes towards non-medical prescription stimulant use, in order to target them with prevention programs. Identifying such students is therefore the focus of the next study in this thesis.

Furthermore, it is necessary to understand exactly why students are misusing prescription stimulants to stay awake, e.g., for study, or recreation, as this will inform how the problem is addressed (i.e., if students are trying to stay awake to study longer, greater academic supports might alleviate this issue). The third study of this thesis will therefore investigate why students are misusing prescription stimulants to stay awake.

Chapter 3:

University Student Attitudes Towards the Non-Medical Use of Prescription Medication

3.1 Abstract

INTRODUCTION: Several factors are associated with the non-medical use of prescription medication among university students, including having more permissive attitudes towards such use. However, it is not clear what factors might be associated with having such liberal attitudes and whether these would differ between misuse for achievement-oriented (i.e. academic) vs. recreational purposes. This study investigated whether, and the extent to which, demographic/clinical factors were associated with more permissive attitudes towards prescription stimulant misuse, and whether these factors differ between misuse for academic vs. recreational purposes.

METHODS: An online survey was administered to students at an Atlantic Canadian university, which collected demographic (e.g., age, gender, ethnicity) and behavioural (e.g., substance use) information, and included standardized measures of anxiety, depression, sleep disturbance, and attitudes towards prescription medication misuse. Participants were 3,160 full-time and part-time students aged 18-35 years. Linear regressions were conducted to determine which factors were associated with more permissive attitudes towards prescription stimulant use in general, as well as more permissive attitudes towards misuse for academic vs. recreational purposes.

RESULTS: The factors associated with more permissive attitudes towards non-medical use of prescription medication at the multivariate level were non-White ethnicity (adjust coefficient [adj β] = 4.79; p = <.001), international student status (adj β = 2.74; p = .047), alcohol (Light, adj β = 2.97; p = <.001; Moderate, adj β = 7.19; p = <.001; Heavy, adj β = 13.95; p = <.001), tobacco (Light, adj β = 3.14; p = .007; Moderate, adj β = 8.01; p =

<.001), nicotine vapour use (Light, adj β = 3.45; *p* = .029), depressive symptoms (Borderline, adj β = 2.21; *p* = .014; Clinical, adj β = 4.10; *p* = <.001), and clinical level of anxiety symptoms (adj β = 2.18; *p* = .009). Female gender (adj β = -5.72; *p* = <.001), part-time study (adj β = -2.48; *p* = .027) and borderline level of anxiety symptoms (adj β = -1.83; *p* = .021) were all associated with less permissive attitudes towards non-medical use of prescription medication. No factors were associated with positive attitudes towards misuse for academic purposes and only age and ADHD medication were associated with positive attitudes to misuse for recreational purposes.

CONCLUSION: The groups identified by this study as having more positive attitudes towards prescription medication misuse could be targeted by prevention programs. More investigation is needed into academic vs. recreational misuse of prescription medication.

3.2 Introduction

The misuse of prescription medication is a disturbing trend that has emerged on university campuses (Johnston, O'Malley, Bachman & Schulenberg, 2012). Stimulants are the most commonly misused class of prescription medication, with the prevalence of such misuse reported as high as 35% for certain US college campuses (Wilens et al., 2008, Schulenberg et al., 2017). Other classes of prescription medications that are frequently misused by teens and young adults include anxiolytics and hypnotics, such as benzodiazepines, and painkillers, such as opioids (Stone & Merlo, 2012; Brandt et al., 2014). Several negative outcomes are associated with the non-medical use of prescription medication, including polydrug use, unintentional overdose, and dependence (McCabe & Teter, 2007, Drazdowski, 2016).

Given that the misuse of prescription medication appears to be a particular issue for university students, it is important to be able to identify which students are likely to engage in such use. The Theory of Planned Behaviour, which was first outlined by Ajzen in 1991 and is often used in the field of health psychology (Ponnet, Wouters, Walrave, Heirman & Van Hal, 2015), suggests that an individual's intention to engage in a "planned, non-habitual" behaviour predicts whether or not they will actually engage in it (LaBelle, 2017, p.2). The intentions of any given individual can, moreover, be predicted by their attitude towards the behaviour, subjective norms (perceived social pressure from others to perform the behaviour) and perceived behavioural control (whether they believe acting on the behaviour is within their power). Thus, if someone has a more positive attitude towards a certain behaviour, believes that others might encourage them to engage

in it, and believes that it is within their power, they are more likely to do it (Bodenlos et al., 2014; Ponnet et al., 2015; LaBelle, 2017).

Support for this theory's applicability to the misuse of substances (particularly the part relating to individuals' attitudes) is provided by Stone and Merlo (2012), who measured university students' beliefs about seeking psychiatric medication (stimulants, benzodiazepines and antidepressants) for non-medical purposes, and correlated their scores with self-reported drug misuse. Participants who reported misusing psychiatric medications were more likely to have positive attitudes towards medication-seeking behaviours (measured by items such as "I believe it is okay to fake symptoms of ADHD in order to receive a prescription") than those who did not engage in such use. It is important to note that attitudes towards prescription drug misuse also seem to be more positive among those who have not yet engaged in such use, but have considered doing so.

A cross-sectional study by Singh, Bard and Jackson (2014) surveyed 877 university students across the UK and Ireland and asked them about their level of interest in misusing prescription stimulants, and whether they felt such use was ethically problematic. Both those who already misused prescription stimulants and those who had considered doing so were less likely to believe that the behaviour was problematic than those who had no interest in it. This finding supports the "subjective norms" part of the Theory of Planned Behaviour and indicates that there may be an at-risk group of university students who do have more positive attitudes towards the non-medical use of prescription medication, but have not yet engaged in such use (Singh et al., 2014).

It would also be important to establish what demographic or clinical factors might be associated with a more positive attitude towards such misuse, in order to further narrow down the target audience for such interventions and determine how best to convey the message to this group. In terms of demographic factors associated with more liberal attitudes towards the misuse of prescription medication, older students have been identified as more likely to have positive attitudes towards prescription drug misuse than younger students (Bodenlos et al., 2014). Those with more positive attitudes towards such use were also more likely to consume greater amounts of alcohol per week and/or marijuana per month, and engage in other illicit substance use (Bodenlos et al., 2014).

Another factor associated with more liberal attitudes to prescription medication misuse is having a legal prescription. In a survey of 988 university students, 74 students had a current prescription for stimulant medication to treat Attention Deficit Hyperactivity Disorder (ADHD) and 67 of those students had diverted that medication at some point (Kinman, Armstrong & Hood, 2017). Over 23% of the overall sample reported having engaged in the diversion and/or non-medical consumption of prescription stimulants. Kinman et al. (2017) also noted that, in terms of health risks, 48.8% of those who had been involved in non-medical use rated such use as slightly/not at all dangerous, whereas 74.6% of those who had never been involved in non-medical use rated it as dangerous/very dangerous. Furthermore, those who had been involved in non-medical use of prescription stimulants had statistically stronger beliefs in the power of stimulant medication to increase concentration/alertness and help with studying (Kinman et al., 2017). This study indicates that students with a legal prescription for ADHD medication

are highly likely to divert it at some point, and that those students involved in diversion are also more likely to believe there are greater benefits and fewer risks to misusing such medication. It is not clear exactly why this should be the case, although it is possible that personal experience of using the medication, at a prescribed dose and with little side effects, might result in those individuals who take it being more aware of the benefits than the potential harms associated with the medication. Other than the studies already mentioned, there has been little research conducted on the demographic or clinical factors associated with more liberal attitudes towards prescription medication misuse.

There is some evidence to suggest that there are certain subgroups of university students who misuse prescription medication, i.e., those who do so strictly for achievement-oriented purposes (i.e., to improve academic performance), those who are more likely to engage in such use for recreational purposes (i.e., getting high), and a third group who misuse medication for both purposes (Pino, Tajalli, Smith & De Soto, 2017). It is therefore possible that there may be different demographic and clinical factors associated with those who have positive attitudes towards prescription medication misuse for academic purposes and those who have more positive attitudes towards recreational use of such substances. It is important to highlight, however, that the distinction between recreational and achievement-oriented misuse may only apply to misuse of prescription stimulants, as other types of prescription medication are not typically used for the purpose of cognitive enhancement (Brandt et al., 2014; Singh et al., 2014).

The current study builds on the findings of Stone and Merlo (2012) and Bodenlos et al. (2014) by asking whether certain demographic characteristics (such as gender, age

and ethnicity) and clinical factors (such as ADHD diagnosis, anxiety, depression and substance use) are associated with a person's attitude towards the non-medical use of prescription drugs. Understanding which students are more likely to perceive such use as socially acceptable (and therefore which are more likely to engage with such use in the future) will help target prevention and intervention programs more effectively towards these groups.

Accordingly, this study has three primary research objectives:

1) To examine the association between demographic and clinical factors and positive attitudes towards the non-medical use of prescription medications among students at Memorial University of Newfoundland (MUN).
2) To determine whether students who report using legally prescribed medication for diagnosed ADHD have more positive attitudes towards the non-medical use of prescription medications than those who do not use such medication for ADHD.
3) To determine whether different demographic and clinical factors are associated with higher scores on the achievement-oriented vs. recreational subscales of the PDAQ.

3.3 Method

Participants

This study used the same dataset as the first study. Data were collected using an online survey between June 2016 and May 2017, and participants were included if they

were full-time or part-time, undergraduate or graduate students at Memorial University of Newfoundland, and aged 18-35 years.

Procedure

Participants were mainly recruited for the survey via social media (e.g. postings from the Department of Psychology's Facebook page), pamphlet recruitment on campus, and mass emails from the Registrar's Office and the Internationalization Office listserv. In addition, classroom recruitment was used to specifically target certain faculties, in order to ensure the sample was broadly representative of the university student population. As an incentive, participants were offered the chance to be entered into a draw to win one of twelve $50 giftcards for a local mall. The study data were collected via an online survey hosted by SurveyMonkey. Informed consent was required of all participants before starting the survey and the procedure was approved by MUN's Interdisciplinary Committee on Ethics in Human Research (see Appendix A).

Study Measures

Participants were asked to provide sociodemographic information, such as gender, age, race/ethnicity and academic status (e.g. whether students were undergraduates or graduates, studying full-time or part-time, living in residence or off-campus), as well as which university faculty they were in. Due to the broad range of faculties represented, these were subsequently condensed into five categories: Humanities and Social Sciences, Engineering and Applied Sciences (including Marine Institute), Health Professions (e.g., Medicine, Nursing, Pharmacy), Science and Undeclared. As Faculty as a category does

not have any inherent order, for the linear regression analysis, the group with the lowest total PDAQ score (Health Professions) were used as the reference group.

Primary Outcome Variables

Attitudes towards the non-medical use of prescription medication were measured using the Prescription Drug Attitudes Questionnaire (PDAQ), a 26-item self-report measure that asks respondents to indicate (on a Likert-type scale of 0-6) their level of agreement with statements relating to the acceptability of non-medical prescription medication use for various purposes, including study aids and pain management. There are eleven items on the recreational subscale and eight items on the achievement-oriented subscale. The PDAQ has good internal consistency and convergent validity, with a Cronbach's alpha of .94 for the whole scale, .92 for the recreational subscale and .89 for the achievement-oriented subscale (Bodenlos et al., 2014). Because there are no standardized categories for this scale, three categories were created based on maintaining a roughly equal number of participants in each category: "less positive" (0-39), "average" (40-59), and "most positive" (60+) attitudes to prescription medication misuse.

Covariate Factors

Substance use

Alcohol, tobacco and nicotine vapour use was captured using the question "How would you describe your level of use of the following substances?" for which there were five possible responses, i.e., Do not use; Light; Moderate; Heavy; Prefer not to answer.

Participants who chose "Prefer not to answer" were excluded from the data analysis for the substance use variable.

ADHD medication

Participants were also asked to indicate whether they were currently taking prescribed medication for several conditions, i.e., anxiety, depression, insomnia, pain, ADHD, or Other. These responses were condensed into a categorical yes/no variable, with those who reported taking ADHD medication placed in the "yes" category and those who did not take such medication placed in the "no" category.

Sleep quality, insomnia and daytime sleepiness measures

Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI), a 19-item self-report instrument examining 7 different areas of sleep quality. It has a Cronbach's alpha of 0.70 - 0.83 in clinical and community samples, along with good convergent and divergent validity (Mollayeva et al., 2016). Participants were categorized as having "good sleep" (0-4) or "poor sleep" (5+), according to the PSQI scoring criteria.

Insomnia was captured using the Insomnia Severity Index (ISI), a 7-item self-report measure that assesses the severity of insomnia symptoms and also daytime dysfunction. Each item is scored on a five-point Likert scale, with 28 being the highest possible score. A score of eight or more indicates the presence of insomnia symptoms, and a score of 15 or more is considered the cut-off for clinical insomnia (Bastien, Vallières & Morin, 2001). The ISI has good reliability, with a Cronbach's alpha of 0.90 in a community sample, as well as good criterion and convergent validity (Morin,

Belleville, Bélanger & Ivers, 2011). Participants were categorized as having “none” (0-7), “mild” (8-14), moderate (15-21), or severe (22-28) insomnia according to the standardized scoring criteria.

Daytime sleepiness was captured using the Epworth Sleepiness Scale (ESS), an 8-item self-report measure, which asks how likely the respondent is to fall asleep in 8 everyday situations using a Likert scale of 0-3 (e.g. watching TV or sitting and reading). Scores range from 0-24, with scores of 10 or more indicating significant levels of daytime sleepiness. In terms of reliability, it has a Cronbach's alpha of .75 (Lund et al., 2009). As with the other scales, participants were characterized as having “none” (0-10), “mild” (11-12), “moderate” (13-15), and “severe” (16-24) levels of daytime sleepiness according to the standardized scoring criteria.

Mental health measures

Anxiety and depression symptoms were measured using the Hospital Anxiety and Depression Scale (HADS), which is a 14-item self-report measure that is divided into two 7-item subscales, one for anxiety symptoms and one for depression symptoms (Mykletun, Stordal, & Dahl, 2001). Scores on each subscale range from 0-21, with scores of 11 or higher indicating the presence of clinical anxiety/depression. The HADS has high internal consistency, with the depression subscale having a Cronbach’s alpha of .80 and the anxiety subscale having a Cronbach’s alpha of .76 (Bjelland, Dahl, Haug, & Neckelmann, 2002; Mykletun, Stordal, & Dahl, 2001). HADS scores were categorized according to the standardized scoring criteria for this scale, i.e. “normal” (0-7), “borderline” (8-10), and “clinical” (11-21) levels of anxiety/depressive symptoms.

Data Analyses

Data were analyzed using SPSS statistical software (Version 24.0; IBM Corp., 2016). As mentioned previously in the first study, the original dataset had a significant proportion of data missing for some of the predictor variables (e.g., ISI, HADS scores), with some variables having more than 25% data missing. Expectation maximization (a single imputation of 50 iterations) was used in order to provide a more complete dataset. Descriptive statistics were used to determine the sociodemographic characteristics of the sample. Univariate and multivariate linear regressions were used to compare attitudes towards non-medical use of prescription medication (as measured by PDAQ score) with the various demographic and clinical factors outlined above. Before conducting the linear regression analyses, any relevant nominal or ordinal variables (e.g., Gender, Alcohol Use) were converted to dummy variables. In addition, Q-Q plots and histograms for the three dependent variables (PDAQ total, achievement-oriented subscale and recreational subscale scores) were examined to determine whether the residuals were normally distributed. None of the three variables were normally distributed, so all three were transformed using a two-step transformation process (as advocated by Templeton, 2011). According to the subsequent Q-Q plots and histograms, the transformed variables were normally distributed, so these were used for the linear regression analyses. Statistical significance was set at $p<0.05$ and variables that were significant in the univariate linear regression were then included in the multivariate model.

3.4 Results

Participant Characteristics

As presented in Table 3, while the total number of participants was 3,699, once those who were outside the 18-35 age range were excluded, the final sample size was 3,160. The mean age of participants was 22.2, with over half (54%) of the participants aged 18-21 years. The majority of participants were female (70%), with 28% identifying as male, and 1.6% as gender minorities (e.g. transgender, agender, genderqueer). In addition, the majority of participants were undergraduates (82%), domestic students (89%), studying full-time (92%) and living off-campus (86%). In terms of ethnicity, 85% of participants were White, with Chinese being the second largest ethnicity, at 3%. Finally, 65% of participants were in the four biggest university faculties: Science (24%), Humanities (19%), Engineering and Applied Sciences (12%) and Business (11%).

The observed descriptive statistics suggest that the sample characteristics are comparable to those of the student population at MUN, based on student statistics from 2016. Specifically, these student statistics show that in 2016, 57% of students were female, 82% undergraduates and 14% international students. Moreover, 65% of students were in the five largest university faculties: Science = 20%; Humanities = 15%; Business = 13%; Engineering and Applied Sciences = 11%; Nursing = 6% (Memorial University of Newfoundland, 2017).

Table 3. Demographic Characteristics of Survey Participants II

	N	%
Gender		
Male	881	27.9
Female	2229	70.5
Other	38	1.6
Age		
18-19	866	27.4
20-21	844	26.7
22-24	736	23.3
25-35	714	22.6
Ethnicity		
White	2655	85
Non-White	435	14
Academic Status		
Undergraduate	2540	82.4
Graduate	541	17.6
Living Situation		
Residence	437	13.9
Off-campus	2696	86.1
Average Grade		
0-69%	528	17.1
70-79%	1174	38.1
80-89%	1141	37.0
90%+	238	7.7
Faculty		
Humanities & Soc. Sci.	1160	36.7
Engineering & App. Sci.	419	13.3
Health Professions	471	14.9
Science	733	23.2
Undeclared	198	6.3
Full/Part Time		
Full Time	2837	92.1
Part Time	244	7.9

	N	%
Citizenship		
Domestic	2731	88.6
International	350	11.4
ADHD Meds		
Legal Prescription	72	2.3
No Prescription	3088	97.7

Attitudes toward Non-Medical Use of Prescription Medications

The mean total PDAQ score assessing prescription drug attitudes for the overall sample was 47, with a standard deviation of 16.5 and a range of 13 to 131. Each independent variable was compared to the dependent variable separately in a univariate analysis, and if the relationship between the two was significant ($p<0.05$), the independent variable was also included in the multivariate analysis.

At the univariate level of analysis, being female was significantly associated with having a lower total PDAQ score compared to males (β = -6.79; p = <.001), and being non-White was significantly associated with having a higher total PDAQ score than being White (β = 5.89; p = <.001). International (β = 6.31; p = <.001) and graduate students (β = 1.72; p = .028) were significantly more likely to have higher total PDAQ scores than domestic and undergraduate students. In contrast, being a part-time student was associated with lower total PDAQ scores than being a full-time student (β = -3.09; p = .005). Compared to those in the Health Professions category, students in the Humanities (β = 2.51; p = .005), Engineering (β = 5.51; p = <.001), Science (β = 3.33; p = .001) and Undeclared (β = 4.77; p = <.001) faculty categories were significantly more likely to have higher total PDAQ scores.

With regard to substance use, alcohol (Moderate Use, β = 5.42; *p* = <.001; Heavy Use, β = 16.24; *p* = <.001), tobacco (Light Use, β = 7.22; *p* = <.001; Moderate Use, β = 11.15; *p* = <.001; Heavy Use, β = 9.79; *p* = <.001) and nicotine (Light Use, β = 6.62; *p* = <.001; Moderate Use, β = 10.23; *p* = <.001; Heavy Use, β = 12.06; *p* = .010) were all associated with having a higher total PDAQ score. In addition, having a legal prescription for ADHD medication was significantly associated with higher total PDAQ score, compared to not having such a prescription (β = 6.74; *p* = .001).

In terms of clinical factors, having poor sleep quality was significantly associated with having a higher total PDAQ score than having good sleep quality (β = 1.61; *p* = .043). Similarly, daytime sleepiness (Mild, β = 2.30; *p* = .025; Moderate, β = 2.41; *p* = .037; Severe, β = 3.61; *p* = .022) and insomnia symptoms (Mild, β = 1.73; *p* = .007; Moderate, β = 3.22; *p* = .001) were also associated with higher PDAQ scores compared to those who had no issues with daytime sleepiness or insomnia. Finally, both borderline and clinical levels of depression (Borderline, β = 3.91; *p* = <.001; Clinical, β = 6.49; *p* = <.001) and anxiety (Clinical, β = 2.81; *p* = <.001) symptoms were associated with higher total PDAQ scores than those who had "typical" levels of such symptoms. Age, residence (on/off-campus), and average grade were not significantly associated with total PDAQ scores at the univariate level of analysis.

The results of the multivariate linear regression revealed ten factors which accounted for 13% of the variance (Adjusted R^2 =.13, F(31,2657) = 14.4, *p*<.001). Being female (adjusted coefficient [adj β] = -5.72; *p* = <.001), non-White (adj β = 4.79; *p* = <.001), international (adj β = 2.74; *p* = .047) and part-time (adj β = -2.48; *p* = .027) all

remained significant at this level of analysis. In contrast, only two faculty categories remained significant at the multivariate level, with Science (adj β = 2.11; *p* =.027) and Undeclared (adj β = 2.83; *p* = .040) being significantly associated with higher total PDAQ scores than the Health Professions category.

In terms of substance use, alcohol (Light, adj β = 2.97; *p* = <.001; Moderate, adj β = 7.19; *p* = <.001; Heavy, adj β = 13.95; *p* = <.001), tobacco (Light, adj β = 3.14; *p* = .007; Moderate, adj β = 8.01; *p* = <.001), and nicotine use (Light, adj β = 3.45; *p* = .029) were all significantly associated with higher PDAQ scores, compared to non-use of these substances. Finally, depressive symptoms (Borderline, adj β = 2.21; *p* = .014; Clinical, adj β = 4.10; *p* = <.001) and clinical levels of anxiety symptoms (adj β = 2.18; *p* = .009) were still significantly associated with higher total PDAQ scores, whereas borderline levels of anxiety (adj β = -1.83; *p* = .021) was significantly associated with lower PDAQ scores. Undergraduate/graduate status, having a legal prescription for ADHD medication, poor sleep quality, daytime sleepiness, and insomnia were no longer significant at the multivariate level.

Table 4. Multiple Linear Regression of Factors Associated with Total PDAQ Score

	Univariate Analysis Coefficient (95% CI)	***p***	**Multivariate Analysis Coefficient (95% CI)**	***p***
Gender				
Male	1		1	
Female	-6.79 (-8.05 – (-5.54))	**<.001**	-5.72 (-7.13 – (-4.30)	**<.001**
Other	0.62 (-4.30 – 5.54)	.806	1.02 (-4.03 – 6.07)	.692
Age				
18-19	1			

	Univariate Analysis Coefficient (95% CI)	*p*	Multivariate Analysis Coefficient (95% CI)	*p*
20-21	0.92 (-1.46 – 1.65)	.908		
22-24	.07 (-1.54 – 1.68)	.930		
25-35	.96 (-0.67 – 2.58)	.249		
Ethnicity				
White	1		1	
Non-white	5.89 (4.29 – 7.50)	**<.001**	4.79 (2.59 – 6.99)	**<.001**
Citizenship				
Domestic	1		1	
International	6.31 (4.48 – 8.14)	**<.001**	2.74 (0.04 – 5.43)	**.047**
Academic Status				
Undergraduate	1		1	
Graduate	1.72 (0.18 – 3.26)	**.028**	1.66 (-0.14 – 3.47)	.071
Full/Part-time				
Full-time	1		1	
Part-time	-3.09 (-5.26 – (-0.93))	**.005**	-2.48 (-4.68 – (-0.29))	**.027**
Residence				
On-campus	1			
Off-campus	-0.21 (-1.88 – 1.45)	.802		
Average Grade				
0-69%	1			
70-79%	-0.87 (-2.56 – 0.80)	.308		
80-89%	-1.15 (-2.83 – 0.52)	.177		
90-100%	-0.65 (-3.15 – 1.85)	.610		
Faculty				
Health Professions	1		1	
Humanities & Social Sciences	2.51 (0.74 – 4.28)	**.005**	1.26 (-0.48 – 2.99)	.156
Engineering & Applied Sciences	5.51 (3.33 – 7.68)	**<.001**	1.41 (-0.82 – 3.64)	.214
Science	3.33 (1.42 – 5.24)	**.001**	2.11 (0.24 – 3.97)	**.027**
Undeclared	4.77 (2.03 – 7.52)	**.001**	2.83 (0.13 – 5.53)	**.040**
Alcohol Use				

	Univariate Analysis Coefficient (95% CI)	***p***	**Multivariate Analysis Coefficient (95% CI)**	***p***
Do Not Use	1		1	
Light	0.63 (-0.92 – 2.17)	.427	2.97 (1.34 – 4.60)	**<.001**
Moderate	5.42 (3.77 – 7.06)	**<.001**	7.19 (5.37 – 9.00)	**<.001**
Heavy	16.24 (12.42 – 20.06)	**<.001**	13.95 (9.98 – 17.92)	**<.001**
Tobacco Use				
Do Not Use	1		1	
Light	7.22 (5.50 – 8.94)	**<.001**	3.14 (0.84 – 5.43)	**.007**
Moderate	11.15 (7.82 – 14.48)	**<.001**	8.01 (4.55 -11.46)	**<.001**
Heavy	9.79 (4.70 – 14.87)	**<.001**	2.64 (-2.95 – 8.22)	.354
Nicotine Use				
Do Not Use	1		1	
Light	6.62 (4.46 – 8.78)	**<.001**	3.45 (0.36 – 6.55)	**.029**
Moderate	10.23 (4.48 – 15.98)	**<.001**	3.78 (-1.87 – 9.43)	.190
Heavy	12.06 (2.84 – 21.27)	**.010**	0.49 (-9.06 – 10.04)	.920
ADHD Meds				
No Prescription	1		1	
Legal Prescription	6.74 (2.92 – 10.56)	**.001**	3.49 (-0.27 – 7.24)	.069
PSQI				
Normal Sleep (0-4)	1		1	
Poor Sleep (5-20)	1.61 (0.05 – 3.16)	**.043**	1.33 (-0.41 – 3.08)	.134
ESS				
None (0-10)	1		1	
Mild (11-12)	2.30 (0.29 – 4.31)	**.025**	1.53 (-0.42 – 3.48)	.124
Moderate (13-15)	2.41 (0.15 – 4.66)	**.037**	0.85 (-1.41 – 3.10)	.461
Severe (16-24)	3.61 (0.53 – 6.68)	**.022**	2.52 (-0.48 – 5.51)	.099
ISI				
None (0-7)	1		1	
Mild (8-14)	1.73 (0.48 – 2.98)	**.007**	-0.42 (-1.87 – 1.04)	.575
Moderate (15-21)	3.22 (1.35 – 5.09)	**.001**	-0.55 (-2.69 – 1.58)	.612
Severe (22-28)	2.43 (-2.18 – 7.05)	.301	-3.39 (-7.98 – 1.21)	.149
HADS Depression				
Normal (0-7)	1		1	
Borderline (8-10)	3.91 (2.23 – 5.59)	**<.001**	2.21 (0.45 – 3.96)	**.014**
Clinical (11-21)	6.49 (4.40 – 8.59)	**<.001**	4.10 (1.87 – 6.33)	**<.001**

	Univariate Analysis Coefficient (95% CI)	*p*	Multivariate Analysis Coefficient (95% CI)	*p*
HADS Anxiety				
Normal (0-7)	1		1	
Borderline (8-10)	-1.31 (-2.73 – 0.11)	**.071**	-1.83 (-3.38 – (-0.27))	**.021**
Clinical (11-21)	2.81 (1.38 – 4.24)	**<.001**	2.18 (0.54 – 3.83)	**.009**

The final aim of this study was to examine whether different demographic or clinical factors were associated with higher scores (i.e., more positive attitudes towards non-medical use of prescription medication) on the achievement-oriented and recreational subscales of the PDAQ. The mean score for the achievement-oriented subscale of the PDAQ (i.e., attitudes towards non-medical use of prescription medications for academic purposes) was 13, with a standard deviation of 6.3 and a range of 4 to 42.

At the univariate level of analysis, none of the demographic or clinical factors were significantly associated total score on the achievement-oriented subscale, thus a multivariate analysis was not conducted for this subscale.

Table 5. Multiple Linear Regression of Factors Associated with Achievement-oriented Subscale Score

	Univariate Analysis Coefficient (95% CI)	***p***	**Multivariate Analysis Coefficient (95% CI)**	***p***
Gender				
Male	1			
Female	.22 (-0.24 – 0.68)	.348		
Other	-.76 (-2.56 – 1.04)	.407		
Age				
18-19	1			
20-21	0.07 (-0.48 – 0.63)	.797		
22-24	0.29 (-0.29 – 0.86)	.328		
25-35	-0.31 (-0.90 – 0.27)	.289		
Ethnicity				
White	1			
Non-white	0.26 (-0.32 – 0.84)	.374		
Citizenship				
Domestic	1			
International	0.47 (-0.19 – 1.12)	.161		
Academic Status				
Undergraduate	1			
Graduate	-0.30 (-0.85 – 0.24)	.275		
Full/Part-time				
Full-time	1			
Part-time	0.55 (-0.22 – 1.31)	.163		
Residence				
On-campus	1			
Off-campus	-0.26 (-0.86 – 0.33)	.386		
Average Grade				
0-69%	1			
70-79%	0.32 (-0.28 – 0.93)	.294		
80-89%	0.29 (-0.31 – 0.89)	.340		
90-100%	-0.26 (-1.16 – 0.63)	.567		
Faculty				

	Univariate Analysis Coefficient (95% CI)	*p*	Multivariate Analysis Coefficient (95% CI)	*p*
Health Professions	1			
Humanities & Social Sciences	-0.24 (-0.87 – 0.39)	.450		
Engineering & Applied Sciences	-0.43 (-1.20 – 0.35)	.280		
Science	-0.21 (-0.89 – 0.47)	.545		
Undeclared	0.20 (-0.77 – 1.18)	.682		
Alcohol Use				
Do Not Use	1			
Light	-0.16 (-0.72 – 0.41)	.590		
Moderate	-0.03 (-0.63 – 0.57)	.920		
Heavy	-0.50 (-1.89 – 0.90)	.484		
Tobacco Use				
Do Not Use	1			
Light	0.26 (-0.37 – 0.89)	.417		
Moderate	-0.45 (-1.67 – 0.76)	.464		
Heavy	0.22 (-1.63 – 2.08)	.813		
Nicotine Use				
Do Not Use	1			
Light	-0.05 (-0.83 – 0.73)	.893		
Moderate	-1.96 (-4.04 – 0.12)	.064		
Heavy	-1.02 (-4.34 – 2.31)	.549		
ADHD Meds				
No Prescription	1			
Legal Prescription	-1.38 (-2.75 – (-0.01))	.049		
PSQI				
Normal Sleep (0-4)	1			
Poor Sleep (5-20)	0.01 (-0.55 – 0.57)	.970		
ESS				
None (0-10)	1			
Mild (11-12)	-0.17 (-0.89 – 0.56)	.654		
Moderate (13-15)	0.05 (-0.77 – 0.86)	.911		
Severe (16-24)	-0.06 (-1.17 – 1.05)	.916		

	Univariate Analysis Coefficient (95% CI)	*p*	Multivariate Analysis Coefficient (95% CI)	*p*
ISI				
None (0-7)	1			
Mild (8-14)	-0.02 (-0.47 – 0.44)	.938		
Moderate (15-21)	0.41 (-0.27 – 1.09)	.233		
Severe (22-28)	-0.62 (-2.29 – 1.06)	.469		
HADS Depression				
Normal (0-7)	1			
Borderline (8-10)	-0.36 (-0.97 – 0.25)	.245		
Clinical (11-21)	-0.05 (-0.81 – 0.71)	.897		
HADS Anxiety				
Normal (0-7)	1			
Borderline (8-10)	0.26 (-0.25 – 0.78)	.316		
Clinical (11-21)	0.02 (-0.50 – 0.54)	.946		

The mean score for the recreational subscale of the PDAQ (i.e., attitudes towards non-medical use of prescription medications for recreational purposes) was 17.9, with a standard deviation of 8.8 and a range of 3 to 64. Univariate linear regression analysis was used to examine the relationship between the mean score on the recreational subscale and each of the various demographic and clinical factors (see Table 6).

The only factor that was significantly associated with a higher score on the recreational subscale was age, with those aged 22-24 years having higher scores than those aged 18-19 years ($\beta = 1.00$; $p = .001$). In contrast, tobacco use (Moderate Use, $\beta = -1.78$; $p = .039$), nicotine use (Moderate Use, $\beta = -3.07$; $p = .038$) and having a legal

prescription for ADHD medication (β = -2.39; *p* = .014) were all associated with lower scores on the recreational subscale.

When these four factors were included in a multivariate analysis, two factors accounted for .004% of the variance (Adjusted R^2 =.004, F(10,3149)=2.2, *p*=.016), with only age (adj β = .99; *p* = .015) and ADHD medication (adj β = -2.24; *p* = .022) remaining significant.

Table 6. Multiple Linear Regression of Factors Associated with Recreation Subscale Score

	Univariate Analysis Coefficient (95% CI)	***p***	**Multivariate Analysis Coefficient (95% CI)**	***p***
Gender				
Male	1			
Female	0.37 (-0.27 – 1.01)	.257		
Other	0.23 (-2.27 – 2.74)	.855		
Age				
18-19	1			
20-21	0.61 (-0.16 – 1.39)	.122	0.60 (-0.18 – 1.37)	.133
22-24	1.00 (0.20 – 1.81)	**.015**	0.99 (0.20 – 1.80)	**.015**
25-35	-0.02 (-0.83 – 0.79)	.961	0.01 (-0.80 – 0.82)	.983
Ethnicity				
White	1			
Non-white	-0.06 (-0.87 – 0.74)	.876		
Citizenship				
Domestic	1			
International	0.42 (-0.49 – 1.33)	.368		
Academic Status				
Undergraduate	1			
Graduate	0.65 (-1.41 – 0.11)	.092		
Full/Part-time				
Full-time	1			

	Univariate Analysis Coefficient (95% CI)	*p*	Multivariate Analysis Coefficient (95% CI)	*p*
Part-time	0.96 (-0.11 – 2.03)	.078		
Residence				
On-campus	1			
Off-campus	-0.13 (-0.96 – 0.70)	.756		
Average Grade				
0-69%	1			
70-79%	0.39 (-0.46 – 1.23)	.369		
80-89%	0.41 (-0.43 – 1.25)	.335		
90-100%	-0.08 (-1.33 – 1.17)	.899		
Faculty				
Health Professions	1			
Humanities & Social Sciences	-0.73 (-1.60 – 0.15)	.104		
Engineering & Applied Sciences	-0.83 (-1.91 – 0.24)	.129		
Science	-0.46 (-1.41 – 0.48)	.337		
Undeclared	-0.43 (-1.79 – 0.93)	.533		
Alcohol Use				
Do Not Use	1			
Light	-0.13 (-0.91 – 0.66)	.755		
Moderate	0.19 (-0.65 – 1.03)	.653		
Heavy	-0.36 (-2.30 – 1.59)	.719		
Tobacco Use				
Do Not Use	1		1	
Light	-0.21 (-1.08 – 0.67)	.646	-0.14 (-1.21 – 0.93)	.797
Moderate	-1.78 (-3.48 – (-0.09))	**.039**	-1.56 (-3.27 – 0.15)	.073
Heavy	-0.90 (-3.49 – 1.68)	.493	-0.55 (-3.16 – 2.06)	.681
Nicotine Use				
Do Not Use	1		1	
Light	-0.10 (-1.18 – 0.99)	.863	0.08 (-1.25 – 1.41)	.905
Moderate	-3.07 (-5.96 – (-0.17))	**.038**	-2.67 (-5.60 – 0.26)	.074
Heavy	-0.35 (-4.99 – 4.28)	.881	-0.14 (-4.79 – 4.52)	.955
ADHD Meds				
No Prescription	1		1	

	Univariate Analysis Coefficient (95% CI)	*p*	Multivariate Analysis Coefficient (95% CI)	*p*
Legal Prescription	-2.39 (-4.30 – (-0.48))	**.014**	-2.24 (-4.15 – (-0.32))	**.022**
PSQI				
Normal Sleep (0-4)	1			
Poor Sleep (5-20)	-0.33 (-1.10 – 0.45)	.411		
ESS				
None (0-10)	1			
Mild (11-12)	-0.69 (-1.70 – 0.32)	.180		
Moderate (13-15)	-0.29 (-1.42 – 0.84)	.612		
Severe (16-24)	-0.41 (-1.95 – 1.13)	.600		
ISI				
None (0-7)	1			
Mild (8-14)	-0.14 (-0.77 – 0.50)	.669		
Moderate (15-21)	0.51 (-0.43 – 1.46)	.287		
Severe (22-28)	0.37 (-1.97 – 2.71)	.758		
HADS Depression				
Normal (0-7)	1			
Borderline (8-10)	-0.14 (-0.99 – 0.72)	.755		
Clinical (11-21)	-0.15 (-1.21 – 0.91)	.778		
HADS Anxiety				
Normal (0-7)	1			
Borderline (8-10)	0.04 (-0.68 – 0.76)	.907		
Clinical (11-21)	-0.11 (-0.83 – 0.62)	.770		

3.5 Discussion

The main purpose of this study was to determine which demographic and clinical factors were associated with more positive attitudes towards the non-medical use of prescription medications. The overall mean total PDAQ score for MUN students in this sample was 47, (with scores ranging between 13-131). This was higher than the mean

total PDAQ score of 37.72 (range 19-95) reported by Bodenlos et al. (2014), which suggests that students in the current sample have, in general, more positive attitudes towards the non-medical use of prescription medications than the student participants at the northeastern US college in the original PDAQ study. This is striking because, according to a recent cross-sectional study involving 807 graduate students from across the US, students from northeastern colleges seem to be more likely to misuse prescription medications than those in other areas of North America (Verdi et al., 2016). An alternative explanation is that university students' attitudes towards the non-medical use of prescription medications are gradually becoming more liberal as such misuse has become more prevalent across North America over the last few years (McCabe et al., 2014; American College Health Association, 2013; 2016). This study provides important insight into the attitudes towards prescription medication misuse within an Atlantic Canadian university student population that had not previously been investigated.

Differences in Attitudes Toward Non-Medical Use of Prescription Medication

The results of the linear regression analyses indicate that there are differences in attitudes towards the non-medical use of prescription medications within the university population. Some of these differences fit in with previous research findings, and others fall outside of the current narrative. Unexpected findings from the current study may be partly due to the fact that this study was focused on investigating factors associated with attitudes towards prescription medication misuse, in contrast to the vast majority of previous studies in this area, which have tended to focus specifically on factors associated with prescription stimulant misuse.

The first main finding was that male students have significantly more positive attitudes towards prescription medication misuse than female students, something which was also noted by Bodenlos et al. (2014). This finding therefore makes sense in the context of previous studies that have noted males are more likely to engage in the non-medical use of prescription stimulants than females (McCabe et al., 2014; Schulenberg et al., 2017).

The second main finding is that non-White and international students appear to be significantly more likely to endorse positive attitudes towards prescription medication misuse than domestic or White students. This finding does not seem to fit with previous cross-sectional studies in university student populations, which, in general, have suggested that White students are more likely to misuse prescription medications than non-White students (Webb et al., 2013; McCabe et al., 2014; Verdi, Weyandt & Zavras, 2016). International students (particularly in Newfoundland) are more likely to be non-White than domestic students, so it is possible that ethnicity may be influencing the association between international status and positive attitude towards non-medical prescription drug use. International students often have to cope with cultural and language barriers that may result in increased academic stress, which is in turn associated with non-medical prescription stimulant use (Verdi et al., 2016, Norman & Ford, 2018). However, international students may also have less "perceived behavioural control" than domestic students (e.g., not knowing how/where to obtain prescription medication for non-medical purposes), or believe that the behaviour is socially unacceptable. Moreover, international students may not be subject to the same "subjective norms" (i.e., social

pressure to engage in a behaviour) to which domestic students might be vulnerable, as they are likely to have less knowledge about cultural norms in their host countries. A cross-sectional study of 3,589 university students in Belgium found that subjective norms were actually the greatest predictor of students' intention to misuse stimulant medication, above attitudes and perceived behavioural control (Ponnet et al., 2015). Taking all of the aforementioned potential factors into consideration may help to explain why international students appear to have more permissive attitudes to non-medical prescription drug use than domestic students, even though previous research suggests they do not engage in the same level of prescription medication misuse.

With regard to substances, alcohol use was more strongly associated with positive attitudes towards prescription medication misuse, compared to tobacco and nicotine vapour use. This result corroborates the findings of Bodenlos et al. (2014), who also noted an association between alcohol misuse and more positive attitudes towards prescription medication misuse. Moreover, it dovetails with previous studies (e.g., Brandt et al. 2014; Benson et al., 2015; Blevins, Stephens & Abrantes, 2017) indicating that those who actively misuse prescription stimulants, in particular, are more likely to engage in substance use in general, and polydrug use in particular (i.e., simultaneous use of prescription medication and other drugs, such as alcohol or marijuana). The results from this study also suggest that a higher level of alcohol use is associated with more positive attitudes than a lower level of use. This fits with one of the key findings from a meta-analysis conducted by Norman and Ford (2018), in which binge drinking was significantly associated with prescription stimulant misuse.

The association between attitudes towards prescription medication misuse and the legal use of stimulants prescribed for ADHD was not significant at the multivariate level, despite previous research indicating that an association does exist (Kinman, Armstrong & Hood, 2013). This may be because the number of participants who had a legal prescription for ADHD medication was not large enough to produce a significant effect, given the fairly large overall sample size. It is also possible that physicians who prescribe ADHD medications may be more aware of the potential for misuse and are therefore providing clearer warnings of the dangers of medication misuse to patients, such that those currently taking the medications are less likely to believe it is acceptable or safe to misuse them.

The lack of a significant association between positive attitudes towards prescription medication misuse and sleep-related factors might initially seem unexpected, given that improving sleep is a common reason cited by participants for misusing prescription medication (Drazdowski, 2016). However, the most commonly misused prescription medication are stimulants, which are rarely used as sleep aids (Drazdowski, 2016).

In terms of clinical factors, having a higher score on the HADS depression subscale was associated with more positive attitudes towards the non-medical use of prescription medications, which fits with previous findings (Teter et al., 2010; Bodenlos et al., 2014), who also found this association for depressive symptoms. Interestingly, two cross-sectional studies of university student populations by Dussault & Weyandt (2013) and Verdi et al. (2016) found an association between anxiety and prescription stimulant

misuse, but did not find a similar association for depression, which is the opposite of the current findings. This is striking, because both of these studies used the DASS-21, which, like the HADS, is a standardized measure for both anxiety and depressive symptoms. It is possible that the associations found using the DASS-21 and the HADS may be a function of the instruments used, and there may in fact be a relationship between both depressive and anxiety symptoms and (attitudes towards) prescription medication misuse. One possible way of verifying this would be to use separate, highly reliable and valid standardized measures for anxiety and depression (e.g. the Beck Depression Inventory and the Beck Anxiety Inventory), to reduce the possibility of confounding results due to using one measure for both constructs. It may also be the case that once students actually start engaging in prescription medication misuse (particularly for stimulants), they are more likely to experience anxiety than depressive symptoms (perhaps as a side effect of their misuse).

Attitudes Toward Misuse for Achievement-oriented vs. Recreational Purposes

This study found that none of the demographic or clinical factors were associated with the achievement-oriented subscale and only two factors were associated with the recreational subscale. These results were unexpected, because several factors were associated with the total PDAQ score. The lack of multicollinearity between factors suggests that there may be other, unidentified factors that could influence scores on the two subscales, however it is not clear what these could be, given that the main factors included in this analysis were based on literature indicating an association between such factors and prescription medication misuse. It is notable that there are some items on the

full scale that are not included in either of the two subscales. These "non-subscale" items in particular may contribute substantially to the validity of the overall PDAQ scale. Furthermore, the recreational subscale actually covers a number of different reasons for misuse, including losing weight, pain relief, improving athletic performance. If the recreational subscale was solely focused on misuse for the purpose of "partying" or "getting high", there might have been a clearer association between various demographic and clinical factors and higher scores on the recreational subscale. Overall, these findings suggest the two subscales may not be accurate or valid measures of attitudes towards misuse for achievement-oriented or recreational purposes, and additional research should confirm their utility.

These findings support those of Stone and Merlo (2012) and Bodenlos et al. (2014), and seem to confirm that having a positive attitude towards prescription medication misuse is indeed associated with actual misuse of such medication, as predicted by the Theory of Planned Behaviour (Ponnet et al., 2015; LaBelle, 2017). Furthermore, it suggests that those groups in the current study who endorsed more positive attitudes towards prescription medication misuse would make appropriate target audiences for any prevention or intervention programs aimed at addressing such misuse. Such groups include male, international student, non-White students, those who have depressive symptoms, and those who use tobacco, alcohol and nicotine vapours – particularly those whose level of alcohol use is fairly high.

Strengths and Limitations

This study has a number of strengths. First, the sample size represents around 20% of the MUN student population, meaning that this study provides an important insight into non-medical prescription stimulant use among university students in Atlantic Canada, specifically, that was previously lacking in the research literature. Second, the sample size is highly representative of MUN students, meaning that the results are generalizable to the university population as a whole (the exception to this is gender, as 27% of the sample were male, compared to 43% of the MUN student population (Memorial University of Newfoundland, 2017). Third, the survey was online and anonymous, meaning that there was less likelihood of respondents being influenced by social desirability bias (i.e., tailoring their answers to questions about sensitive issues such as substance use, in order to make them more socially acceptable). Another significant strength of the study was the use of standardized measures, which have previously been used on both clinical and community populations to assess anxiety/depressive symptoms and insomnia. This study also focused on attitudes towards prescription medication misuse, which is important in terms of identifying factors that could lead to potential misuse in the future. The integration of the Theory of Planned Behaviour into these findings will hopefully provide more nuanced understanding of which groups could be targeted with programs designed to prevent students from initiating prescription medication misuse.

This study also has some limitations, the first of which is its cross-sectional design, which does not allow for the determination of causality, only associations. The

second limitation relates to the use of the PDAQ. The recreational subscale covers a fairly broad range of uses, other than simply "getting high", which could account for the lack of difference between factors associated with the recreational vs. achievement-oriented subscale. It also makes it challenging to generalize the results to other studies and populations, for which a narrower definition of "recreational use" has been used.

Finally, this study only asked students about substances that were legal at the time the survey was active, and any future studies in this area that focus on Canadian universities should also ask about marijuana use, given that it is now available legally in Canada.

Conclusion

This study has demonstrated that there are differences in attitudes towards non-medical use of prescription drugs within the student population at MUN. The results of this study therefore have a highly practical application, as they will allow any prevention and intervention programs focusing on non-medical use of prescription medications that are developed by Canadian universities to be much more targeted in their approach. Such programs should focus in particular on males, international students, non-Whites, those who engage in alcohol, tobacco and nicotine use, and students with depressive or anxiety symptoms. Furthermore, in order to determine for definite whether there are differences between attitudes towards medication misuse for achievement-oriented vs. recreational purposes, it is necessary to expand on the findings of the current study by identifying students who currently misuse prescription medication for academic, recreational or both purposes and investigating whether the three groups differ on their scores for the two

PDAQ subscales. This may also help to determine whether there are any other factors that can explain more of the variance for attitudes towards prescription medication misuse, as well as ascertaining whether there are any potential interaction effects between already-identified and/or unknown factors.

Chapter 4:

Understanding Students' Attitudes and Beliefs Regarding the Effects of Non-Medical Prescription Stimulant & Caffeine Pill Use on Sleep

4.1 Abstract

INTRODUCTION: University students are known to use caffeine pills and prescription stimulants non-medically in order to stay awake, but it is not clear exactly why they are choosing to do this. Students do seem to be aware that such use can affect their sleep, and understanding how they weigh up the costs and benefits of non-medical prescription stimulant/caffeine pill use for this purpose may help to identify possible alternatives to such use.

METHODS: Ten university students were recruited from both the Sleep, Health, and Wellness Survey sample and the Psychology Research Experience Pool (PREP) system run by the Psychology department, in which students participate in studies for course credit. Semi-structured interviews were conducted, then transcribed, and the data were analyzed using directed content analysis.

RESULTS: Four participants reported using prescription stimulants non-medically to stay awake, and nine used caffeine pills for this purpose. The main themes that arose from the data were sleep disturbance, academic stress, costs/benefits of stimulant use, and alternatives to stimulant use.

CONCLUSION: All of the participants in this study reported that they used prescription stimulants and caffeine pills to stay awake in order to study later at night, or be more alert in morning classes. Healthier alternatives to stimulant use should be promoted to university students, along with programs that warn of the (long-term) negative effects of such stimulant use.

4.2 Introduction

Sleep disturbance is common among university students (Taylor et al., 2013; Lund et al., 2009, Forquer et al., 2008) and students frequently self-medicate to either promote sleep or cope with the effects of sleep disturbance (Taylor & Bramoweth, 2010). While substances like alcohol and sleeping medications are used to promote sleep, stimulants (such as soda and caffeine) are more likely to be used to increase alertness or stay awake (Taylor & Bramoweth, 2010). Much has been written about the non-medical use of prescription stimulants in order to enhance concentration and thus improve academic performance and the research to date suggests that students are primarily engaging in non-medical prescription stimulant use "to stay awake and alert, in order to complete course work and to study for exams" (Schulenberg, Johnston, O'Malley, Bachman, Miech & Patrick, 2017; page 372).

Moreover, students are more likely to engage in non-medical prescription stimulant use at certain times during the academic year, i.e., during midterms and final exams (DeSantis & Hane, 2010; Brandt et al., 2014). However, although some previous survey studies have included "staying awake" as a motive for prescription stimulant misuse, they have not always specified whether this refers to staying awake in order to study, or staying awake for some other purpose (Sharp & Rosén, 2007; Judson & Langdon, 2009). For example, students also sometimes engage in non-medical prescription stimulant use for recreational purposes, e.g., to get high and/or party for longer with their friends – although this appears to be much less common than using the drugs to improve concentration/study better (Sharp & Rosén, 2007; Judson & Langdon,

2009; Rabiner et al., 2009). There has been to date much less research on how and why students use stimulants to stay awake, and how they manage any negative effects of such use on their sleeping pattern.

In general, students seem to view the non-medical use of prescription stimulants as socially acceptable, rather than harmful. (Arria, Caldeira, O'Grady & Wish, 2008; DeSantis & Hane, 2010). For example, DeSantis and Hane (2010) noted that many students in their sample equated prescription stimulant misuse with taking caffeine pills, and did not view the former as being more harmful than the latter, in terms of negative potential consequences. Having said this, students do seem to be aware of the impact that non-medical use of prescription stimulant use can have on their sleep. For example, Parks et al. (2017) conducted eight focus groups involving a total of 61 university students and found that participants reported experiencing sleep-related effects, including extreme fatigue and insomnia, following misuse of prescription stimulants. Another qualitative study by Hildt, Lieb, Bagusat and Franke (2015), in which 18 students at a German university were interviewed, found that participants who used prescription stimulants non-medically reported experiencing sleeplessness, depression and lack of energy. Several participants also described engaging in "opposite consumption" of substances such as cannabis, alcohol, or benzodiazepines to help reduce the stimulant effect and calm down again. Moreover, participants were aware of the potential for addiction and took steps to minimize the possibility of becoming dependent on the substances they were using, e.g., introducing periods of abstinence, so they were not using the drug continuously, or only engaging in occasional use. The sleeplessness and

use of other substances to relax and calm down following stimulant use that was reported by students in Hildt et al.'s (2015) study is a good example of how stimulant users can become trapped in the "stimulation-sedation loop", in which stimulant use leads to sleep disturbance, which can result in the use of sedatives to aid sleep, which in turn can cause next-day drowsiness, necessitating the use of stimulants, and so on (Marhefka, 2011). This cycle can be difficult to escape and poor sleeping patterns that develop in adolescents and young adults have the potential to become chronic and persist into later life (Dregan & Armstrong, 2010).

The first study discussed in this thesis showed that 3.1% of university students in the overall survey sample had used prescription stimulants non-medically in order to stay awake. One of the aims of the current study is to determine why these students are trying to stay awake longer. Moreover, students appear to be aware that non-medical prescription stimulant use can affect sleep, which suggests that the perceived benefits are such that the level of risk is deemed acceptable. It therefore seems necessary to determine exactly how students feel they are benefitting from such use, in order to determine whether their perceived needs could be met in other, less harmful ways. The final aim of this study was to examine students' understanding of the relationship between their stimulant use and any reported sleep disturbance, as well as investigating how, if at all, they tried to mitigate any sleep-related side effects.

4.3 Method

Participants

Participants were all full or part-time students at Memorial University of Newfoundland (MUN) who had reported using caffeine pills or prescription stimulants non-medically to promote wakefulness.

Procedure

Participants were mainly recruited via the Sleep, Health & Wellness Survey, which was designed to investigate various different aspects of health and wellness among MUN students, including sleep disturbance, substance use and physical exercise. During the survey, participants were asked whether they engaged in non-medical prescription stimulant use in order to help them stay awake. Participants were also asked if they would be willing to be interviewed later about their stimulant use. If participants answered yes to both of these questions, they were eligible to participate and were invited to be interviewed (see Appendix C). Initially, the interviews were intended to focus on students who misused prescription stimulants, however, due to recruitment challenges, this was later extended to include participants who reported using caffeine pills to help them stay awake. Recruitment was also conducted using the Psychology Research Experience Pool (PREP) system, by which Psychology undergraduate students at MUN can gain course credits by participating in university research studies. Informed consent was required of all participants before starting the interviews and the procedure was approved by MUN's Interdisciplinary Committee on Ethics in Human Research (see Appendix D).

A semi-structured interview format was used to gather information regarding participants' reasons for using stimulants, the costs/benefits of stimulant use; and their perception of how stimulant use affects their sleeping patterns (see Appendix E). Each interview was audio recorded and then subsequently de-identified, transcribed and entered into the NVivo 12 software program for data analysis. Each participant was also assigned a pseudonym, in order to further ensure confidentiality, while also allowing the researcher to easily distinguish each of the de-identified transcripts.

Data Analysis

Directed content analysis was used to identify key themes in the interview data (Hsieh & Shannon, 2005). Prior to examining the interview data, the researcher used evidence from existing research to determine key concepts that could be used as coding categories. The analysis thus began with some a priori codes that were based on existing theories and research relating to stimulant use and sleep disturbance, and additional codes were added later as they emerged from the data. The prospective codes were verified with a collaborating researcher, to confirm that the emerging codes would fit in with the existing literature. A careful record was kept regarding which codes were a priori and which arose later in the process. This method was deemed the most appropriate because of a priori research questions, based on considerable evidence from previous research demonstrating a relationship between stimulant use and sleep disturbance (Hsieh & Shannon, 2005).

4.4 Results

Participant Characteristics

From the nineteen participants originally recruited, the final sample was ten. Two individuals were excluded from the analysis because they reported that their physician had prescribed them stimulants to treat ADHD, and the remaining seven individuals were excluded because, on arriving for the interview, it transpired that they did not in fact use either of the two categories of stimulants specified in the study requirements (prescription stimulants or caffeine pills). This was an unforeseen complication arising from recruitment through the PREP system and was undoubtedly due to the fact that the screening questions were less thorough than those used in the Sleep, Health & Wellness Survey.

Demographic characteristics of the sample are presented in Table 7. The sample was 50% female, 90% White and 70% were undergraduates. Only one participant was an international student. The average age was 25.2, with a standard deviation of 3.9.

Table 7. *Demographic Characteristics of Interview Participants*

	N	**(%)**
Age (M ± SD)	25.2 ± 3.9	
Gender		
Male	5	50
Female	5	50
Race		
White	9	90
Non-white	1	10
Canadian/International		

Canadian	9	90
International	1	10
Undergraduate/Graduate		
Undergraduate	7	70
Graduate	3	30
Types of Stimulants Used		
Caffeine Pills	9	90%
Prescription Stimulants	4	40%
Method of Ingestion		
Oral Only	8	80%
Oral and Nasal	2	20%
Source of Prescription Stimulants		
Gifted by Friend	2	20%
Purchased from Friend	2	20%
Purchased Online	1	10%

Four of the participants reported using prescription stimulants non-medically, and nine reported using caffeine pills, although one participant reported that, as well as caffeine pills, he also used nicotine, ephedrine, and a 'pre-workout' substance to promote wakefulness and boost energy levels. Pre-workout is a supplement consumed by recreational and professional athletes prior to exercise that is intended to boost energy levels and improve performance. Common ingredients include caffeine, creatine, and amino acids. There is evidence to suggest that pre-workout can in fact influence muscular endurance and subjective mood, if taken immediately prior to engaging in exercise, however, there is little to no evidence regarding the long-term effects of chronic consumption, as most studies that have examined the safety of pre-workout have been less than eight weeks in length (Harty et al., 2018). Although ephedrine is a stimulant that

does not require a prescription and is available in dietary supplement stores in Canada, its use is banned in the US due to health concerns (Palamar, 2011).

All four of the prescription stimulant misusers said they had obtained the pills from a friend whose doctor had prescribed them for ADHD. The two female prescription stimulant misusers said the pills had been gifted to them, whereas the two males had purchased them. In addition, the one participant who reported using armodafinil said that they purchased it from a website. The majority of the participants (80%) said that they only ingested pills orally, although two of the participants did also report ingesting prescription stimulants nasally.

Primary Qualitative Themes

The main themes identified during the qualitative analysis were the effects of stimulant use on sleep, academic stress (this was the main reason cited by students for engaging in stimulant use), availability of stimulants (e.g. whether they were purchased at a store, online, or gifted by a friend), method of ingestion (e.g. oral vs. nasal), benefits and costs of stimulant use and alternatives to stimulant use.

Sleep Disturbance

One of the main factors contributing to and impacted by stimulant use that participants mentioned was sleep disturbance. Some did acknowledge that taking stimulants at night in order to stay up later and study would affect their performance the next day:

> *"Essentially if I don't get enough sleep I'll take a caffeine pill. A caffeine pill in the morning usually wakes me right up during midterms or finals season, however I follow a much different sleep pattern than I or any other sane people normally would…I would pull all sorts of all-nighters, sometimes multiple nights in a row, using caffeine pills, Concerta if I can get my hands on it, depending on, you know, my sources and stuff."* – Simon, 20

Similarly, Matt described the vicious cycle of sleep disturbance that can occur as a result of chronic stimulant use:

> *"We wanted that caffeine to keep us up. Unfortunately, when you have so many other bad habits which influence your sleep, I don't think it matters much that you have caffeine, because if you have bad habits and only get 3 hours of sleep anyway… it's just kind of an infinite cycle of just getting into a state where you're always tired."* – Matt, 31

Another participant, Darren, added further comments in terms of the rapid effect of caffeine pills – as opposed to coffee, his usual stimulant of choice:

> *"I remember taking it and I was super, super tired, and it's almost like…one minute I was super tired and literally within seconds, I was wide awake."* – Darren, 29

When asked if they knew the reason for their sleepiness and low energy levels, four participants attributed it to insomnia, four reported that it was mainly due to academic workload or late-night socializing and two participants said they felt there was a mismatch between their class schedule and their ideal sleeping pattern.

Academic Stress

It quickly became apparent during the interviews that all of the participants increased their stimulant use at times of academic stress, such as exams, assignment

deadlines, and writing theses. For example, one participant described how her use of Adderall was directly linked to a heavy workload:

> *"I only took Adderall once, took two pills that were not prescribed to me. A friend gave them to me and I had some very big, long fourth-year papers to get through, so I sat down and had two in about a weekend timeframe."* – Kayla, 24

Another participant talked about using stimulants to write his thesis:

> *"I used that* [Armodafinil] *a lot for probably two or three months within the past year. Probably at least like ten separate occasions. Most, if not all of those occasions were to do research or write my thesis…I'm sure you know writing a thesis, you need to go through like a hundred or more references, so I find it really hard to focus on reading things, so I found it really helped me be able to actually focus on what I'm reading…"* – Stephen, 27

A couple of participants described how they and their friends collectively started taking caffeine pills to cope with their heavy workloads, highlighting the fact that stimulant use for study purposes is seen by many students as socially acceptable:

> *"My friends and I were all kind of in a similar boat of being very tired. We had some very intense course loads. I was just taking a general year, but from just coming straight out of high school it was a bit of a shock… My friends were doing first year engineering, which is notorious for being very difficult."* – Matt, 31

Availability of Stimulants

Of the four participants who had taken prescription stimulants non-medically, all of them had obtained it from a friend who had a legal prescription in order to treat ADHD. The two female participants had been given the pills by their friends and had only used them once or twice, whereas the two male participants had paid their friends for the pills and used them more regularly.

> *"I didn't ask, it* [Ritalin] *was offered. And yeah, they just said "we've both got it to do, why don't you just have one of these" sort of thing, and I just, and I took half of the prescription because I didn't want to take the whole dose."* – Brianna, 29

> *"Actually, I have a friend who gets a prescription…she usually sells most of it. So that's where I get some of that. And I guess it's the same for the Adderall."* – Stephen, 27

Participants who reported using caffeine pills all stated that they obtained them from their local drugstore. Rick (the participant who also reported using nicotine, ephedrine and pre-workout) stated that the nicotine was obtained from a local company that sells vape products, and the ephedrine and pre-workout were from his local supplement store. Stephen, who used Armodafinil, reported that he bought this online. He was the only participant who reported buying stimulants online, and acknowledged the risks involved in this, as well as the benefits:

> *"It's extremely convenient. And most of the things are really cheap too. And most of them are coming…well you have to have a bit of trust in everything, they have spec sheets saying what percentage the things are, so you pretty much have to trust that what they're saying is true."* – Stephen, 27

Method of Ingestion

When participants were asked about their method of ingestion, all of them reported taking pills (either caffeine or prescription medication) orally, although the two participants who reported the heaviest stimulant use (Simon and Stephen) said that they had also snorted prescription stimulants to achieve the desired effects.

Benefits of Stimulant Use

Participants reported several benefits of stimulant use, including improvements in alertness, concentration, mood and energy levels. Marie and Matt described the effect that caffeine pills had on their mood and alertness, respectively:

> *"Yeah, yeah it made me feel really good, like, even my mood I felt was, like, boosted, like I just felt really happy that day, very sociable and, like, you know, just felt like night and day from how I was, like, before (laughs)."* – Marie, 24

> *"I took a caffeine pill, naturally, because it was an English exam in the morning; I wanted to be awake and alert."* – Matt, 31

In addition, a couple of participants stated that ingesting pills had an advantage over other types of stimulants such as coffee or energy drinks, because they took less time to consume and the effects occurred more quickly:

> *"…it was just more, like, zero-to-sixty. Like, there's like that you flip the switch and I was all of a sudden awake. Whereas coffee, like, you're sitting there and you're drinking it, so (you) slowly feel the effects over time."* – Darren, 29

Costs of Stimulant Use

Several participants mentioned the financial cost of using stimulants. Most participants reported that caffeine pills were relatively affordable, although there were a couple of participants who stated that, due to their student status, they had very little money and so, for them, everything was expensive. Simon highlighted the difference in price between caffeine pills and prescription stimulants such as Concerta:

> *"A hundred pack of* [caffeine] *pills is eight dollars... so I can't see the financial aspect being a big deal – other than Concerta: that shit's expensive."* – Simon, 20

Stephen described how he obtains Ritalin/Concerta at a discounted price compared to the usual going rate for such substances:

> *"Three dollars for a 10mg pill. That's a good price, because otherwise they're a lot more expensive than that. It can go up to ten dollars for a 10mg pill…usually like a dollar per milligram. So 20mg pills would be $20 each, 10mg pills would be $10 each. I think there's five mg too maybe, five bucks each. So, I get deals from her because she's my friend."* – Stephen, 27

Other negative effects of stimulant use mentioned by participants included the physical effects, as described here by Marie, who took more than the recommended dose of caffeine pills on the one occasion she tried them:

> *"I was trying to go to bed that night and my heartbeat was going crazy, and I couldn't even close my eyes, I thought I was blinking a whole bunch because like, I don't know, it was really weird, and I couldn't concentrate on things either and then the next day I felt really, really, really low, I guess just because I was so hyped up and energized, the next day I just felt awful and my mood was horrible. I just felt so tired and bad."* – Marie, 24

A couple of participants also mentioned that using stimulants could either cause anxiety or make the anxiety worse. For example, Matt reported taking caffeine pills before an exam and then feeling both anxious and nauseous:

> *"It definitely builds anxiety. I remember one time I had an English exam in the morning, so I took a caffeine pill…But, I also had that kind of test anxiety because it was a final exam. Between the combination of the two, I almost threw up… I think if I hadn't of had the caffeine pill before that exam, I wouldn't have felt as bad as I did afterwards."* – Matt, 31

One participant also talked about the fact that using prescription stimulants non-medically was illegal and knowing this had prevented her from trying it again:

> *"I was interested in getting more, but I didn't like the fact that I wasn't actually prescribed them, so I think I just never tried them, used them again, because they*

weren't actually mine… I definitely would have tried them again if they were, like, over-the-counter kind of drugs." – Kayla, 25

Alternatives to Stimulant Use

In order to understand why participants chose to use stimulants to reduce their sleepiness or improve energy levels, participants were asked if they had ever tried any other methods apart from stimulant use. Four participants reported that they had used sedatives (including prescribed medication, melatonin and antihistamines), but all of them added that their sedative use was rare. Four participants said they had found exercise helpful, including Emily:

"Usually I'll work out, like, almost every day, just because it helps my depression and helps me fall asleep earlier, which helps me get a better sleep…." – Emily, 19

In spite of this, three of the four participants commented that they did not exercise as often as they would like, because it was too time-consuming, (particularly when compared to consuming stimulants). Three participants also reported using meditation as means of relaxing and falling asleep more easily. Even though all three stated that meditation was effective, as with exercise, two of them admitted that they no longer meditated regularly, because the time commitment was too great:

"I've tried meditation. I definitely found that helpful... But I think it was just, I wasn't making time any more, cuz I was stressed again, so I was like "I don't have time to meditate any more…" – Kayla, 25

As Marie mentions below, any new habits or routines designed to improve sleep often take a while to show any positive effects, whereas stimulants usually provide immediate and obvious results:

> *"I guess in the long-term it's probably more helpful, but short-term, stimulants are definitely more effective... Because I think altering my environment and having a regular sleep schedule will make me feel really good in the long-term, kind of thing, but I wouldn't notice it after, like, one night."* – Marie, 24

4.5 Discussion

While previous qualitative studies have focused more on the various reasons for students' stimulant use and their beliefs about how socially acceptable and/or harmful it is, this interview study is one of the first to specifically ask students about the relationship between their stimulant use and sleep disturbance, as well as the benefits and costs of stimulant use compared to other strategies for reducing sleepiness or boosting energy levels. The results indicate that students do, in fact, recognise the relationship between stimulant use and sleep disturbance, but the cost of alternative strategies is often perceived to be too high to make it worthwhile switching from stimulant use to other coping methods.

Previous research has suggested that overall the use of caffeine pills (10%) is twice as prevalent as the non-medical use of prescription stimulants (5%) among university students (Franke et al., 2011). This also held true for the participants in this study, with four out of the ten participants reporting prescription stimulant use, compared to nine participants who had used caffeine pills. Moreover, the two female participants who reported being given prescription stimulants for free by their friends also said they

had only used the pills once or twice, whereas the two male participants who used prescription stimulants on a regular basis had paid for their pills. This is consistent with previous research suggesting that those who pay for prescription stimulants are likely to have a higher level of dependence on substances (Vrecko, 2015). Furthermore, these two male participants also reported having snorted prescription stimulants, as well as taking them orally. Snorting substances is viewed as a riskier form of ingestion, because the effects of the drug may be enhanced and the risk of addiction is higher (McCabe & Teter, 2007). It is therefore not surprising that the participants who reported higher levels of stimulant use had also engaged in riskier methods of ingestion. Vrecko's (2015) study mentioned above also found that people who paid for drugs were viewed more negatively by their peers, as they were seen as having less control over their use. This could be incorporated into awareness campaigns on campuses, highlighting that paying for illegal substances could be a sign that a person is becoming dependent on them and may need to seek help in reducing their use.

Although participants were asked about their use of stimulants to reduce sleepiness and boost energy levels, all of them reported that their stimulant use was strongly associated with their levels of academic stress. This ties in with previous research suggesting that the primary motivation for students to use stimulants is neuroenhancement. Participants in the current study were using stimulants to stay awake, but mainly in the context of staying up late at night to study, or feeling more alert and awake for class the next morning. The fact that academic stress is the main cause of stimulant use suggests that students could benefit from universities promoting healthier

ways for students to cope with stress and providing more support for students during particularly stressful periods, such as during midterms and final exams. It may also be helpful for universities to emphasize that the misuse of prescription stimulants is not associated with better grades, and that there is in fact an association between non-medical use of prescription stimulants and lower GPAs (Clegg-Kraynok, McBean & Montgomery-Downs, 2011). Such information may help to dissuade students from engaging in such misuse, if they feel that it is not likely to improve their academic performance.

As well as academic workload being the main motivation for prescription stimulant misuse, it was also, according to the participants, one of the main causes of sleepiness and low energy levels, along with insomnia. Moreover, participants recognized that their stimulant use could itself affect their sleeping pattern, particularly if it became chronic. When asked how they coped with sleep disturbance, four out of the ten participants reported using some form of sedative to help them fall asleep more easily. This provides direct support for the stimulation-sedation loop cycle mentioned by Marhefka (2011), in which stimulant users start using sedatives to balance out the negative effects on sleep caused by the stimulant use. All four of these participants, however, mentioned that they were not convinced that the sedatives were always effective and tended to use them infrequently, which suggests that students might be interested in learning about other sleep promotion strategies (e.g., introducing a "buffer zone" of low-stimulation activities before bedtime in order to relax before trying to sleep).

It is important to recognize, however, that compared to stimulant use, most of the other strategies mentioned by the participants had some hidden cost that prevented them from becoming a viable alternative. For example, although four participants said they had found exercise helpful in improving their sleep, and three reported that meditation was helpful, most of these participants also said that exercise and meditation took up a lot of time and thus neither strategy was as efficient as stimulant use, even though they might be more beneficial in the long-term. Stimulant use provides such a fast and effective fix for sleepiness and low energy levels that it may be difficult to "sell" alternative strategies that may require a greater lifestyle change and commitment, as well as taking longer to produce the desired results.

Strengths & Limitations

A key strength of this study was that a significant proportion of the coding themes were grounded in the research literature relating to prescription stimulant misuse, thus reducing the potential for subjectivity on the part of the coders to influence the coding process. The inclusion of a second coder, to verify appropriate a priori codes derived from the literature is also a strength, and similarly serves to improve the objectivity of the analysis. One of the main limitations of this study is that the sample is not necessarily representative of stimulant users in the university population as a whole. For example, previous research has suggested that males are more likely to use stimulants than females (McCabe, West, Teter & Boyd, 2014; Benson et al., 2015), but there was an equal number of male and female participants in this sample. Having said this, it is clear from the data that the heaviest stimulant users in this sample were all male, with the female

participants reporting that they had only misused prescription stimulants on one or two occasions. It is also important to note that the mean age of the interviewees was higher than the mean age of the overall survey sample used for studies 1 and 2, from which the interviewees were selected. This means that the data gathered from the interviews may not necessarily be generalizable to the wider sample, and thus the university population as a whole.

The other main issue with this study is that only four out of the ten participants reported engaging in prescription stimulant misuse, and two of those four participants had only misused stimulants on one or two occasions. This recruitment challenge is in striking contrast to previous interview studies at other universities in North America, such as that carried out by DeSantis and Hane (2010), who recruited 175 prescription stimulant misusers from one US college with, as the authors themselves note, very little difficulty. The fact that recruitment was so difficult at this university is almost certainly linked to the relatively low prevalence rate of prescription stimulant misuse for the purpose of staying awake in this population, and suggests that such use is considerably less socially acceptable than at other universities in North America. It would be helpful for any future qualitative studies in this area, particularly those focused on populations in which a relatively low prevalence of prescription stimulant misuse has been reported, to carefully consider their recruitment strategies in advance, in order to have a better chance of recruiting greater numbers of regular, long-term non-medical users of prescription stimulants.

Conclusion

The main findings from this study suggest that university students' stimulant use appears to be primarily influenced by academic stress, which leads to them staying up later at night to study, which negatively impacts their sleep, and increases the perceived need for using stimulants to feel more alert and awake the following morning. In addition, the results indicate that students are aware of the impact of stimulant use on their sleep, but compared to alternative strategies, stimulant use is perceived as the fastest and most effective method for reducing sleepiness and boosting energy levels. Developing and administering sleep education and stress management programs on campus might help to reduce the burden of academic stress and promote healthier coping strategies that have a lower time burden, thus decreasing the use of stimulants such as caffeine pills and prescription stimulants. A sleep education program aimed at reducing alcohol use in 42 heavy-drinking students resulted in significantly reduced typical week drinking and improved subjective sleep quality (Fucito et al., 2017). This indicates that a similar program might also be an effective intervention for caffeine pill use and/or prescription stimulant misuse.

Chapter 5:

Final Discussion

5.1 Summary of Main Findings

This mixed-methods investigation focused on prescription stimulant misuse for the purpose of staying awake among students at Memorial University of Newfoundland (MUN) in Atlantic Canada. The first study in this investigation examined the prevalence and factors associated with prescription stimulant misuse in order to stay awake. The prevalence of prescription stimulant misuse to promote wakefulness in this sample was 3.1% (99 participants). Since this study only focused on misuse for one specific purpose, the prevalence found in this sample, is, not surprisingly, slightly lower than the national prevalence of such misuse for any purpose among university students across Canada (4.5% - ACHA, 2016). Factors that remained significant in the multivariate analysis were alcohol, tobacco and nicotine vapour use, poor sleep quality, moderate daytime sleepiness, and more positive attitudes towards prescription medication misuse.

The second study then examined what factors were associated with having a more positive attitude towards the misuse of prescription medication, with the following factors remaining significant at the multivariate level: non-White ethnicity, international student status, substance use (alcohol, tobacco, and nicotine vapours), depressive symptoms, and a clinical level of anxiety symptoms, In contrast, female gender, part-time study, and borderline level of anxiety symptoms were associated with less positive attitudes towards prescription medication misuse. With regard to the other main objective of the second study – determining whether different factors were associated with high scores on the academic vs. recreational subscales, no factors were significantly associated with the

achievement-oriented subscale and only two factors (age and ADHD medication) were significantly associated with the recreational subscale at the multivariate level.

Finally, the third study in this investigation involved interviews with ten participants who had engaged in non-medical prescription stimulant use, and/or used caffeine pills, for the purpose of staying awake. The main themes that arose from these interviews were that participants used these substances in order to stay awake later to study, and/or to feel more alert and awake for class the next morning. Participants were aware that stimulant use could negatively affect their sleep and took measures to address this, e.g. using sedatives to help them relax before trying to sleep. Those participants who had tried alternative methods of counteracting the effects of sleep disturbance (e.g., exercise or meditation), noted that such methods were not as fast or effective as stimulant use.

5.2 Challenges and Limitations

One of the main limitations of this study is that the gender representation in the sample did not reflect the university population as a whole, with 70% of the sample identifying as female, compared to only 57% of the MUN student population (Memorial University of Newfoundland, 2017). Having said this, the results of our survey studies are not dissimilar to those of other cross-sectional studies in this area that did have a more evenly balanced male:female ratio in their sample (Stone & Merlo, 2012, Arria et al., 2013). Furthermore, the challenge of recruiting male participants – for any type of study – is a long-standing issue in research that has been well-documented (Patel, Doku & Tennakoon, 2003). The survey sample was also not particularly ethnically diverse, with

only 11% of participants identifying as non-White. However, the actual student population is also not very ethnically diverse, so the sample is still fairly representative of the university as a whole. It is also important to note that some of the results in this study were unexpectedly different from other university student samples (e.g. international students and non-Whites were more likely to have positive attitudes towards prescription medication misuse, despite previous studies showing that these two groups are less likely to engage in prescription stimulant misuse). As mentioned in the third chapter, the more positive attitudes towards misuse could be because international students, who are also more likely to be non-White, are likely to experience greater academic stress, which is associated with prescription stimulant misuse (Norman & Ford, 2018). However, due to lack of access, opportunity or knowledge of subjective norms, international students may conversely also be less likely to actually engage in prescription medication misuse.

Another limitation is the use of self-reported data to measure the illicit use of prescription stimulants, as participants may have been reluctant to be honest about their use, due to fear of exposure. In order to offset this possibility, participants were informed that their data would remain anonymous. It is also important to note that the survey asked participants about the non-medical use of prescription stimulants specifically for the purpose of staying awake. It is therefore necessary to exercise caution when comparing the results of this study to previous studies that have asked about the illicit use of prescription stimulants for any purpose. The other main limitation regarding the quantitative aspect of the survey was that no data was gathered regarding the frequency of substance use. This would be an important area for future research, as there is evidence

to suggest that there is a positive relationship between the amount of stimulants consumed over time and the severity of the effects caused by such use (Reske et al., 2010). Furthermore, the lack of an objective measure of substance use (such as the College Alcohol Problems Scale, or CAPS-R, used by Bodenlos et al., 2014) may have resulted in participants under- or over-estimating their level of alcohol/tobacco/nicotine vapour use compared to their peers, as they were asked to rate their use for each of these substances as none/light/moderate/heavy. Future research in this area should ideally ask students to report the frequency of their substance use (e.g. daily/weekly/monthly/hardly ever etc.), and/or the amount of each substance they consume each time they use it. This would provide a more accurate picture of students' current level of substance use.

Because the quantitative section of this study was a survey and therefore cross-sectional in nature, it is impossible to determine cause and effect. Thus, while factors associated with stimulant use can be identified, it is not possible to state with any certainty whether such factors actually result in the non-medical use of prescription stimulants. For example, although poor sleep quality is one of the factors associated with prescription stimulant misuse in this study, it is still not clear whether sleep disturbance is one of the main factors that lead to stimulant use, or whether poor sleep is more often the result of such use, or if both variables affect each other equally.

Regarding the qualitative section of this study, it is difficult to extrapolate too much from the data, because qualitative research usually involves such small samples relative to the population size. However, in the case of this study, it should be noted that, although ten participants were interviewed, the actual number of participants who

reported engaging in non-medical prescription stimulant or caffeine pill use in the survey section was approximately 300, so the interviewees represented 3% of this total number. The interpretation of qualitative data is also vulnerable to subjectivity and the personal biases of the researcher who is coding it. Having said this, the use of directed content analysis in this study was intended to offset this subjectivity to a certain degree, by identifying some potential themes that might emerge from the data based on previous research in this area. Thus, there was less reliance on the coder's personal interpretation of the data.

5.3 Strengths

Many previous studies have focused on students at colleges in the US, while a few have focused on universities in Canada, but, prior to the current study, this particular population had not received the same attention. The first two survey-based studies in this investigation involved a large and broadly representative sample of 3,160 participants, totalling almost 20% of the entire university population. Moreover, this sample was highly representative in terms of faculty, with 65% of the sample represented by the four biggest faculties, which is very close to the statistics for the actual student population (65% of students in the top five faculties). The researchers made a conscious and deliberate effort to recruit from across the university, rather than simply recruiting students from the Psychology Department. The current investigation thus provides a broad picture of the university population as a whole, not just one faculty within the university.

Another main strength of this study was the inclusion of standardized measures (e.g., ISI, PSQI, HADS) to examine clinical factors such as insomnia, poor sleep quality and anxiety and depression. The data provides important information regarding the prevalence of non-medical prescription stimulant use for the purpose of staying awake in this population, as well as the factors associated with such use among MUN students. Understanding the scale of the problem and who is most likely to be affected by it is a vital first step towards determining how it can be addressed.

In addition, the second study used the Prescription Drug Attitudes Questionnaire to determine whether students' attitudes towards non-medical prescription stimulant use were associated with actual use of these stimulants. Only a handful of studies have looked at this before, and (aside from the original PDAQ study), none have used the PDAQ measure to do so. Finally, the third study incorporated a qualitative element, thus enriching and adding a deeper layer to the quantitative data. The semi-structured interviews provided insight into students' awareness of the effects of prescription stimulant misuse on their sleep, any strategies they used to mitigate these effects and how they weighed up the pros and cons of non-medical prescription stimulant use. The importance of sleep and the potential long-term negative impacts of chronic sleep disturbance means that this is a vital new area of research to be explored.

5.4 Implications and Directions for Future Research

Despite the fact that prescription stimulant misuse has been identified as an area of concern among adolescents and young adults across North America (particularly for those in post-secondary education), very few studies have as yet involved designing and

evaluating interventions to prevent or reduce prescription stimulant misuse in either university students or young adults in general. In the past decade or so, a few such programs have been proposed and implemented. This section will outline some previous research in this area whose findings are potentially relevant to the Atlantic Canadian population currently under investigation, as well as some suggestions for future programs that could be tailored to this particular population.

This investigation found that the prevalence of non-medical stimulant use to stay awake was 3.1%. Because the survey only asked about misuse for one particular purpose, it is very likely that there are students at MUN who misuse prescription stimulants for other purposes (e.g., getting high) and were therefore not identified by the survey. Having said this, all of the interviewees in the third study reported misusing stimulants in order to stay awake for academic purposes, and the number of students who misuse for purely recreational reasons seems to be a very small proportion of users (Rabiner et al., 2009), which suggests that the statistic of 3.1% is probably not far off from the total number of prescription stimulant misusers at MUN. It also indicates that it would probably be more worthwhile to focus any prevention efforts on those who misuse for academic reasons.

A literature review on prescription stimulant misuse in university students highlighted the fact that students with lower grades are more likely to engage in prescription stimulant misuse and proposed that effective interventions would focus on developing effective study habits and improving stress management skills (Weyandt et al., 2016). A more specific intervention was proposed by He and colleagues (2015), who noted that students who report experiencing some ADHD symptoms but do not have a

full ADHD diagnosis are more likely to engage in prescription stimulant misuse than those who do not report ADHD symptoms. Such students may potentially experience challenges with their executive functioning (i.e. planning, organizing), which is a key feature of ADHD and can seriously impact an individual's academic performance. He, Sense and Antshel (2015) therefore proposed using a cognitive-behavioural therapy program designed to address executive functioning issues as the basis for an academic preparatory skills intervention for students who report subclinical ADHD symptoms.

As several studies (including the first study of this investigation) have shown, positive attitudes towards prescription medication misuse are correlated with actual misuse of such drugs (Stone & Merlo, 2012; Bodenlos et al., 2014; Singh et al., 2014), so changing students' attitudes is likely to reduce the risk of prescription stimulant misuse. However, when designing interventions for students, it is important to consider the logistics and cost involved in administering such programs. He and colleagues (2015) recommended using cellphone app-based or social media-based interventions, due to such programs being brief, low-cost and easy to disseminate.

A web-based intervention aimed at reducing prescription medication misuse was administered as part of a randomized trial with a post-intervention survey to 391 students at the University of New Mexico (Arabyat, Borrego, Hamidovic, Sleath & Raisch, 2019). Prior to the intervention, 28.9% of participants reported at least one lifetime misuse of prescription medication (44% of whom had misused stimulants). Participants were randomly assigned to the intervention group (who were sent a link to the web-based intervention) or control group (who received a link to a website providing general health

information). Both the intervention and the subsequent survey were based on the reasoned-action approach, (which is itself derived from the Theory of Planned Behaviour). The data from the follow-up survey indicated that, while the intervention group had significantly more negative attitudes towards prescription medication misuse than the control group, the two groups did not differ on perceived norms or perceived behaviour control. Arabyat and colleagues noted that this study demonstrated web-based interventions need to be engaging and easy to navigate, as the average time spent on the website was less than four minutes. Although this study indicates that web-based interventions may have the potential to change student attitudes, the original email advertising the study was sent out to 4,000 students and only 391 (less than 10%) of them actually responded to the study. For maximum impact, intervention programs should ideally be reaching a greater proportion of the university population.

Another factor influencing prevalence of prescription stimulant misuse is access to the medication. All of the interviewees in the third study who reported misusing prescription stimulants said they had obtained pills from friends who had a legal prescription for ADHD medication. This finding supports that of several previous studies, which have noted that diversion of ADHD medication is worryingly common (e.g. Flory, Payne & Benson, 2014; Kinman, Armstrong & Hood, 2017). A prevention program aimed specifically at those who have such prescriptions, and/or the physicians who prescribe the drugs, could therefore have a significant impact in reducing the diversion and subsequent misuse of these drugs. Various strategies are available for physicians who are concerned about potential prescription stimulant misuse by patients who have ADHD.

A study involving a survey that was mailed out to 828 physicians in the US who prescribe stimulants for ADHD found that when physicians suspected patients were diverting or misusing their medication, 79.2% prescribed long-acting stimulants and 71.9% prescribed non-stimulant medication, but only 44.7% used pill counts and 40.7% limited prescriptions to a smaller number of pills. Moreover, 85.2% rarely or never used medication contracts and 81.0% rarely or never distributed print materials (Colaneri, Keim & Adesman, 2017). The authors of this study reported that participating physicians did not believe many of the prevention strategies available were actually effective. It therefore seems vital to design studies that investigate the effectiveness of such strategies, to determine whether they are indeed effective.

A recent study evaluated the effectiveness of a 1-hour educational workshop providing strategies to reduce stimulant diversion among patients with ADHD in six primary care provider practices in the US (Molina et al., 2019). The diversion rate was not significantly different at post-intervention (14.9%) compared to baseline (16.7%), however there were statistically significant decreases in three risk factors for diversion – number of times patients were approached to divert medication, intent to share/sell/trade stimulants and disclosure of stimulant use to others. Furthermore, providers and staff reported a high level of satisfaction with the program. While this program did not appear to reduce diversion rates over the course of the study, it does indicate that educating primary care staff may be beneficial in reducing diversion, although it may require lengthier or more in-depth interventions than a simple 1-hour workshop. Another strategy for addressing diversion has been proposed by researchers at the University of Syracuse

in the US, who have posited that diversion may be more likely to occur among students who do not take their medication every single day and therefore have extra medication available to give away or sell to fellow students (He et al., 2015). The researchers thus recommend that universities collect data on how often students take "drug holidays", so physicians who prescribe to such populations will have a better idea of approximately how much of each prescription is unused and thus potentially limit the number of pills in each prescription.

Another type of prevention program involves disseminating accurate information to students about the prevalence of prescription stimulant misuse and the potential negative consequences associated with it. This type of program could potentially involve peer intervention – using members of the student population to educate others, which has been shown to be successful in reducing the use of other substances such as alcohol (He et al., 2015). The rationale for this method is based on the Theory of Planned Behaviour mentioned above, which indicates that subjective norms (believing that a behaviour is socially acceptable) and attitudes are highly predictive of individuals engaging in a certain behaviour (Ponnet et al., 2015). If students are made aware that in fact only a small minority of students engage in prescription stimulant misuse, and that such misuse is actually associated with lower grades rather than improved academic performance, it might lead students to have less positive attitudes towards this behaviour.

With a couple of exceptions, the majority of participants in the qualitative study of this project seemed to use prescription stimulants for staying up later in order to study, whereas caffeine pills were more likely to be used to enhance alertness and wakefulness

in the mornings. Participants also indicated that they felt stimulant use was the most efficient and effective way of counteracting the effects of sleep disturbance, however, they also acknowledged that in the long-term, strategies such as exercise and meditation were probably healthier. Following on from this, implementing a campus-wide campaign focused on improving sleep hygiene, with an emphasis on effective and efficient methods of increasing sleep quality that require relatively little time commitment (e.g. a short relaxation exercise before bed, or maintaining a regular rise time) might reduce students' reliance on using stimulants such as caffeine pills as a way of managing the effects of sleep disturbance.

A behavioural sleep intervention designed to address alcohol-related problems was developed and administered to 42 heavy-drinking university students (Fucito et al., 2017). The rationale for addressing substance use via sleep is based on evidence indicating that, in general, students are more interested in improving their sleep than reducing their substance use. Participants were assigned to either an experimental group (which received a web-based intervention that included sleep hygiene, relaxation training, and cognitive strategies to address maladaptive sleep beliefs, as well as information about the impact of alcohol use on sleep) or a control group (which completed a web-based intervention focusing on general health issues, including basic advice about nutrition, exercise, sleep and substance use). The interventions each comprised four modules and were delivered over four weeks. Both groups had significantly reduced typical week drinking and improved subjective sleep quality, although interestingly there were no changes in objective sleep quality (as measured by actigraph). The fact that the control

group also showed significant improvements in sleep/alcohol use indicates that even basic advice about substance use and sleep can potentially have a beneficial effect in university students. Furthermore, such an intervention could easily be adapted to specifically address prescription stimulant misuse and the sleep issues associated with such use.

5.5 Conclusion

This study provides important data relating to the non-medical use of prescription stimulants for the purpose of staying awake within a university student population in Atlantic Canada. The factors associated with the non-medical use of prescription stimulants to promote wakefulness in this population were sleep quality and attitudes towards the off-label use of prescription medication. The factors associated with more liberal attitudes towards such use were being male, international, non-White, engaging in alcohol, tobacco and nicotine vapour use, having depressive symptoms and a clinical level of anxiety symptoms. When interviewed about their stimulant use, students indicated that such use was linked to their levels of academic stress. They appeared to recognize the effects of stimulant use on their sleep, with some reporting they used sedatives to help them fall asleep more easily. Some participants reported engaging in more healthy, long-term strategies to improve sleep quality, or boost energy levels (i.e. exercise, or meditation) but admitted that these strategies often took more time than they were willing to commit. Stimulants such as caffeine pills and prescription stimulants are perceived as an efficient, easily accessible method of improving alertness and energy levels, and the main reason students cite for engaging in such use is to study for longer.

In order to address this issue, it is necessary to invest in (and evaluate) strategies to reduce diversion of medication, decrease positive attitudes towards prescription stimulant misuse and promote less harmful (and more effective) ways for students to try and improve their academic performance.

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Appendix A. Informed Consent for Survey Participation

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Informed Consent Form

Title:	A Survey of Sleep, Health, and Wellness of Students at Memorial University of Newfoundland
Researchers:	Dr. Sheila Garland, PhD, R Psych Assistant Professor, Department of Psychology Memorial University of Newfoundland Phone: (709) 864-4897, Fax: (709) 864-2430 email: sheila.garland@mun.ca

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You are invited to take part in a research project entitled:

"A Survey of Sleep, Health, and Wellness of Students at Memorial University of Newfoundland"

This form is part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. It also describes your right to withdraw from the study. In order to decide whether you wish to participate in this research study, you should understand enough about its risks and benefits to be able

to make an informed decision. This is the informed consent process. Take time to read this carefully and to understand the information given to you. Please contact the researcher, Dr. Sheila Garland, if you have any questions about the study or would like more information before you consent.

It is entirely up to you to decide whether to take part in this research. If you choose not to take part in this research or if you decide to withdraw from the research once it has started, there will be no negative consequences for you, now or in the future.

1.0 Introduction:
My name is Dr. Sheila Garland and I am an Assistant Professor in the Department of Psychology at Memorial University of Newfoundland.

1.1 Purpose of study:
This is a TWO-PART study. The overall purpose of this study is to investigate the sleep, health, and wellness behaviours of students. In PART 1, we are interested in the prevalence of sleep problems among students as well as factors that might contribute to poor sleep. This study will help us learn about the relationships between sleep and psychological and physical health in university students. In PART 2. we are interested in learning more about student's use of caffeine, energy drinks or energy 'shots', and non-medical use of prescription stimulants, to help them focus and stay awake during the day. Data you provide will be combined with that of other students to help campus organizations like the student counselling centre develop prevention and/or intervention programs to help students sleep better, live healthier, and be well.

1.2 What you will do in this study:
There are two parts to this study. You are not required to participate in both studies. You can indicate below whether you would like to participate in Part 1, Part 2, or both studies.

2.0 PART 1

In Part 1 of the study, you will be asked to complete an online survey about your sleep habits, lifestyle, psychological well-being and physical health. Specifically, during this survey you will complete a demographic questionnaire with such questions as your age, height, weight, sex, gender, sexuality, living situation, relationship status, ethnic/racial heritage, academic status. We will also ask about your use of back-lit tech devices, alcohol and tobacco use, and use of substances to help you sleep or increase your energy.

There are also questions about your sleep quality, general health and physical activity, anxious and depressive symptoms, social support, stress, mindfulness, and optimism.

2.1 Length of time: Completion of the online survey will take approximately 45 minutes.

2.2 Compensation: Participants who consent to be contacted by email will be entered into a monthly draw to win an Avalon Mall gift card valued at $50.

2.3 Withdrawal from the study:
If at any time you wish to discontinue the survey, you can simply click the EXIT button, which will be present on each page. If you have provided consent to being contacted by email you will still be eligible to receive the gift card.

Complete withdrawal of participation, including all information provided, is possible up until April 18, 2017, after which time, the data will be anonymized and aggregated. If you do not contact the principal investigator before this date, your partial data will be used to the greatest extent possible.

To formally withdraw from this research study, you should contact the principal investigator of this research study at the email address listed on the first page of this form. At this point, you will need to provide the principal investigator with the email address you used to complete the survey.

2.4 Possible benefits:
Although you may not receive any immediate, direct benefits yourself, your participation will help us to understand the sleep, health, and wellness behaviours of students at MUN as a whole. This in turn may be used to help campus organizations to develop targeted prevention and/or intervention programs to help you and other students in the future.

This survey will explore areas of interest that are not well researched. This survey will help to evaluate the generalizability of existing findings, as well as to identify trends that are unique to MUN.

2.5 Possible risks:
This study does not deal with information of a very sensitive nature, but it is possible that some participants may be upset by these questions. In this study, you will be asked to reveal information about your sleep habits and quality, and personal information including mood, sexual orientation, gender/sex, and GPA. Should you feel distressed

from participating in this research, or if you are concerned about your sleep, health, or wellness, you are encouraged to contact the Counselling Centre by visiting UC-5000 or calling (709) 864-8874. This information will also be provided on the feedback form, available at the end of the survey.

If you feel uncomfortable providing this information, you can cancel your participation in this study with no consequence.

2.6 Confidentiality:
The ethical duty of confidentiality includes safeguarding participants' identities, personal information, and data from unauthorized access, use, or disclosure.

The data from this study will be presented on the Sleep, Health, and Wellness Lab's website, as well as published in scholarly journals; however, the data will be reported in aggregate form, so that it will not be possible to identify individual participants.

2.7 Anonymity:
Anonymity refers to protecting participants' identifying characteristics, such as name or description of physical appearance.

If you consent to giving your MUN email address to the researchers for the purpose of being contacted in the event of your prize draw win, your email address will be given a unique study ID. Study IDs will be secured in a password-protected file, on a password-protected computer, in a locked office on campus. The ID log for decoding study IDs into email addresses will be kept separate from the database.

Every reasonable effort will be made to ensure your anonymity. Any publication of data obtained from this study will be free of individually identifiable features.

2.8 Storage of Data:
Only the personnel involved in this study will have access to the data. The ID log will be kept on a separate password-protected computer from the participant data. For additional security, the data-file itself will also be password protected. The data will be retained for the required duration of 5 years and then securely disposed, as required by Memorial University's policy on Integrity in Scholarly Research.

The on-line survey company, Survey Monkey, hosting this survey is located in the United States. The US Patriot Act allows authorities to access the records of internet service providers. Therefore, anonymity and confidentiality cannot be guaranteed. If you choose

to participate in this survey, you understand that your responses to the survey questions will be stored and may be accessed in the US. The security and privacy policy for the web survey company can be found at the following link: https://www.surveymonkey.com/mp/policy/privacy-policy/.

3.0 PART 2

Participants who indicate in PART 1 of the study that they previously or currently use stimulants such as caffeine, energy drinks, or non-medical use of prescription stimulants (see note below) will be invited to participate in Part 2 of the study. If you do not use stimulants or do not wish to be interviewed, please skip to the Section 4.0. Participants will be interviewed individually about their attitudes, behaviors, and beliefs relating to stimulant use. These interviews will be conducted with a graduate student in the Doctor of Psychology program and will be audio recorded.

NOTE: Caffeine can come in beverages such a coffee, tea, or soft drinks or in foods. Energy drinks, or energy 'shots', typically include a combination of caffeine, B vitamins, amino acids, sugar, and herbal extracts. Some common brand names are Monster, RedBull, RockStar, or Amp. The types of prescription medications that are used for non-medical purposes include drugs such as Adderall (dextroamphetamine), Ritalin, Concerta or Biphentin (methylphenidate), or Dexedrine (dextroamphetamine),

3.1 Length of time: The duration of interview will take approximately 30-45 minutes.

3.2 Withdrawal from the study: If you wish to discontinue the interview, you can ask the interviewer to stop at any point.

Complete withdrawal of participation, including all information provided, is possible up until April 18, 2017, after which time, the data will be anonymized and aggregated. If you do not contact the principal investigator before this date, your partial data will be used to the greatest extent possible.

To formally withdraw from this research study, you should contact the principal investigator of this research study at the email address listed on the first page of this form. At this point, you will need to provide the principal investigator with the email address you used to complete the survey.

3.3 Possible benefits:
Although you may not receive any immediate, direct benefits yourself, your participation will help us to understand the reasons that students choose to use stimulants. This in turn may be used to help campus organizations to develop targeted prevention and/or intervention programs to help you and other students in the future.

3.4 Possible risks:
This study does not deal with information of a very sensitive nature, but it is possible that some participants may be upset by these questions. In this study, you will be asked about your use of stimulant medication. Should you feel distressed from participating in this research, or if you are concerned about your sleep, health, or wellness, you are encouraged to contact the Counselling Centre by visiting UC-5000 or calling (709) 864-8874. This information will also be provided on the feedback form, available at the end of the survey.

If you feel uncomfortable providing this information, you can cancel your participation in this study with no consequence.

3.5 Confidentiality:
The ethical duty of confidentiality includes safeguarding participants' identities, personal information, and data from unauthorized access, use, or disclosure.

The data from this study will be presented on the Sleep, Health, and Wellness Lab's website, as well as published in scholarly journals; however, the data will be reported in aggregate form, so that it will not be possible to identify individual participants.

3.6 Anonymity:
Anonymity refers to protecting participants' identifying characteristics, such as name or description of physical appearance.

The audio recordings from individuals who agree to be interviewed will be given a unique study ID. Study IDs will be secured in a password-protected file, on a password-protected computer, in a locked office on campus. The ID log for decoding study IDs into email addresses will be kept separate from the database.

Every reasonable effort will be made to ensure your anonymity. Any publication of data obtained from this study will be free of individually identifiable features.

3.7 Recording of Data:

The interviews will be audio recorded using a hand-held device. The files will be transferred to a password protected file in a password protected computer in a locked office immediately after the interview. The interviews will be transcribed, after which the audio files will be securely erased. The transcripts will be de-identified of any potentially identifiable information.

3.8 Storage of Data:
Only the personnel involved in this study will have access to the data. The ID log will be kept on a separate password-protected computer from the participant data. For additional security, the data-file itself will also be password protected. The data will be retained for the required duration of 5 years and then securely disposed, as required by Memorial University's policy on Integrity in Scholarly Research.

4.0 Reporting of Results:
Reports on the findings of this survey will be published in scholarly journals, which participants can be directed to also from the lab's website. The data collected in this study will also be presented at various scientific conferences. Only aggregate data will be reported.

4.1 Sharing of Results with Participants:
Results of the survey will be made available on the Sleep, Health, and Wellness Lab's website at www.drsheilagarland.com

4.2 Questions:
You are welcome to ask questions at any time before, during, or after your participation in this research. If you would like more information about this study, please contact Dr. Sheila Garland at (709) 864-4897 or sheila.garland@mun.ca.

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research, such as the way you have been treated or your rights as a participant, you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at 709-864-2861.

4.3 Consent:
By completing this survey you agree that:

- You have read the information about the research.

- You have been advised that you may ask questions about this study and receive answers prior to continuing.
- You are satisfied that any questions you had have been addressed.
- You understand what the study is about and what you will be doing.
- You understand that you are free to withdraw participation from the study by closing your browser window or navigating away from this page, without having to give a reason and that doing so will not affect you now or in the future.
- You understand that if you choose to withdraw, you may request that your data be removed from the study by contacting the researcher before April 18, 2017.
- You are 19 years or older.

By consenting to this online survey, you do not give up your legal rights and do not release the researchers from their professional responsibilities.

PART 1

I agree to participate in the survey study ☐ Yes ☐ No

I agree to enter my email address into a draw to win a $50 Avalon Mall gift card ☐ Yes ☐ No

My email address is

_____

PART 2

I agree to be contacted and interviewed about my stimulant use ☐ Yes ☐ No

I agree to be audio-recorded ☐ Yes ☐ No

My email address is

_____

Please print a copy of this consent information for your records.

Selecting "I AGREE" below and submitting this survey constitutes consent and implies your agreement to the above statements.

Appendix B. Survey Debriefing Form

Faculty of Science

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A Survey of Sleep, Health, and Wellness of Students at Memorial University of Newfoundland

Researcher: Dr. Sheila Garland, Assistant Professor, Department of Psychology, Memorial University of Newfoundland, Phone: (709) 864-4897, Fax: (709) 864-2430, e-mail: sheila.garland@mun.ca

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Thank you for participating in this study! Your participation and the data that you contribute are valuable for our research. This feedback sheet is intended to explain to you the purpose and hypotheses of the study in which you have just participated.

The purpose of this study was to gather information on the sleep, health, and wellness behaviours of MUN students. We want:

1) to determine the prevalence of disordered or inadequate sleep;
2) to identify behaviours that contribute to poor sleep among MUN students and;
3) to discover possible correlations between disordered or inadequate sleep and behavioural and psychological outcomes.
4) to investigate students' attitudes and beliefs towards stimulant use and its impact on their health and wellbeing

This will shed light on areas for further research at MUN, as well as inform the creation of targeted prevention and/or intervention programs on campus to improve sleep, health, and/or wellness behaviours.

You were asked demographic questions about your age, height, weight, sex, gender, sexuality, living situation, relationship status, ethnic/racial heritage, academic status, use of back-lit tech devices, general alcohol and tobacco use, and use of substances to help you sleep or increase your energy. You also completed 10 measures including: the

Morningness-Eveningness Questionnaire (MEQ), a measure of chronotype, or circadian preference (Are you a "morning person" or a "night-owl"?); the Pittsburgh Sleep Quality Index, a measure of sleep quality; the Insomnia Severity Index, which gives information regarding the severity of insomnia symptoms; the SF-12, a measure of mental and physical health; the Hospital Anxiety and Depression Scale (HADS), a measure with subscales of anxious and depressive symptom severity; the Duke-UNC Functional Social Support Questionnaire (FSSQ), a measure of social support; the Perceived Stress Scale (PSS), a measure of perceived stress levels; the Mindful Attention Awareness Scale (MAAS), a measure of mindfulness; the Revised Life Orientation Test (LOT-R), a scale of optimism; and the International Physical Activity Questionnaire (IPAQ), a measure of physical activity within work and recreational domains.

We want to know if and how your demographic information is related to the information you provided on the above measures. We expect that poor sleep quality will be related to negative behavioural and psychological consequences. Research has shown that this is the case, so we expect to see similar results. Very few previous studies have combined as many measures, which provide such a wide range of information. This survey is the first of its kind in Atlantic Canada, and we hope that the results of this study will provide new information unique to Newfoundland.

We cannot interpret and discuss each participant's results with him/her, so it is not possible for us to share your particular test results with you. However, we will post a summary of the results of this study on the lab website at www.mun.ca/sleephealthwellness in April 2017. In addition, the results will be reported in scholarly journals, which students can also be directed to through the lab website.

We appreciate your participation in this study and hope that this has been an interesting experience. If you have any additional questions about this research, or wish to request that we do not use your survey data, please contact Dr. Sheila Garland at (709) 864-4897 or sheila.garland@mun.ca, or Lily Repa at lmrepa@mun.ca.

If participation in this study has made you feel upset or uncomfortable, or if you are concerned about your sleep, health, or wellness, we encourage you to contact the University Counselling Centre by visiting UC-5000 or calling (709) 864-8874.

If you have any ethical concerns about your participation in this study (such as the way you have been treated or your rights as a participant), you may contact the Chairperson of the ICEHR at icehr@mun.ca or at (709) 864-2861.

Once again, thank you for your participation in this study.

If you would like to learn more about research in this area, please see the following articles:

Lund, H.G., Reider, B.D, Whiting, A.B., Prichard, J.R. (2010). Sleep patterns and predictors of disturbed sleep in a large population of college students. *Journal of Adolescent Health, 46*(2), 124-132. doi:10.1016/j.jadohealth.2009.06.016

Orzech, K.M., Salafsy, D.B., Hamilton, L.A. (2011). The state of sleep among college students at a large public university. *Journal of American College Health, 59*(7), 612-619. doi:10.1080/07448481.2010.520051

Strine, T. W., & Chapman, D. P. (2005). Associations of frequent sleep insufficiency with health-related quality of life and health behaviors. Sleep Medicine, 6, 23-27. doi: 10.1016/j.sleep.2004.06.003

Appendix C: Recruitment Email for Potential Interview Participants

Dear [Participant],

Thank you for participating in the Sleep, Health, & Wellness survey. Your time and responses are incredibly valuable.

In that survey, you indicated that you were interested in being interviewed about your use of stimulants. We want to learn more about how students use stimulants (such as caffeine, energy drinks and the non-medical use of prescription stimulants) to help them stay awake and focus during the day. The interview will last 30-45 minutes and will take place in the Psychology Department at Memorial University.

Please read the attached informed consent form for more details and let me know if you have additional questions. Please do not sign the consent form until you come in for the interview. Once you decide that you are willing to be interviewed, we can arrange a convenient time.

Kind regards,

Ellie King
(Principal Researcher)

Appendix C. Informed Consent for Interview Participation

Faculty of Science
Sheila N. Garland, PhD
Department of Psychology
Science Building: SN2065
232 Elizabeth Avenue
St. John's, NL Canada A1B 3X9
Tel: 709 864 4897 | Fax: 709 864 2430
sheila.garland@mun.ca
www.mun.ca/psychology

Informed Consent Form

Title: *"A Investigation of Attitudes Towards Stimulant Use Among Students at Memorial University of Newfoundland"*

Researchers: Dr. Sheila Garland, PhD, R Psych
Assistant Professor, Department of Psychology
Memorial University of Newfoundland
Phone: (709) 864-4897, Fax: (709) 864-2430
email: sheila.garland@mun.ca

You are invited to take part in a research project entitled:

"A Investigation of Attitudes Towards Stimulant Use Among Students at Memorial University of Newfoundland"

This form is part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. It also describes your

right to withdraw from the study. In order to decide whether you wish to participate in this research study, you should understand enough about its risks and benefits to be able to make an informed decision. This is the informed consent process. Take time to read this carefully and to understand the information given to you. Please contact the researcher, Dr. Sheila Garland, if you have any questions about the study or would like more information before you consent.

It is entirely up to you to decide whether to take part in this research. If you choose not to take part in this research or if you decide to withdraw from the research once it has started, there will be no negative consequences for you, now or in the future.

1.0 Introduction:
My name is Dr. Sheila Garland and I am an Assistant Professor in the Department of Psychology at Memorial University of Newfoundland. The person conducting the interviews for this project will be Ellie King, who is a doctoral student in the Clinical Psychology program at Memorial University of Newfoundland.

1.1 Purpose of study:
We are interested in learning more about student's use of caffeine, energy drinks or energy 'shots', and non-medical use of prescription stimulants, to help them focus and stay awake during the day. Data you provide will be combined with that of other students to help campus organizations like the student counseling centre develop prevention and/or intervention programs to help students sleep better, live healthier, and be well.

NOTE: Caffeine can come in beverages such a coffee, tea, or soft drinks or in foods. Energy drinks, or energy 'shots', typically include a combination of caffeine, B vitamins, amino acids, sugar, and herbal extracts. Some common brand names are Monster, RedBull, RockStar, or Amp. The types of prescription medications that are used for non-medical purposes include drugs such as Adderall (dextroamphetamine), Ritalin, Concerta or Biphentin (methylphenidate), or Dexedrine (dextroamphetamine).

1.2 What you will do in this study:
Participants will be interviewed individually about their attitudes, behaviors, and beliefs relating to stimulant use. These interviews will be conducted with a graduate student in the Doctor of Psychology program and will be audio recorded.

1.3 Length of time: The duration of interview will take approximately 30-45 minutes.

1.4 Withdrawal from the study: If you wish to discontinue the interview, you can ask the interviewer to stop at any point. Complete withdrawal of participation, including all information provided, is possible up until April 18, 2017, after which time, the data will be analyzed and prepared for publication. If you do not contact the principal investigator before this date, you will no longer be able to withdraw your data.

To formally withdraw from this research study, you should contact the principal investigator of this research study at the email address listed on the first page of this form.

1.5 Possible benefits:

Although you may not receive any immediate, direct benefits yourself, your participation will help us to understand the reasons that students choose to use stimulants. This in turn may be used to help campus organizations to develop targeted prevention and/or intervention programs to help you and other students in the future.

1.6 Possible risks:

This study does not deal with information of a very sensitive nature, but it is possible that some participants may be upset by the interview questions. In this study, you will be asked about your use of stimulants, including prescription medication. Should you feel distressed from participating in this research, or if you are concerned about your sleep, health, or wellness, you are encouraged to contact the Counselling Centre by visiting UC-5000 or calling (709) 864-8874. This information will also be provided on the debriefing form that will be provided to you once you have been interviewed.

If you feel uncomfortable providing this information, you can cancel your participation in this study with no consequence.

1.7 Confidentiality:

The ethical duty of confidentiality includes safeguarding participants' identities, personal information, and data from unauthorized access, use, or disclosure.

The data from this study will be presented on the Sleep, Health, and Wellness Lab's website, as well as published in scholarly journals; however, the data will be anonymized, so that it will not be possible to identify individual participants.

1.8 Anonymity:

Anonymity refers to protecting participants' identifying characteristics, such as name or description of physical appearance.

The audio recordings from individuals who agree to be interviewed will be given a unique study ID. Study IDs will be secured in a password-protected file, on a password-protected computer, in a locked office on campus. The ID log for decoding study IDs into email addresses will be kept separate from the database.

Every reasonable effort will be made to ensure your anonymity. Any publication of data obtained from this study will be free of individually identifiable features.

1.9 Recording of Data:
The interviews will be audio recorded using a hand-held device. The files will be transferred to a password protected file in a password protected computer in a locked office immediately after the interview. The interviews will be transcribed, after which the audio files will be securely erased. The transcripts will be de-identified of any potentially identifiable information.

1.10 Storage of Data:
Only the personnel involved in this study will have access to the data. The ID log will be kept on a separate password-protected computer from the participant data. For additional security, the data-file itself will also be password protected. The data will be retained for the required duration of 5 years, as required by Memorial University's policy on Integrity in Scholarly Research.

2.0 Reporting of Results:
Reports on the findings of this survey will be published in scholarly journals, which participants can be directed to also from the lab's website. The data collected in this study will also be presented at various scientific conferences. Only anonymized data will be reported. A doctoral students (Ellie King) will also be involved in the collection, analysis and reporting of data from this study, under the supervision of Dr Sheila Garland.

2.1 Sharing of Results with Participants:
Results of the survey will be made available on the Sleep, Health, and Wellness Lab's website at www.drsheilagarland.com

2.2 Questions:
You are welcome to ask questions at any time before, during, or after your participation in this research. If you would like more information about this study, please contact Dr. Sheila Garland at (709) 864-4897 or sheila.garland@mun.ca, or contact Ellie King at (709) 986-8377, or erk206@mun.ca.

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research, such as the way you have been treated or your rights as a participant, you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at 709-864-2861.

2.3 Consent:

Your signature on this form means that:

- You have read the information about the research.
- You have been able to ask questions about this study.
- You are satisfied with the answers to all your questions.
- You understand what the study is about and what you will be doing.
- You understand that you are free to withdraw participation in the study without having to give a reason, and that doing so will not affect you now or in the future.
- You understand that if you choose to end participation during data collection, any data collected from you up to that point will be destroyed.
- You understand that if you choose to withdraw after data collection has ended, your data can be removed from the study up to April 18th 2017.

I agree to be audio-recorded	☐ Yes	☐ No
I agree to the use of direct quotations	☐ Yes	☐ No

By signing this form, you do not give up your legal rights and do not release the researchers from their professional responsibilities.

Your signature confirms:

☐ I have read what this study is about and understood the risks and benefits. I have had adequate time to think about this and had the opportunity to ask questions and my questions have been answered.

☐ I agree to participate in the research project understanding the risks and contributions of my participation, that my participation is voluntary, and that I may end my participation.

☐ A copy of this Informed Consent Form has been given to me for my records.

Signature of participant	Date

Researcher's Signature:

I have explained this study to the best of my ability. I invited questions and gave answers. I believe that the participant fully understands what is involved in being in the study, any potential risks of the study and that he or she has freely chosen to be in the study.

Signature of Principal Investigator	Date

Appendix D. Semi-structured Interview Questions

1) In the survey, you noted that you use the following stimulants: X, Y & Z. What, if any, other stimulants do you use, which were not mentioned in the survey?
2) What prompted you to first start taking stimulants?
3) What factors influence your current stimulant use?
4) How does your current pattern of stimulant compare to when you first started using them? (E.g. amount/frequency).
5) The survey questions asked about the use of stimulants to counteract sleepiness and improve energy levels. What do you feel causes your own sleepiness/lack of energy?
6) How does stimulant use affect your sleeping patterns?
7) Apart from improving energy levels and reducing sleepiness, what (if any) other benefits do you receive from taking stimulants?
8) What (if any) negative effects have you experienced as a result of stimulant use?
9) Have you tried any other methods to reduce the effects of sleep disturbance, apart from stimulant use?
    9a) If so, how do those methods compare to stimulant use, in terms of costs/benefits?
10) How do you think your own stimulant use compares to the rest of the student population?

Appendix E. Interview Debriefing Form

Sleep, Health, & Wellness Lab

Debriefing Sheet for Interview on Stimulant Use

Thank you for participating in the study! Your participation and the data that you contribute are valuable for our research. This feedback sheet is intended to explain to you the purpose and hypotheses of the study in which you have just participated.

This was a mixed-methods study involving a survey to collect quantitative data regarding demographics and the general levels of sleep disturbance and stimulant use in the student population of Memorial University of Newfoundland. Students who reported using stimulants in their survey responses were then invited to participate in semi-structured interviews, in order to better understand the predisposing, precipitating, and perpetuating factors that influence their stimulant use and also their own attitudes and beliefs regarding the use of stimulants.

The specific objectives of this project were:

- To determine the overall prevalence of stimulant use in university students and the prevalence of stimulant use in good and poor sleepers.
- To understand student beliefs and attitudes towards stimulants as a means of increasing energy or combatting daytime sleepiness resulting from sleep disturbance and the impact of stimulant use on functioning.

The data gathered from this study will be used to provide a better understanding of how students at Memorial engage in stimulant use and why they choose to do so, as well as potentially informing the future creation of prevention and/or intervention programs aimed at making students aware of the potential negative effects of stimulant use.

We appreciate your participation in this experiment and hope that this has been an interesting experience. If you have any additional questions about this research or other research conducted in this lab, please ask the Primary Investigator (Ellie King, sleeplab@mun.ca, 709-864-8035).

If you have any ethical concerns about your participation in this study (such as the way you have been treated or your rights as a participant), you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at 709-864-2861.

Once again, thank you for your participation in this experiment.

If you would like to learn more about stimulant use among student populations, please see the following articles:

Clegg-Kraynok, M. M., McBean, A. L., & Montgomery-Downs, H. E. (2011). Sleep quality and characteristics of college students who use prescription psychostimulants nonmedically. Sleep Medicine, 12(6), 598-602. doi:10.1016/j.sleep.2011.01.012 [doi]

Malinauskas, B. M., Aeby, V. G., Overton, R. F., Carpenter-Aeby, T., & Barber-Heidal, K. (2007). A survey of energy drink consumption patterns among college students. Nutrition Journal, 6, 35. doi:1475-2891-6-35 [pii]

McCabe, S. E., & Teter, C. J. (2007). Drug use related problems among nonmedical users of prescription stimulants: A web-based survey of college students from a midwestern university. Drug and Alcohol Dependence, 91(1), 69-76. doi:S0376-8716(07)00212-8 [pii]