Is Non-Medical Use of Prescription Sedatives and Sleeping Pills Associated with Symptoms of Depression, Anxiety, and Stress in Undergraduate University Students

by

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THESIS EXAMINATION INFORMATION

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Thesis title: Is Non-Medical Use of Prescription Sedatives and Sleeping Pills Associated with Symptoms of Depression, Anxiety, and Stress in Undergraduate University Students

An oral defense of this thesis took place July 17th, 2019 in front of the following examining committee:

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The above committee determined that the thesis is acceptable in form and content and that a satisfactory knowledge of the field covered by the thesis was demonstrated by the candidate during an oral examination. A signed copy of the Certificate of Approval is available from the School of Graduate and Postdoctoral Studies.

ABSTRACT

Introduction: Mental health is a public health concern on university campuses. However, little is understood about the etiology of mental health in this population.

Purposes: To measure the association between the non-medical use of sedative and sleeping pills in the past three months and moderate-extremely severe symptoms of depression, anxiety, and stress in the past week, in undergraduate students at the University of Ontario Institutes of Technology (UOIT).

Methods: Cross-sectional study of undergraduate students enrolled in the faculty of health sciences and faculty of education at UOIT in the Fall semester of 2017.

Findings: Few students reported lifetime (7.8%) and past three month (3.7%) non-medical sedative and sleeping pill use. More students reported moderate-extremely severe symptoms of depression (30.3%), anxiety (47.3%), and stress (25.5%). I found no association between non-medical sedative and sleeping pill use and moderate-extremely severe symptoms of anxiety, stress, and depression.

Discussion: Despite no association between non-medical sedative and sleeping pills use and symptoms of anxiety, stress, and depression, students must be educated about the potential negative health impacts of non-medical sedative and sleeping pill use.

Keywords: cross-sectional; non-medical; sedative use; mental health; university students

AUTHOR'S DECLARATION

I hereby declare that this thesis consists of original work of which I have authored. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Andrew Reynolds

STATEMENT OF CONTRIBUTIONS

I completed the literature search included in Chapter 1. This included conducting the searches on databases, downloading citations and articles, reading articles, and deciding which ones were included in the summary of previous research

The work described in Chapter 2 was completed by the University Student Mental Health Research Team, of which I was one of two leading authors. I helped to administer the pilot, as well as helped with coding the data and computing early statistics. This chapter has been submitted for publication. I contributed significantly to the writing of the manuscript that is currently under review in a peer-reviewed journal.

I led the research described in Chapter 3. This research was conducted in collaboration with the UOIT Mental Health and Wellness Study team. I played a significant role in the development of the study questionnaire, data collection, coding of data and data analysis.

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CHAPTER 1: BACKGROUND

BACKGROUND

1.1 MENTAL HEALTH

1.1.1 Mental Health in Young Canadian Adults

Recent surveys of Canadians suggest that 10% of the population meets the criteria for a mental health or substance use disorder in the past year[1]. Although mental health impacts all Canadians, the risk may be higher for youth between the ages of 15 to 24 years[1]. This is significant because poor mental health is associated with suicide, which is one of the leading causes of death in adults under the age of 35 years[2]. Certainly, in my own experience as a mental health worker, I have received a steady stream of referrals for people under 24 years old. Typical complaints range from issues with relationships, anxiety, and stress, to self-harm, suicide attempts, and substance use. Individuals between the ages of 15 to 24 years may be more vulnerable to developing mental health problems because of the critical developmental periods and key life changes occurring during this time, and transitions from adolescent to adult services[3]. One key life change that may play a role in mental health is the transition to post-secondary school education. This may be because students away to school for the first time may become disconnected from their support networks and have difficulty adapting to a new environment and navigating difficult social and academic challenges.

1.1.2 Prevalence of Depression, Anxiety, and Stress in University Students

Symptoms of depression, anxiety, and stress are common in undergraduate university students. According to the 2016 National College Health Assessment, in the past 12 months 64.45% of Canadian university students reported experiencing "overwhelming anxiety"; 44.4% reported feeling "so depressed it was difficult to function"; and 42.2% reported stress had an impacted their academic performance[4]. This represents an increase from 2013, where in the past year 56.5% of students in Canada reported "overwhelming anxiety"; 37.5% reported feeling "so depressed it was difficult to function"; and 38.6% reported stress had an impacted their academic performance[5]. These statistics, although striking, do not provide measures of diagnosis; rather, they refer to the prevalence of self-reported mental health symptoms. Studies conducted using psychometrically sound scales to measure depression and anxiety suggest that between 8% and 21% of university

students report anxiety in the last 4 weeks[6,7], and that between 13% and 17.9% report depression in the last 2 weeks[6,7]. Another cross-sectional study found that 14% of university students reported a lifetime diagnosis of depression and 13% with a lifetime diagnosis of anxiety[8].

Mental health problems, such as depression and stress, can have a significant negative impact on student experiences, performance, and behaviour. Arria et al.[8] found that depression in the first two years of university is associated with early dropout from school. Stallman[9] found that higher psychological distress was associated with lower GPA in university students. Moreover, mental health problems are positively associated with cyber addiction, eating disorders, substance use (smoking, alcohol and drugs), self-harm, and increased risk of suicide[10-15].

The etiology of anxiety, depression, and stress in university students is poorly understood but the non-medical use of prescription medications is hypothesized to be a risk factor[12,16-18]. The non-medical use of medications may be associated with poor mental health through motivations for use related to poor sleep quality, coping with anxiety or stress, and getting high[16-18]. For example, a student struggling with a lack of sleep may misuse a sedative to help them sleep. Or another student may misuse pain medication for recreational purposes. The association between mental health and drug use in university students is of particular concern because it is associated with suicide in university students[12].

The current evidence about the use of prescription medication and its misuse highlight the need to study this association in university students. Previous studies suggest that the proportion of American college students who reported misuse of any medication in the past year remained stable between 2003-2013 (13.6% in 2003; 13.1% in 2013)[19]. One interesting finding about patterns of use over time is that the misuse of sedative medications in the past year have also remained constant (2.9% in 2003; 3% in 2013)[19]. Drawing on my own experiences as a mental health worker, it was common to see individuals misusing sedative medications; more so than other types of medications. In addition, compared to other types of medications, there appeared to be a more casual attitude regarding stockpiling sedatives for use other than what was prescribed, taking

extra sedatives to help cope with breakthrough symptoms, and sharing sedatives with others.

1.2 SEDATIVE USE

1.2.1 General Population

Sedative medications are one of the most widely prescribed medications in Canada[20]. Common sedatives include benzodiazepines, barbiturates, and non-benzodiazepine drugs (z-drugs), which are typically prescribed for anxiety or sleep difficulties. In Canada, 10% of the general population report current use of sedative medications[19]. Studies in the United States have reported significant increases in doctor visits involving benzodiazepine prescriptions since the early 2000s[21,22]. For example, one study found that the number of doctor visits that resulted in a benzodiazepine prescription increased from 2.6% in 1993 to 4.4% in 2010[21]. This is important because those who are prescribed sedatives may be more likely to use them for non-medical reasons, for reasons other than the prescription, and use other medications that are not prescribed to them[23].

In 2015, 3% of the Canadian general population reported having used sedatives for non-medical reasons[24]. Research conducted in other countries provides similar results. In the United States, 2.3% of the general population report the non-medical use of prescription sedatives in the past year[25] and in Switzerland 2.9% and 2.6% of the population reported use of sleeping pills and anxiolytics respectively in past year[26].

One of the main concerns with sedative use is its potential negative impact on health. A cohort study of in 3550 individuals from the general population in Sweden found that the 20 year mortality rate was 63.3% in men and 46.2% in women who reported regular sleeping medication use compared to 20.9% and 14.7% for men and women who did not report regular use of sleeping medication[27]. The authors concluded that regular hypnotic use significantly increased all-cause mortality and that regular use was a risk factor for suicide[27]. Another concern is overdose. Although overdosing on sedative medications alone can be difficult[28,29], the risk of overdose increases significantly when mixed with other substances[28,30]. In the United States, benzodiazepine is a leading cause of drug overdose leading to emergency department visits[31], admission

to hospital, and death[32]. Use of sedatives is also associated with risky sexual behaviours, dependence, cognitive decline, and reduced quality of life[29,33-35].

1.2.2 University Students

In Canada, 2.2% of post-secondary students reported using a sedative medication that was not prescribed to them in the past 12 months[4] and 3% of high school students report non-medical use of sedatives in the past year[36]. These results are consistent US statistics where between 2.3% and 3% of students reported using sleeping and anxiety medications without a prescription in the past year[18]. McCabe et al.[19] also reported that the lifetime use of sleeping and anxiety medication use was 4.8% and 5.4% respectively. Other studies suggest that lifetime prevalence of sedative use is higher, with 12.2% and 10.1% of undergraduate students in the US reporting lifetime use of tranquilizer and sleeping medications, respectively[37,38].

1.3 REVIEW OF THE LITERATURE

1.3.1 Association between Sedatives and Mental Health in University Students

Previous research suggests that mental health problems and sedative use are prevalent in university students. However, few studies have investigated whether they are associated. Therefore, I reviewed the literature to synthesize evidence on the association between sedative use and depression, anxiety, or stress in university and college students.

1.3.2 Methods

1.3.2.1 Eligibility criteria

Eligible studies investigated nonmedical use of sedative medications (benzodiazepines, barbiturates, and non-benzodiazepine drugs) in undergraduate and college students. These medications include broad categories of medications such as anxiolytics and hypnotics as well as specific medication classes like benzodiazepine. These medications are typically prescribed for sleep or anxiety[20]. Non-medical use of sedatives was defined as off label use and/or taking medications that were prescribed to others.

1.3.2.2 Study characteristics

I considered studies that were published in peer-reviewed journals between January 2007 and January 2018. The search terms for my review were adapted from a larger review on mental health and substance use conducted by the UOIT Mental Health and Wellness Study team. These included: human subjects, substance use, non-medical use of prescription medication, clonazepam, benzodiazepines, sleeping pills, Ativan, university students, undergraduate students, mental health, anxiety, depression, stress (Appendix A). Eligible designs included cohort, case-control, cross-sectional studies and systematic reviews. Systematic reviews were searched manually for additional references.

1.3.2.3 Information sources

I searched the literature using PubMED and PSYCInfo. Search terms were entered into PSYCInfo on February 21, 2017 and the search was updated on January 7th, 2018. Search terms were entered into PubMED on February 26th, 2017, and updated on January 5th, 2018 (Appendix A).

1.3.2.4 Outcomes

Relevant outcomes for my literature review included depression, anxiety, or stress. Studies that used self-report or diagnoses were eligible for review. Studies that investigated serious mental illness (ex. Schizophrenia, bipolar disorders, etc.) were excluded because these were not the focus of the study.

1.3.2.5 Study selection

Article titles and abstracts were downloaded in EndNote. I used a two-phase screening methodology to identify relevant articles. In phase 1, I screened each article's title and abstract for eligibility using the criteria described above. Articles that were possibly relevant (not enough detail was provided to determine eligibility in the title and abstract) were further reviewed in phase 2. In phase 2, the full text of articles was reviewed to determine eligibility. Articles selected after phase 2 were included in the review.

1.3.3 Results

1.3.3.1 Study selection

The search yielded 2684 articles. After phase 1 (title and abstract screening), sixty of the 2684 articles were selected for additional screening (phase 2). Articles were excluded if the study population was not undergraduate university or college students. Therefore, studies of medical, graduate, or high school students were not included in the review. I also excluded studies that explored sedative use in clinical or senior populations, and clinical investigations of physiological effects of these medications. The focus of my literature review was undergraduate students; thus any studies not directly related to undergraduate students, sedatives, and mental health, were excluded. After phase 2 screening was completed, eight articles were selected that met the search criteria (Appendix B). Five of the eight articles investigated the non-medical use of prescription medication and mental health in university students[38-42]. These studies included sedatives in their investigation of prescription medications, but do no separate sedatives from other medications in much of the analysis. They were kept for review because the report prevalence of sedative use and offer some insight into the potential association between sedative use and mental health. The remaining three studies focused on the non-medical use of sedatives and mental health in university students[12,43,44].

1.3.3.2 Study characteristics

All eight studies were cross-sectional (Table 1 and Table 2). Three studies defined non-medical sedative use as "medications that were not prescribed to you"[12,38,44]. Two studies defined non-medical use as "medications that were not prescribed to you" and "off label use"[39,42]. The remaining three studies used other definitions (use for coping and not medically indicated) or their definitions for use were unclear (misuse was not defined)[40,41,43].

Three studies used psychometric assessments to determine mental health status[38,39,41], one asked about self-reported experiences with symptoms of mental health[12], and the remaining studies were able to comment on a connection between sedative use

and mental health by asking about reasons for substance use (i.e. use sedatives to cope with mental health issues)[40,42-44].

Table 1. Studies that reported on the association between non-medical use of prescription medications and mental health disorders in university students.

Author(s) and Country	Study Sample and Sample Size	Substances Used and Time Frame	Types of Misuse	Assessment of Sedative Use	Mental Health Disorder	Results
McCauley et al. (2011) (US)	2000 college and university students. National sample. Women only	Tranquilizers and sedatives; use in the past year	Off label use and not prescribed	Question asking if they have ever used	Major Depressive Episode	1-year prevalence of sedative use: 1.8% 1-year prevalence of tranquilizer use: 2.3% Association between the non-medical use of prescription medications and lifetime diagnosis of depression: OR=2.67; 95% CI [1.74-4.11]
Maier et al. (2013) (Switzerland)	6275 university students from 3 Swiss universities	Sedatives (including hypnotics); lifetime use and past 30 days	No medical indication for use	Question asking if they have ever used and how often	Stress	Lifetime use of sedative medications: 5.8% Prescription drug use more common in those reporting higher stress*
Betancourt et al. (2013) (US-Puerto Rico)	275 first and second year students enrolled at two American universities	Anxiolytics and sleeping medications; use in the past year	Use of medication is for coping	Question asking how often they have used	Stress	Past 6 month prevalence of anxiolytics: 10.6% Past 6 month prevalence of sleeping pills: 7% Association between the non-medical use of prescription medications and stress: OR=1.48; 95% CI [1.04-2.12], p=0.03

Jeffers et al. (2015) (US)	758 university students enrolled in psychology courses. 18-25 years old.	Anxiolytics and sleeping medications; lifetime use past 3 month use	Not prescribed	Question asking if they have ever used	Health anxiety	10.1% reported using anxiolytics and 4.4% sleeping medications Association between the non-medical use of prescription medications and health related anxiety: OR=1.03; 95% CI [1.002-1.06]
Holloway et al. (2014) (UK)	558 university students from a university in Wales.	Tranquilizers and sedatives; lifetime use	Off label use and not prescribed	Question asking if they have ever used	Motivations for use (including depression and anxiety)	Lifetime prevalence of sedative use: 21% Lifetime prevalence of tranquilizer use: 23% Students reported using medications to deal with symptoms of stress and anxiety*

*These studies only report students reported rationale for medication misuse, and do not report any statistics

Table 2. Studies that reported on the association between non-medical sedative use and mental health disorders in university students.

Author(s) and Country	Study Sample and Sample Size	Substances Used and Time Frame	Types of Misuse	Assessment of Sedative Use	Mental Health Disorder	Results
Zullig and Divin (2012) (US)	22783 students from several universities from all over the US. 25 years old and younger.	Sedatives (includes tranquilizers); past year	Not prescribed	Question asking if they have ever used	Depression	Association between sedative use and feelings of depression: OR=1.36; 95% CI [1.11-1.66] Stronger association between sedative use and depression in female than male participants
Stone and Merlo (2011) (US)	383 university students from a single school in the US.	Benzodiazepines; lifetime and past year	Self-report of misuse	Question asking if they have ever used	Stress	Lifetime benzodiazepine misuse: 3.3% 26.7% reporting using to relax 6.7% reported using to deal with stress*
Paredes, et al., (2008) (Ecuador)	181 nursing students.	Benzodiazepines; lifetime, past year, current	Not prescribed	Question asking if they have ever used	Motivations for use (including depression and anxiety)	Current use of benzodiazepine without a prescription: 3.9% 43.5% reported use due to stress 36.7% reported use due to anxiety 38.5% reported use due to depression*

*These studies only report students reported rationale for misuse, and do not report and statistics

Studies in Table 1 report lifetime, past year, or past 6 month prevalence of non-medical sedative medications. These studies do not report any specific associations between sedatives and mental health, but they do report a positive association between non-medical prescription medication use and mental health (depression, stress, and health anxiety). Studies in Table 2 report lifetime or current prevalence of sedative use. These studies do look at sedatives independently of other medications and substances. One study found a positive association between sedative use and feelings of depression, while the rest of the studies reported on the number of students who used sedatives as a means to cope with a mental health issue.

1.3.4 Study Results

Overall, the studies included in my literature review support the hypothesis that non-medical use of prescription medications, specifically sedatives, are associated with prevalent mental health problems in students (Table 1 and 2). Although Studies in Table 1 provide some insight they do not examine the association between sedatives and mental health. As a result they will be excluded from any further examination into the association between sedatives and mental health.

1.3.4.1 Association between Sedatives and Depression

One study found that students reporting sedative use were more likely to report feelings of depression (OR=1.36; 95% CI [1.11-1.66])[12]. When stratified by gender, the association was only present in females. Paredes et al.[44] also found that of those reporting sedative use, 38.5% reported use as a means to cope with depression.

1.3.4.2 Association between Sedatives and Anxiety

One study commented on anxiety, reporting that in those who use sedatives non-medically, 36.7% report using sedatives as a means to cope with anxiety[44].

1.3.4.3 Association between Sedatives and Stress

Finally, sedative medication misuse was frequently reported by university students as a mean to cope with stress. Stone et al.[43] found that of those reporting

sedative use, 6.7% reported use as a means to cope with stress. Whereas Paredes et al.[44] found that 43.5% reported sedative use due to stress.

1.3.5 Methodological Challenges with Studying Mental Health and Sedative Use in University Students

Previous studies examining student mental health and prescription sedative use have limitations. Low response rate in studies involving university students is common and may have led to selection bias[4,6,40,45,46]. Another limitation is measurement bias related to the assessment of mental health. In some studies, mental health was measured as symptoms[12,45,46], whereas other studies measure diagnosis of conditions[8,11,13] or through self-report[6,7,15,45]. Measurement bias in these studies may have occurred because the validity and reliability of measurements were poor or not established. The measurement of medication use has limitations as well. Studies commonly combined sedative medication with other prescription medications, such as opioids and stimulants (Table 1). This does not allow for sedative use to be reported separately of other types of substances. This is important because different medications may be used non-medically for different reasons[39]. There were also inconsistencies in the definition, classification and labelling of sedative type medications. For example, McCabe et al.[19] lists sedatives as anxiolytics, while Holloway et al.[42] lists sedatives as something separate from anxiolytics. Some studies group sedatives and anti-anxiety medication together[37], while others separate them[42], and others still only assessed one type of sedative medications, such as benzodiazepines[43,44]. These measurement differences make comparison between studies difficult and can result in the underestimation of the use of these types of medications.

1.3.6. Conclusion

The current research on the non-medical use of prescription medications suggests that prescription medications, as a whole, have an impact on student mental health. Looking at sedative medications separately, this pattern appears to be similar. However, there are inconsistencies in how sedatives and mental health are defined and measured. This makes comparison between studies difficult and raises the possibility of biased

results. The non-medical use of prescription sedatives and its association to student mental health is important to explore and more thorough investigation is needed.

1.4 KNOWLEDGE and METHODOLOGICAL GAPS

From an epidemiological perspective, little is known about non-medical use of prescription sedatives and its association with depression, anxiety, and stress in Canadian university students. Although research has been conducted in other countries, differences exist in the medical systems and prescription patterns, justifying the need to explore this association in Canadian students[25,26]. Furthermore, previous studies used inconsistent definitions and measurement methods to collect data on and mental health[12,37,40,42-44]. Therefore, there is a need for a study that uses standardized, valid and reliable measures of sedative use and mental health (symptoms of depression, anxiety, and stress). Moreover, there are concerns about selection bias in previous studies[12,43,44]. Future research must adopt recruitment strategies that will maximize participation and reduce the potential for selection bias.

1.5 SUMMARY

Sedatives are central nervous system depressants, commonly prescribed for sleep and anxiety issues[20]. Previous research into the non-medical use of sedatives in the general population, as well as university students, suggests that a proportion of individuals use them for non-medical purposes[4,19,36]. But is the non-medical use of sedatives associated with mental health in university students? Anecdotally, my own experiences have suggested a link to mental health, as well as a casual attitude towards the non-medical use of sedatives. My review of the literature found only a few studies that have attempted to answer that question. These studies suggest that non-medical sedative use is more common in those reporting depression[11], and that it is often used to cope with anxiety and stress[43,44]. However, there are concerns over methodological limitations with these studies, and no research has been conducted in Canada. Therefore, it is important to conduct rigorous research in this area because sedative use is associated with poor health outcomes (including the risk of overdose, risky sexual behaviours, dependence, cognitive decline) and reduced quality of life[28-30,33-35].

1.6 THESIS OBJECTIVES

The general objective of my thesis is to describe the use of non-medical use of prescription sedative and sleeping pills and measure the association between non-medical use of prescription sedative and sleeping pills and symptoms of depression, anxiety, and stress in undergraduate students in the faculty of health sciences and the faculty of education at the University of Ontario Institute of Technology (UOIT).

1.6.1 Specific Objectives:

1. To determine the lifetime and three-month period prevalence of non-medical sedative and sleeping pill use in undergraduate students in the faculty of health sciences and the faculty of education at UOIT.
2. To determine the one-week period prevalence and symptoms of depression, anxiety, and stress in in undergraduate students in the faculty of health sciences and the faculty of education at UOIT.
3. To determine whether non-medical sedative and sleeping pill use in the past three months is associated with symptoms of depression, anxiety, and stress in undergraduate students enrolled in the faculty of health sciences and the faculty of education at UOIT in the Fall semester of 2017.

1.7 REFERENCES

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CHAPTER 2: MANUSCRIPT 1
TITLE: EXPLORING THE PREVALENCE OF DEPRESSION, ANXIETY AND STRESS SYMPTOMS IN UNIVERSITY STUDENTS: A PILOT STUDY.

The following manuscript is currently under review in the Community Mental Health Journal. The style of Manuscript 1 is in accordance with the journal's requirements.

Exploring the prevalence of depression, anxiety and stress symptoms in university students: A pilot study.

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2.1 ABSTRACT

We aimed to test the feasibility of conducting a cross-sectional survey of mental health and associated lifestyle factors in undergraduate students. Our online survey included validated instruments to measure depression, anxiety and stress symptoms and modifiable lifestyle factors. We requested feedback about the length, clarity, and content of the survey. Participants included 137 students enrolled in the Faculty of Health Sciences at the University of Ontario Institute of Technology in March, 2017. The participation rate was 80%. The average time of completion was 15:35 (SD=4:27) minutes. Students rated the length and clarity of the survey as adequate. Students reported moderate to severe symptoms of: depression (37%), anxiety (45%), and stress (30%) for the previous week. We collected complete data on sleep quality, substance use, pain, and food insecurity. Therefore, it is feasible to conduct an internally valid survey of mental health and wellness in undergraduate students.

Keywords: Epidemiology; Cross-sectional; University students; Mental Health

2.2 INTRODUCTION

Mental health is a growing public health problem in university students (Ibrahim, Kelly, Adams, & Glazebrook, 2013; Storrie, Ahern, & Tuckett, 2010). In Canada, the prevalence of disabling depression among university students increased from 37.5% in 2013 to 44.4% in 2016, and the prevalence of overwhelming anxiety grew from 56.5% in 2013 to 64.5% in 2016 (American College Health Association [ACHA], 2013, 2016). In 2016, 59.6% of students reported "feeling hopeless", 13.0% experienced suicidal ideation, 8.7% reported self-harm, and 2.1% reported to have attempted suicide (ACHA, 2016).

Little is known about the etiology of mental health problems in university students; however, cross-sectional studies suggest that they are associated with substance use, poor sleep quality, food insecurity, spinal pain, and physical inactivity (Bruening, Brennhofer, van Woerden, Todd, & Laska, 2016; Harbour, Behrens, Kim, & Kitchens, 2008; Hershner & Chervin, 2014; Keith, Hart, McNeil, Silver, & Goodwim, 2015; Kennedy, Kassab, Gilkey, Linnel, & Morris, 2008; Robertson, Kumbhare, Nolet, Srbely, & Newton, 2017; Samaranayake, Arroll, & Fernando, 2014; Zullig & Divin, 2012). The impact of poor mental health in university students is significant; it is associated with low grade point averages, poor academic performance, low retention, early drop-out from university, antisocial behaviours, substance use and suicide (Cranford, Eisenberg, & Serras, 2009; DeBerard, Scott, Spielmans, & Julka, 2004; Hysenbegasi, Hass, & Rowland, 2005; Keith et al., 2015; Kwan, Arbour-Nicitopoulos, Duku, & Faulkner, 2016; Zullig & Divin, 2012). Studying mental health in university students can be challenging. This is partly due to personal, cultural and public stigma associated with mental health that may prevent students from participating (Eisenberg, Downs, Golberstein, & Zivin, 2009; Eisenberg, Hunt, Speer, & Zivin, 2011). Previous studies demonstrate low response rates of between 11-28% (Kwan et al., 2016; Lovell, Nash, Sharman, & Lane, 2015). Our objective was to test the feasibility of recruitment and to collect valid and reliable mental health and wellness data in a sample of undergraduate students enrolled in the Faculty of Health Sciences. We aimed to determine participation rate, time to complete, clarity, length, missing data, and suggestions for strengthening the survey instrument.

2.3 METHODS

2.3.1 Study design and source population

We conducted a pilot cross-sectional study of undergraduate students enrolled at the University of Ontario Institute of Technology (UOIT) in March 2017. UOIT is a publically funded research university located in Oshawa, Ontario. In 2016, the university included 9,405 students enrolled in seven faculties with a highly diverse student population: 46.6% of students are visible minorities, 82% are between the ages of 18-24, 59.1% are female (2.3% non-binary) and 46.3% are first-generation university students (parent(s) or guardian(s) did not attend or successfully complete post-secondary studies) (Office of Institutional Research and Analysis [OIRA], 2017).

Our pilot study included undergraduate students enrolled in the Faculty of Health Sciences. Twenty percent (1963 students) of the university's student population was enrolled in the Faculty of Health Sciences (OIRA, 2017). The faculty includes the following programs and specializations: Allied Health Sciences, Health Science (Human Health Science and Public Health), Kinesiology (Exercise Science, Health and Wellness, and Rehabilitation), Nursing, Medical Laboratory Science, and Fitness and Health Promotion.

2.3.2 Study sample

To be included, students had to be at least 18-years-old and enrolled in the Faculty of Health Sciences. We recruited participants from three classes in Nursing (third year class), Kinesiology (third year class), and Health Science (first year class) programs over a one week period (March 23rd, 24th and 29th, 2017).

2.3.3 The Mental Health and Wellness Questionnaire

We developed an online survey questionnaire, after reviewing the pertinent literature and in consultation with subject-matter experts at the University. We designed the survey instrument to measure the presence of symptoms of depression, anxiety, and stress, and the impact on function, and modifiable lifestyle factors (Lovibond & Lovibond, 1995; World Health Organization [WHO], 2017). Our questionnaire included valid and reliable questions and instruments to measure sleep quality, physical activity, substance use, food insecurity, spinal pain, and socio-demographic variables (Backhaus, Junghanns, Broocks, Riemann, & Hohagen, 2002; Bickel, Nord, Price, Hamilton, & Cook, 2000; Buysse, Reynolds, Monk, Berman, & Kupfer 1989; Childs, Piva, & Fritz,

2005; Craig et al., 2003; Gallasch & Alexandre, 2007; Grandner, Kripke, Yoon, & Youngstedt, 2006; Gryczynski et al., 2015; Gulliford, Mahabir, & Rocke, 2004; Humeniuk & Ali, 2006; Lee, Macfarlane, Lam, & Stewart, 2011; Statistics Canada, 2016).

Symptoms of depression, anxiety and stress

We selected the Depression Anxiety Stress Scales -21 item (DASS-21) to measure symptoms of depression, anxiety, and stress in the past week (Lovibond & Lovibond, 1995). The DASS-21 is a self-administered scale designed for nonclinical populations, and includes three subscales (symptoms of depression/DASS-D, anxiety/DASS-A and stress/ DASS-S). Each subscale contains seven items each, scored from '0' (Does not apply to me) to '3' (Applied to me very much or most of the time), for a total score of 21. The total score is multiplied by two to fit the original scoring developed for the DASS-42. The DASS-21 has adequate psychometric properties and has been validated and used in a range of cultures and age groups, including university students (Henry & Crawford, 2005; Mahmoud, Lynne, & Staten, 2010; Norton, 2007; Sinclair et al., 2012).

Impact of symptoms of depression, anxiety and stress on function

We used four questions from the 'functioning' section of the World Health Organization's (2017) Model Disability Survey to measure the impact of symptoms of depression, anxiety and stress and ability to cope with problems in daily life (questions I4024m, I4025, I4030, and I4031). The Model Disability Survey was developed to standardize the measurement of health and disability across cultures, providing insight into challenges that may arise due to the environment in which one is living, or, because of the attitudes or behaviours of people around them. Response options to these questions are offered through a Likert scale ranging from '1' (no problem) to '5' (extreme problem). These questions have adequate reliability (WHO, 2017).

Sleep quality

The Pittsburgh Sleep Quality Index (PSQI) was used to measure overall sleep quality. The PSQI provides a standardized, reliable and valid measure of sleep quality that distinguishes between 'good' and 'poor' sleepers (Backhaus et al., 2002; Buysse et al., 1989). Overall sleep quality is assessed through measuring a variety of associated

factors such as sleep duration, sleep efficiency, subjective sleep quality, sleep latency, sleep medication, sleep disturbances and daytime dysfunctions. The scale contains 19-self-rated items grouped into seven component scores, with each weighted on a '0' to '3' scale. The total sleep score is the sum of the seven component scores (ranging from 0 to 21). A total score < 5 is associated with good sleep quality, while a total score ≥ 5 is associated with poor sleep quality. The PSQI demonstrates adequate psychometric properties and is valid and reliable in adults (Backhaus et al., 2002; Grandner et al. 2006).

Physical activity

We used the seven-item version of the International Physical Activity Questionnaires (IPAQ) to collect information on time spent: 1) walking; 2) vigorous-intensity activity; 3) moderate-intensity activity and 4) sedentary activity in the past 7 days (Lee et al., 2011). The IPAQ total score is calculated through Metabolic Equivalent of Task (MET)-min per week (a product of the MET level, minutes of activity, and events per week), and classified as low, moderate, and high. The moderate category includes individuals who engage in vigorous activity (minimum 20 minutes per day) for three or more days. Similarly, the high category includes individuals who spend a minimum of three days engaging in vigorous-intensity activity, while accumulating at least 1500 MET-minutes/week. The IPAQ shows broad variation in cross-cultural validity and reliability in adults; therefore, we aimed to test the tool in our population (Craig et al., 2003; Lee et al., 2011).

Substance use

We selected the WHO's Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) screening questionnaire to measure the use of psychoactive substances (Humeniuk & Ali, 2006). The ASSIST questionnaire consists of eight items including tobacco, alcohol, cannabis, cocaine, amphetamine-type stimulants, inhalants, sedatives, hallucinogens, opioids and 'other drugs'. The ASSIST measures substance use in an individual's lifetime and past three months. It is cross-culturally validated, reliable and useful to classify individuals in three categories: 1) low risk substance user or abstainers; 2) those whose patterns of substance use put them at risk, or already had or were at risk of developing problems related to their use; and 3) those who were dependent on a substance (Gryczynski et al., 2015).

Food insecurity

We measured food insecurity using the six-item Household Food Security Scale Module (HFSSM) (Bickel et al., 2000). The HFSSM, and variations of it, are most commonly used when measuring food security status among university student populations across a range of cultural groups (Bruening et al., 2016; Hughes, Serebryanikova, Donaldson, & Leveritt, 2011; Pia Chaparro, Zaghloul, Holck, & Dobbs, 2009). The tool uses a prevalence period of the last 12 months, and has been shown to approximate closely the three main categories of food security status: 'food secure', 'food insecure without hunger', and 'food insecure with hunger'. Respondents are classified into a food security status based on the sum score that is calculated by the total number of affirmative responses. A sum score between '0' to '1' suggests high food security ('food secure'), 2 to 4 suggests low food security ('moderate food insecurity'), and 5 to 6 suggests very low food security ('severe food insecurity'). The six-item HFSSM has adequate psychometric properties (Gulliford et al., 2004).

Spinal pain

We provided a mannequin diagram to identify the neck and low back region. We used the numeric pain rating scale (NRS) to measure back and neck pain intensity. The NRS is an 11 point scale and segmented version of the visual analog scale, in which a respondent selects a whole number (0 to 10 integers) that best reflects the intensity of their pain (Childs et al., 2005). The numbers are arranged in a horizontal line with '0' representing no pain and '10' representing worst pain imaginable. Respondents report average pain intensity over the past seven days, once for low back pain and again for neck pain. The NRS has been tested in a variety of cultural groups with high test-retest reliability, acceptable construct validity (strongly correlated to Visual Analogue Scale [VAS] scores) and scores that are responsive to change (Gallasch et al., 2007).

Socio-demographic variables

Socio-demographic information was collected through questions drawn from Statistics Canada (2016). Information included: age, gender, program of study, year of study, diagnosed underlying medical conditions, marital status, number of dependents, academic average, annual personal and household income, hours of work per week,

living arrangement, commute time, citizenship, parents' marital status and parents' employment status.

Comorbidities

Information regarding comorbidities was assessed using a list of 26 items inquiring about chronic health conditions included in Ontario Common Assessment of Needs and the Canadian Community Health Survey (Ontario Common Assessment of Need [OCAN], 2017; Statistics Canada, 2015). Medically diagnosed conditions include allergies, anxiety, arthritis, asthma, attention disorder/learning disability, eating disorder, hypertension, intestinal or stomach ulcers, migraine headaches, mood disorder, scoliosis, and sexually transmitted infections.

Feasibility of administering the questionnaire

We added four questions to assess the ease of administration of the questionnaire. The first question inquired about the length of the questionnaire. Students were asked to rate the length of the questionnaire on a 10 point numerical rating scale with '0' indicating that the questionnaire was "too short" and '10' indicating "too long". We also asked students to rate the clarity of the questionnaire, in which '0' indicated that the questionnaire was "unclear" and '10' indicated that it was "clear." The third question asked students for open-ended feedback regarding the constructs addressed in our questionnaire. The fourth question asked students for general comments on additional areas relevant to mental health and wellness that were not addressed directly in the questionnaire.

2.3.4 Recruitment and data collection

We administered the pilot survey in three undergraduate classes. Students were informed of the study prior to attending class on the designated survey date and were given the opportunity to review the informed consent form. At the beginning of each class, the research team introduced the study with a short presentation. Students who were interested in participating were instructed to access a link to the consent form and questionnaire, using their student access login. Students who chose not to participate were asked to remain seated. This was done to minimize the risk of identifying students who did not wish to participate. The study was approved by the UOIT Research Ethics Board (REB#14310).

2.3.5 Analysis

We analysed the data using SPSS 24.0 (IBM SPSS Statistics, 2016). Descriptive statistics were computed to describe the distribution of all the variables. We used NVivo version 11 to conduct content analysis of student responses to open-ended questions in the feedback portion of the questionnaire (NVivo qualitative data analysis, 2016). Feedback content was analysed by categorizing responses into themes based on descriptive similarities and differences. Content analysis was conducted to make sense of the feedback collected, in order to highlight key messages retrieved from students (Elo & Kyngas, 2008).

2.4 RESULTS

2.4.1 Sample characteristics

172 students were eligible for the study and 137 participated (80%). The participation rates across the three classes were 85% (in Health Science), 82% (in Nursing), and 72% (in Kinesiology). Seventy-five percent of our sample were female. The mean age was 22 years (SD=3.41). Thirty-six percent of the sample were nursing students, 33% kinesiology students and 14% health science students. Most of our sample were first- and third-year students (52%). With respect to income, over 75% of our students reported an annual personal income under $10,000, and 50% reported working 1 to 19 hours/week. Two-thirds of the students reported an academic average of 70-85% in the previous academic year.

2.4.2 Feasibility

On average, it took 15:35 minutes (SD=4:27) to complete the questionnaire. The mean rating of the length of the survey was 6.5/10 (SD=1.9) suggesting that students were satisfied with the length of the questionnaire. The mean clarity rating was 8.4/10 (SD=2.20) suggesting that students were satisfied with the clarity of the questions.

2.4.3 Symptoms of depression, anxiety and stress

Overall, 50.0% (95% CI: 41.6-58.4) of participants experienced symptoms of depression in the past week. Similarly, 62.0% (95% CI: 53.9-70.1) experienced symptoms of anxiety and 42.0% (95% CI: 33.7-50.3) experienced symptoms of stress (Table 1). In the past week, 37.0% (95% CI: 28.9-45.1) of participants experienced moderate-extremely severe depressive symptoms, 45.5% (95% CI: 36.7-53.3)

experienced moderate-extremely severe symptoms of anxiety, and 30.0% (95% CI: 23.3-37.7) experienced moderate-extremely severe stress-like symptoms (Table 1).

2.4.4 Sleep quality

Eighty percent (95% CI: 73.3-86.7) of participants experienced poor sleep quality in the past week. On average, participants spent 8.05 hours (95% CI: 7.57-8.52) in bed; however, 34.0% (95% CI: 26.0-41.9) reported experiencing 6-7 hours of actual sleep and 28.0% (95% CI: 20.5- 35.6) reported experiencing 5-6 hours of actual sleep. Most participants (60.0%; 95% CI: 51.8- 68.2) required between 16-60 minutes to fall asleep.

2.4.5 Substance use

Alcohol (76.9%; 95% CI: 72.9-86.4) and marijuana (51.1%; 95% CI: 42.7-59.5) were the most commonly used substances in the participants' lifetime (Table 2). Similarly, alcohol (71.5%; 95% CI: 63.9-79.1) and marijuana (32.1%; 95% CI: 24.3-39.9) were the most commonly used substances in the past three months. Finally, 7.3% (95% CI: 2.9-11.7) and 5.8% (95% CI: 1.9- 9.7) of participants reported to have used sedatives and hallucinogens respectively during their lifetime.

2.4.6 Food insecurity

Our data suggest that 23.0% (95% CI: 16.0-30.1) of participants experienced either low food security or very low food security in the past 12 months. Low and very low food security can include behaviours ranging from compromising on the quality or quantity of food, cutting the size of meals, and skipping meals. Specifically, 25.0% (95% CI: 17.8-32.3) of participants reported being unable to afford balanced meals, 10.0% (95% CI: 5.0-15.0) have cut the size of meals, and 13.0% (95% CI: 7.4-18.6) have been hungry but unable to eat due to financial constraints.

2.4.7 Spinal pain

In the past week, 70% (95% CI: 62.3-77.7) of participants reported to have experienced low back pain and 68% (95% CI: 60.2-75.8) reported neck pain. Participants with low back pain reported a mean pain intensity of 3.8/10 (95% CI: 3.4-4.2). Similarly, those with neck pain reported a mean intensity of 3.7/10 (95% CI: 3.3-4.2).

2.4.8 Comorbidities

Fifty-eight percent (95% CI: 49.7-66.3) of participants reported a medical diagnosis (Table 3). Of these, 23% (95% CI: 15.9-30.1) reported between two and four

diagnosed conditions, and 2.0% (95% CI:-0.3-4.3) of students had five diagnosed conditions. The most common comorbidities were allergies, asthma and anxiety (Table 3).

2.5.9 Physical activity

Most data on physical activity was of poor quality, which prevented the computation of descriptive statistics. Feedback from the participants suggested that the wording of the IPAQ was very ambiguous, thereby contributing to the poor data that was reported. Specifically, the structure of the questions was problematic for participants. Participants indicated that the IPAQ items lacked consistency and clarity, requesting both daily and weekly estimates of physical activity to be reported. We were nevertheless able to analyse responses from one question: "During the last 7 days, on how many days did you walk for at least 10 minutes at a time?" Most participants (95.0%; 95% CI: 91.4-98.7) reported that they perform at least 10 minutes of walking on any day of the week.

2.4.10 Feedback and revisions for Cross-Sectional Study

Overall, respondents were satisfied with the study. Students' feedback included comments such as: "The questionnaire is very detailed and clear", "Great job", and "Good variety of questions." Respondents also provided suggestions regarding others areas of mental health and wellness, important to them, and not currently addressed in the survey. Content analysis generated three general themes: 1) academic performance/school-related stressors, 2) ability to cope, and 3) social support systems. Students primarily provided feedback regarding academic performance/school-related stressors. Students suggested that the burden of academic work is an important area of student mental health and wellness. Therefore, our questionnaire should include questions that address students' academic life. Similarly, respondents stated that our questionnaire should inquire about coping strategies to recognize and capture a wide scope of students' diverse approaches to coping. Finally, respondents identified social networks and interpersonal relationships as a significant area of student mental health and wellness. Students indicated that the questionnaire should inquire about their capacities to build and maintain social relationships.

2.5 DISCUSSION

Our pilot study aimed to determine the feasibility of conducting a cross-sectional survey to assess the association between modifiable lifestyle factors and symptoms of depression, anxiety and stress in undergraduate university students. The results suggest that our recruitment and data collection methodologies are acceptable for in-class administration in university students. In our sample of students, participants completed the questionnaire within an average of 15 minutes. Therefore, it is suitable for the questionnaire to be administered during traditional face-to-face class time, with minimal disruption. The participation rates of eligible students in our three pilot administrations suggest that students are interested in the study. Moreover, students' feedback demonstrates that students appreciated the opportunity to participate, and find that the questionnaire is easy to navigate, and that its length is appropriate. The open-ended feedback suggests that the questionnaire's content resonated with students. Favorable feedback indicates that students are satisfied with the objectives of this study in that they consider these issues both timely and important. For follow-up studies, it may be relevant and useful to assess the feasibility of administering the questionnaire in a fully online learning environment, and to use qualitative approaches including individual interviews and focus group interviews with university students to explore and capture these issues.

The Mental Health and Wellness study addresses an important gap in the literature by investigating the multidisciplinary nature of mental health and wellness in university students. The results of our study suggest the need for further research; our pilot study is the first in a series of investigations to better understand university student mental health and wellness.

2.5.1 Post-pilot modifications to questionnaire

Based on feedback from participants and the pilot study results, we modified the questionnaire as described below:

(1) The International Physical Activity Questionnaire (IPAQ) will be replaced with the Physical Activity and Sedentary Behaviour Questionnaire (PASB-Q). We encountered ambiguous data using the IPAQ to gather information on physical activity. The responses retrieved from this portion of the questionnaire did not match the format of the question, as many required respondents to include days, hours, and minutes spent running, walking and sitting. Moreover, students' feedback described challenges in understanding the

physical activity set of questions. Prior research has suggested that the IPAQ is not an accurate indicator of physical activity and has shown inconsistent results; this was borne out in our population as well (Lee et al., 2011). To rectify this, we will use the PASB-Q to measure physical activity and sedentary behaviour. The PASB-Q was developed by the Canadian Society for Exercise Physiology (CSEP) to measure the one-week prevalence of physical activity and sedentary behaviour in adults. The questionnaire measures sedentary behaviour, moderate activity and vigorous activity, and each of the seven items are scored based on self-report in minutes, hours, days, and frequencies. An early study suggests that the PASB-Q demonstrates adequate reliability and validity (Fowles, O'Brien, Wojcik, d'Entremont, & Shields, 2017).

(2) Additional examples and street names of substances in the "amphetamine-type stimulants", "sedatives and sleeping pills", and "opioids" sections of the ASSIST tool will be included to ease comprehension of the substance use section. "Employment status of your [father/male] and [mother/female] guardian" questions will be altered to allow answers for 30 same sex and single parents. Both revisions are a response to feedback by coinvestigators and students.

(3) We will remove the diagnosed conditions that had a very low prevalence rate in pilot study findings (<5%), and present the remaining list of conditions for the comorbidities question in alphabetical order to ease clarity. This will eliminate conditions not typically seen in this population (e.g. cancer) and allow students to navigate this question with greater ease.

(4) Applicable items from the Student University Satisfaction Scale (SUSS) and the Social Provisions Scale (SPS) were selected and will be incorporated into the questionnaire (Bhamani & Hussain, 2012; Cutrona & Russell, 1987). These will be added in response to student feedback suggesting the inclusion of constructs that address student satisfaction with the university, and social support systems. Further, the SPS has adequate psychometric properties (Cutrona & Russell, 1987).

2.5.2 Strengths

First, our questionnaire was developed with the use of valid and reliable instruments to measure symptoms of depression, anxiety, and stress, food insecurity, substance use, and other modifiable lifestyle risk factors in this population. Second, the

participation rates among class attendees were high (80%). Third, the completion time for the questionnaire was reasonable which suggests that it is feasible to administer the questionnaire in class with minimal disruption.

2.5.3 Limitations

Our recruitment strategy only recruited students who attended class. Although 399 students were enrolled in the three classes, 172 students attended classes (on the days that the survey was administered) and were eligible to participate in the pilot questionnaire. Because we did not have data on those who did not attend classes, we are unable to comment on the reasons for non31 participation. Moreover, the results of our pilot study are not generalizable to a more diverse population of students. The purpose of our pilot study was not to produce generalizable results; rather, it was to understand the feasibility of conducting a cross-sectional study and obtain preliminary estimates of the prevalence of mental health symptoms and lifestyle factors. Finally, we are unable to comment on the level of physical activity on our pilot sample as we obtained unreliable data in the physical activity portion of our questionnaire. Therefore, it is likely that the physical activity questions in the pilot version of the questionnaire (retrieved from the IPAQ) are associated with measurement error.

2.5.4 Conclusion

Our pilot study suggests that it is feasible to administer an in-class questionnaire to study mental health and wellness among university students. Findings from the pilot study suggest that there is a concerning prevalence of symptoms of depression, anxiety and stress in this population. The survey also documented the prevalence of food insecurity, substance use, poor sleep quality, and spinal pain. In our next administration, we aim to obtain class rosters to secure demographic information on enrolled students, in order to assess differences between our sample and the overall population. This pilot study has informed changes to improve the clarity of the questionnaire, and preliminary results have suggested that continued investigation is necessary to understand the prevalence and association of symptoms of depression, anxiety and stress with various lifestyle factors, in this population.

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Table 1. One-week prevalence (95% CI) of symptoms of depression, anxiety, and stress.

	Depression	**Anxiety**	**Stress**
Normal	50.0% (41.6-58.3)	38.0% (29.9-46.1)	58.0% (49.7-66.3)
Mild	13.0% (7.4-18.6)	16.5% (10.3-22.7)	12.0% (6.6-17.4)
Moderate	26.0% (18.7-33.3)	17.5% (11.1-23.9)	19.0% (12.4-25.6)
Severe	7.0% (2.7-11.3)	10.0% (5.0-15.0)	9.0% (4.2-13.8)
Extremely Severe	4.0% (0.7-7.3)	18.0% (11.6-24.4)	2.0% (-0.3-4.3)

Table 2. Lifetime and three-month period prevalence (95% CI) of substance use.

Substance[1]	**Lifetime use**	**Past three month use**
Alcohol	79.6% (72.9-86.4)	71.5% (63.9-79.1)
Marijuana	51.1% (42.7-59.5)	32.1% (24.3-39.9)
Tobacco	37.2% (29.1-45.3)	15.3% (9.3-21.3)
Amphetamine-type stimulants	9.5% (4.6-14.4)	4.4% (0.9-7.8)
Sedatives	7.3% (2.9-11.7)	2.2% (-0.3-4.7)
Opioids	6.6% (2.4-10.8)	2.9% (0.1-5.7)
Cocaine	4.4% (0.9-7.8)	1.5% (-0.5-3.5)
Hallucinogens	5.8% (1.9-9.7)	0.7% (-0.7-2.1)

[1] No participant reported lifetime or past three-month use of inhalants.

Table 3. Lifetime prevalence (95% CI) of diagnosed medical conditions.[1]

Comorbidities	**Proportion**
Allergies	24.0% (18.7-33.3)
Asthma	20.0% (13.3-26.7)
Anxiety	17.0% (10.7-23.3)
Scoliosis	10.0% (10.7-23.3)
Mood disorder(s)	9.0% (4.2-13.8)
Migraine headaches	7.0% (2.7-11.3)
ADD/ADHD – learning disability	5.0% (1.4-8.7)

[1]No participant reported the following comorbidities: arthritis, bowel disorder(s), cancer, chronic bronchitis, emphysema, chronic obstructive pulmonary disorder (COPD), chronic fatigue syndrome, diabetes, eating disorder(s), fibromyalgia, heart disease, high blood pressure, intestinal or stomach ulcers, multiple chemical sensitivities, personality disorder(s), psychosis, sexually transmitted infection(s), sleep apnea, sub stance use disorder(s), other.

CHAPTER 3: MANUSCRIPT 2
TITLE: IS NON-MEDICAL USE OF PRESCRIPTION SEDATIVES AND SLEEPING PILLS ASSOCIATED WITH SYMPTOMS OF DEPRESSION, ANXIETY, AND STRESS IN UNDERGRADUATE UNIVERSITY STUDENTS

3.1 ABSTRACT

Introduction

Little is known about the lifestyle behaviors associated with poor mental health in undergraduate university students. Non-medical use of sedative and sleeping pills may be associated with poor mental health in this population. I aimed to determine whether non-medical sedative and sleeping pill use is associated with symptoms of depression, anxiety, and stress in undergraduate students at the University of Ontario Institute of Technology (UOIT).

Methods

I conducted a cross-sectional study of undergraduate students enrolled in the faculty of health sciences (FHS) and faculty of education (FEd) at UOIT in the Fall semester of 2017. Non-medical sedative and sleeping pill use in the past three months was measured with the Alcohol, Smoking, and Substance Involvement Screening Test and symptoms of anxiety, stress and depression in the past seven days were measured with the 21-item version of the Depression, Anxiety, and Stress Scale. I used multivariable logistic regression to measure the associations while controlling for covariates.

Results

My sample included 882 students and 3.7% (95% CI [2.6, 5.2]) reported non-medical sedative and sleeping pill use in the past three months. Overall, 30.3% (95% CI [27.3, 33.4]), 47.3% (95% CI [43.9, 50.6]), and 25.5% (95% CI [22.7, 28.5]) reported moderate-extremely severe symptoms of depression, anxiety, and stress in the past seven days. My multivariable logistic regression analysis suggests that non-medical sedative and sleeping pill use is not associated with moderate-extremely severe symptoms of anxiety, stress, and depression.

Conclusions

My cross-sectional analysis suggests that non-medical sedative and sleeping pill use are not associated with symptoms of anxiety, stress, and depression in two faculties at UOIT. Nevertheless, students must be educated about the potential negative health impacts of non-medical sedative and sleeping pill use.

3.2 INTRODUCTION

Symptoms of depression, anxiety, and stress are common in undergraduate university students. According to the 2016 National College Health Assessment 65.4% of Ontario university students reported experiencing "overwhelming anxiety" in the past 12 months; 46.1% reported feeling "so depressed it was difficult to function"; and 42.9% reported stress had an impacted their academic[1]. This problem is not specific to Canada. In the United States, the lifetime prevalence of diagnosed depression and anxiety in university students are 14% and 13%, respectively[2]. Other studies from the United States and Australia report that the two-week prevalence of depression ranges from 8% to 18%, and 13% to 21% report symptoms of anxiety in the same period[3, 4]. Finally, the one-week prevalence of symptoms of depression, anxiety, and stress were 22%, 29%, and 27% respectively in students from Australia[5]

Anxiety, stress, and depression may have a significant negative impact on academics and the health and welfare of undergraduate university students. Specifically, the evidence suggests that poor mental health is associated with lower academic performance and early dropout from school[2,6]. Moreover, an association between mental health and self-harm, risk of suicide, smoking, alcohol and drug use has been reported[7-12].

The etiology of anxiety, depression, and stress in university students is poorly understood but it is hypothesized that the non-medical use of prescription medications may be a risk factor[11,13-15]. Non-medical use refers to the use of medications not prescribed to an individual or using medications beyond what is prescribed. The non-medical use of medications may be motivated by several factors including poor sleep quality, coping with anxiety or stress, and getting high[13-15]. The non-medical use of sleep and anxiety medications are of particular concern because it is associated with significant negative health outcomes including risk of overdose and dependence, early mortality, and cognitive declines[16-18]. In Ontario in 2015, 2.1% of university students reported using a sedative medication that was not prescribed to them in the past year[1]. This is consistent with studies from the United States, where 2.3% and 3% of university students reported using sleeping and anxiety medications respectively without a prescription in the past year[19]. Studies exploring lifetime use have found that between 3.3% and 12.2% of

university students reported lifetime non-medical use of some type of sedative or tranquilizer medication[19-23].

To date, few epidemiological studies have investigated the association between non-medical sedative and sleeping pill use and symptoms of depression, anxiety, and stress in university students. Overall these studies report an association between sedative use and depression, anxiety, and/or stress[11,20,21]. However, previous studies had limitations. First, previous studies used heterogeneous definitions of sedatives and sleep medications[11,23-26]. Second, some studies examined only one type of medication (such as benzodiazepines) while others investigate combination of benzodiazepines, barbiturates, or non-benzodiazepine drugs (z-drugs)[11,20,21]. Third, previous studies did not use psychometrically sound instruments to assess the presence of mental health[11,20,21]. Lastly, there are concerns about the representativeness of the samples in previous studies. For example, one study using the ACAH data reported a response rate of 27% from participating schools[11]. Another study only surveyed nurses from the school[20] and another used a convenience sample of students that were not representative of the overall school population[21]. Therefore, my thesis aimed to address the limitations of previous studies by using valid and reliable measurement instruments. The objective of this paper was to determine whether non-medical sedative and sleeping pill use in the past three months is associated with moderate to extremely severe symptoms of depression, anxiety, and stress in undergraduate students enrolled in the faculty of health sciences and faculty of education at UOIT during the Fall term of 2017.

3.3 METHODS

3.3.1 Study Design and Study Population

I conducted an analysis of the Mental Health and Wellness Study, a cross-sectional study of undergraduate students enrolled in the faculty of health sciences and the faculty of education at UOIT. The study was conducted from September 26th to October 23rd, 2017. It was approved by the UOITEthics Board (REB #14310 and REB File #14515).

UOIT is a public research university located in Oshawa, Ontario. In the 2017/2018 academic year, 9,432 students were enrolled in undergraduate programs at the

university[27]. Twenty percent of this population (1931 students) were enrolled in a program within the faculty of health sciences, and four percent (363 students) were enrolled in the faculty of education[27]. Five percent of undergraduate students were international students and 46.3% were first-generation university-goers[27].

The faculty of health sciences includes nine specific programs (Allied Health Sciences, Health Science (Human Health Science and Public Health), Kinesiology (Exercise Science, Health and Wellness, and Rehabilitation), Nursing, Medical Laboratory Science, and Fitness and Health Promotion). The faculty of education offers two undergraduate: bachelor of arts in educational studies and digital technology, and the bachelor of education. Students enrolled in the faculty of health sciences and faculty of education, bachelor of education program (n=268) were eligible for the study.

3.3.2 Study Sample and Recruitment

Students eligible for the study were 18 years of age or older and able to complete the study survey online. Participants were recruited in three sequential waves (Appendix C). In wave 1, participants were recruited during mandatory classes for their program. For example, Anatomy and Physiology are a required course during the first semester of many of the programs in the faculty of health sciences. In the faculty of health sciences, 21 in-person and four online classes were used for recruitment while two classes were used in the faculty of education. One week prior to wave 1 recruitment, emails were sent to class instructors and students to explain the purpose of the study and data collection process. On the day of the survey the research team attended class and explained the purpose of the study to students (Appendix D). The same information was provided to students attending classes on-line but it was delivered in a short video posted on the class' educational software.

Students who did not attend class on the day of wave 1 recruitment were provided the opportunity to participate in a second wave of recruitment. In wave 2, class instructors posted a link to the survey questionnaire on the class' educational software. In wave 3, the deans of the faculty of health sciences and faculty of education emailed all students and invited them to participate in the survey; the email included a link to the survey questionnaire. Finally, approximately one week after wave 1, a social media

campaign was launched using UOIT (faculty of health sciences, faculty of education) Facebook and faculty of health sciences and faculty of education (& CDPR) twitter accounts to remind students about the study. Throughout the recruitment period, posters informing students about the study were placed at university's Student Services office, in the faculty's offices and at the university outreach centre.

3.3.3 Data Collection

Students, who were interested in participating in the survey, were asked to use their computers or portable device to access the online survey questionnaire. Prior to having access to the survey, students were asked to read a consent form and provide informed consent to participate in the study. Once they provided consent, they were directed to the survey. The online study questionnaire included eight sections (Appendix E). Each section included standardized valid, reliable, questions and instruments that have been cross-culturally validated. Students who completed the survey were not able to access the link again. No compensation was provided for participation. As explained in the consent form, the aggregate results of the study will be disseminated to students following the completion of the analysis.

3.3.4 Independent Variable: Non-medical Sedative and Sleeping Pill Use

Substance use was measured using the Alcohol, Smoking, and Substance Involvement Screening Test **(**ASSIST, v3.0)[16,28]. The ASSIST was developed by the World Health Organization to measure non-medical use lifetime and three month use of tobacco products; alcohol, cannabis, cocaine; amphetamine-type stimulants; sedatives and sleeping pills; hallucinogens; inhalants; opioids; "other" drugs. It allows respondents to select use daily, weekly, monthly, one or twice, or never in response to whether they have used in the past 3 months. My thesis focuses on the lifetime use and use in the past three months of sedative and sleeping pills. Students who reported to have used daily, weekly, monthly, or once or twice were classified as users. The ASSIST has adequate validity and reliability in a range of populations[29-31]. In order to make the ASSIST more relevant and to elicit more accurate responses the list of example sedative and sleeping pills were altered. This was done to better reflect sedative and sleeping pills used in

Canada. Several names were added along with their street names (Kept: Valium, Rohypnol; Added: Ativan, Xanax, Clonazepam, downers, tranks, blue heaven, yellow jackets; Removed: Serepax).

3.3.5 Dependent Variables: Symptoms of Depression, Anxiety and Stress

The Depression Anxiety Stress Scales-21 (DASS-21) was used to measure symptoms of depression, anxiety and stress 'over the past week'[32]. The DASS-21 is a self-administered tool used to measures symptoms of depression, anxiety and stress in the past week[33]. It includes 21 questions divided in three subscales (seven questions each for symptoms of depression, anxiety and stress). The total score for each subscale is used to classify participants into five categories: normal, mild, moderate, severe, and extremely severe symptoms. For the purpose of my thesis, I dichotomized participants into two categories those who were with moderate-extremely severe symptoms versus those with normal and mild symptoms. The DASS- 21 has adequate reliability and validity in a range of cultures and age groups[34-39].

3.3.6 Covariates

Socio-demographics: Twenty-two questions from Statistics Canada[40] and the Canadian Community Health Survey[41] and the ACHA[1] were used to collect socio-demographic variables. These questions collected information on age, gender, marital status, number of dependents, academic average, program and year of study, income (personal & household), hours/week paid work, living arrangement, commute to university, Canadian citizenship, domestic or international student status, ethnic/cultural ancestors' origin, parents' marital and employment status.

Comorbidities: The following self-reported diagnosed health conditions were measured using questions from the Canadian Community Health Survey[41] and the Ontario Common Assessment of Need[42]: allergies, anxiety, arthritis, asthma, attention disorder/learning disability, eating disorder, hypertension, intestinal or stomach ulcers, migraine headaches, mood disorder, scoliosis, and sexually transmitted infections.

Mental health disability: Self-reported disability in the past 30 days related to depression, anxiety, stress, and coping was measured with four questions of the World

Health Organization Model Disability Survey[43] (questions I4024m, I4025, I4030, and I4031). The questions asked "How much of a problem do you have with feeling sad, low or depressed?"; "How much of a problem do you have with feeling worried, nervous or anxious?"; "How much of a problem is handling stress, such as controlling the important things in your life?"; "How much of a problem is coping with all the things you have to do?". Responses were provided on a Likert scale with options ranging from '1' (no problem) to '5' (extreme problem).

Academic environment and social support: Two questions from the Student University Satisfaction Scale[44] were used to assess perceptions of academic environment. Questions asked "I find university's learning environment conducive"; and "I find the academic policies of my university student-friendly". Responses were "Never", "Sometimes", and "Always". Moreover, two questions from the Social Provisions Scale[45] were used measure social support. These questions asked "I have no close relationships that make me feel good", and "There is no one I feel comfortable talking about my problems with". Responses were "Strongly Disagree", "Disagree", "Agree", and "Strongly Agree".

Sleep quality: Sleep quality in the past week was measured with the Pittsburgh Sleep Quality Index (PSQI). The PSQI includes 19 questions grouped into 7 components, and provides a measure of self-reported sleep quality that distinguishes between 'good' and 'poor' sleepers[46,47]. The PSQI has adequate psychometric properties and is valid and reliable in adults[46,48].

Physical activity and sedentary behaviour: The Physical Activity and Sedentary Behaviour Questionnaire was used to measure physical activity and sedentary behavior in the past week. The PASB-Q provides self-reported measures of physical activity, muscle strength, perceived fitness, and sedentary behaviors and classifies individuals as excellent, very good, good, fair, or poor. The PASB-Q has adequate reliability and validity[49].

Food insecurity: The presence of food insecurity in the past 12 months was measured using the six-item Household Food Security Scale Module (HFSSM)[50]. Food insecurity refers to the inability to acquire or consume an adequate or sufficient quantity of food, or the uncertainty that one will be able to do so[51,52]. Responses to the six questions are used to classify respondents as: food secure, marginally food insecure, moderately food

insecure, and severe food insecure. The six-item HFSSM has adequate psychometric properties[53].

Neck and low back pain: The numerical rating scale (NRS) was used to measure average low back and neck pain intensity in the past seven days. A picture of a mannequin was provided to ensure that participants referred to standardized locations of the neck and low back. Students were asked to select a whole number (0 to 10 integers) on an 11 point scale that best reflected the intensity of their pain in the past week[54]. The NRS has established test-retest reliability and validity is several populations[55].

3.4 PILOT STUDY

The feasibility of recruiting and collecting data in class in three classrooms was tested in the spring of 2017 (See Chapter 2). A total of 137 participants from the faculty of health sciences were recruited. The in-class participation rate was 80%. The average time of completion was 15:35 (SD=4:27) minute and participants rated the length and clarity of the survey as adequate.

3.5 DATA ANALYSIS

3.5.1 Baseline Characteristics of the Sample and Participation Bias

I described the sample by computing the mean and standard deviations for continuous variables and proportions for dichotomous and categorical variables. I computed participation rates by dividing the number of respondents by the number of students enrolled in each faculty in September 2017. I assessed participation bias by comparing the study sample to available demographic information (age, gender, domestic student status, year of study) obtained from each faculty. I used t-tests and chi squared to compare the characteristics of the samples from the faculty of health sciences and the faculty of education.

3.5.2 Prevalence of Mental Health and Sedative Use

I computed the one-week prevalence and 95% confidence intervals (CI) for moderate to extremely severe symptoms of depression, anxiety, and stress. Similarly, I computed the lifetime and past three-month prevalence (95% CI) of sedative and sleeping

pill use. The number of students who responded to the survey was used as the denominator for all prevalence computation.

3.5.3 Association between Mental Health and Sedative Use

Logistic regression was used to assess the association between non-medical sedative and sleeping pill use in the past three months and moderate-extremely severe symptoms of depression, anxiety, and stress in the past week. Separate models were built for symptoms of anxiety, depression, and stress. My modeling strategy included four steps. First, I computed the crude association between sedative and sleeping pill use and symptoms of depression, anxiety, and stress. Second, I built a series of bivariate models to determine whether covariates changed the strength of the crude association (beta coefficient). A covariate was retained for step 3 of analysis if its addition to the crude model changed the beta coefficient for sedative and sleeping pill use by at least 10%. The following variables were considered covariates for the models: age, gender, academic average, year of study, ethnicity, marital status, annual income (personal), annual income (household), Canadian citizenship, sleep quality, physical activity, sedentary behaviour, neck pain, low back pain, medical conditions, diagnosis of a mood disorder, food security, alcohol use, marijuana use, cocaine use, and stimulant use. Categories within gender, marital status, personal income, household income, and food security were collapsed because some categories had few respondents. In the third step, I included all covariates that resulted in a 10% change in the crude beta coefficient in a final regression model. Finally in the final step, I aimed to build a valid yet parsimonious model by removing covariates that did not significantly contribute to the model (p-value > 0.05 on the Wald Chi-square test) by removing non-significant variables one at a time starting with the least significant one. Only covariates that did not change the beta coefficient for sedative and sleeping pill by more than 10% chance were permanently removed from the final model (See Appendix E for a flow chart of this process).

3.6 RESULTS

3.6.1 Participation

The overall participation rate for the study was 40%; it was 35% (675/1931) in the

faculty of health sciences and 77% (207/ 268) in the faculty of education. Although the survey targeted students enrolled in the faculty of health sciences and faculty of education, 10 students from other faculties (enrolled in courses as electives) completed the survey. These students were excluded from the analysis. Overall, participants were younger than students enrolled in each of the two faculties, but were similar regarding gender, year of study, or residency (Table 1).

3.6.2 Sample Characteristics

The average age of the entire sample was 23.0 years (SD=5.5), most were females (77.1%), and domestic students (98.6%). Most students were single (87.6%) with no dependents (73.9%) and a reported income of less than $5,000 (46%) (Table 2).

Participants from the faculty of health sciences and faculty of education differed according to age, gender, ethnicity, neck pain, academic average, and some of the substance use and personal, financial, and employment variables (Table 2). However, there were no differences between faculties with regards to lifetime prevalence of sedative use, 3-month prevalence of sedative use, and one-week prevalence of moderate-extremely severe symptoms of depression, anxiety, and stress. There was also no difference between the faculty with respect to the crude associations between past week moderate-extremely severe symptoms of depression, anxiety, and stress and past 3 month nonmedical sedative and sleeping pill use (Table 3). The absence of differences in the prevalence of the dependent and independent variable suggest that the association of interest can be evaluated in the entire sample rather than in each of the faculties separately.

3.6.3 Prevalence of Sedative and Sleeping Pills and Symptoms of Anxiety, Stress and Depression

In our sample 7.8% (95% CI [6.1, 9.8]) of respondents reported lifetime non-medical sedative and sleeping pill use, and 3.7% (95% CI [2.6, 5.2]) reported using sedative or sleeping pills in the past three months. When evaluating the prevalence of use in the past three months, 2.5% (95% CI [1.6, 3.8]) reported using sedatives or sleeping pills once or twice and 0.2% (95% CI [0, 0.8]) reported daily or almost daily use (Table

4).

Table 4. Past 3 month prevalence of non-medical sedative and sleeping pill use, and frequency of past 3 month use (% of total sample, number of users, 95% CI).

Frequency of non-medical sedative and sleeping pill use	Past 3 Month Use
Once or Twice	2.5% (22) [1.6, 3.8]
Monthly	0.5% (4) [0.1, 1.2]
Weekly	0.6% (5) [0.2, 1.3]
Daily or Almost Daily	0.2% (2) [0, 0.8]
Total	3.7% (33) [2.6, 5.2]

The one-week prevalence of moderate-extremely severe symptoms of depression was 30.3% (95% CI [27.3, 33.4]). Moreover, 47.3% (95% CI [43.9, 50.6]) reported moderate-extremely severe symptoms of anxiety in the past week and 25.5% (95% CI [22.7, 28.5]) moderate-extremely severe symptoms of stress in the same period.

3.6.4 Crude Association between Sedative and Sleeping Pills Use and Symptoms of Depression, Anxiety, and Stress

The crude analysis suggests that non-medical use of sedatives and sleeping pills in the past three months is not associated with moderate to extremely severe symptoms of depression (OR=1.16; 95% CI [0.53-2.54]) or anxiety (OR=0.65; 95% CI [0.32-1.31]). However, the use of sedatives and sleeping pills in the past three months was associated with moderate to extremely severe symptoms of stress (OR=0.39; 95% CI [0.20-0.80]); suggesting that users of sedatives or sleeping pills were less likely to report moderate to extremely severe symptoms of stress than non-users.

3.6.5 Adjusted Associations between Sedative and Sleeping Pills Use and Symptoms of Depression, Anxiety, and Stress

Results for the bivariate models that determined which covariates were included into the final model can be found in Table 5. The summary of the final models, with

covariates included, and adjusted odds ratios are presented in Table 6.

Moderate to extremely severe symptoms of depression

The final model included nine covariates and suggests that non-medical sedative and sleeping pills use in the past three months is not associated with moderate to extremely severe symptoms of depression in the past week (OR=1.30; 95% CI [0.53, 3.09]) (Table 5).

Moderate to extremely severe symptoms of anxiety

Six covariates were included in the final model. The final model suggests that non-medical sedative and sleeping pills use in the past three months is not associated with moderate to extremely severe symptoms of anxiety in the past week (OR=1.15; 95% CI [0.52, 2.55]) (Table 5).

Moderate to extremely severe symptoms of stress

The final model included 3 covariates, and suggest that non-medical sedative and sleeping pills use in the past three months is not associated with moderate to extremely severe symptoms of anxiety in the past week (OR=0.64; 95% CI [0.29, 1.42] (Table 5).

Table 6. Associations between past 3 month sedative use and past week symptoms of depression, anxiety, and stress, including covariates used in the final model.

Past-7 day Symptoms of Mental Health (Moderate-Extremely Severe)	Variables Included in Final Model	Adjusted Odds Ratios (95% CI)
Depression	sleep quality, sedentary behaviour, age, gender, alcohol, marijuana, neck pain, annual income, and household income	1.30 [0.53, 3.09]
Anxiety	mood disorder, age, marijuana, stimulant, neck pain, and back pain	1.15 [0.52, 2.55]
Stress	mood disorder, marijuana, and neck pain	0.64 [0.29, 1.42]

3.7 DISCUSSION

3.7.1 Summary of Results

The association between the non-medical use of sedatives and sleeping pills and student mental health was assessed in the UOIT Mental Health and Wellness Cross-sectional Study. A minority of students reported the non-medical use of prescription sedatives and sleeping pills in their lifetime (7.8%) and in the past three months (3.7%). However, an important proportion of students reported moderate-extremely severe symptoms of depression (30.3%), anxiety (47.3%), and stress (25.5%) in the past week. Although I found a crude association between non-medical sedative and sleeping pill use and moderate-extremely severe symptoms of stress, this association was explained by covariates. Overall, my results suggest that non-medical sedative and sleeping pill use is not associated with moderate-extremely severe symptoms of depression, anxiety, or stress in undergraduate students enrolled in the faculty of health sciences and faculty of education at the UOIT.

3.7.2 Comparison to Previous Research

3.7.2.1 Response rate

The response rate for my study was 40%. This rate is higher than many previous studies of student mental health[1,3,5,24,56], but is nevertheless suggest that selection bias may have influenced the results. However, a comparison of our sample to the university's undergraduate population demonstrates that our sample is representative with regards to gender, year of study, and residency status, therefore reducing the chances of selection bias.

3.7.2.2 Prevalence of non-medical sedative and sleeping pill use and symptoms of depression, anxiety, and stress

Previous research examining prevalence of sedative use often examines different report periods of consumption. Some reported lifetime use[20-22,24,25], while others reported use in the past year[11,20,21,57,58], or even more current use[20,22,24]. The lifetime prevalence of sedative and sleeping pill use measured in our study varied compared to previous studies[19,-24,57]. It is likely that these differences are due to differences in the types of

medications being investigated. For example, some studies explored sleeping pills and sedative separately[19,57], while some only examined benzodiazepines[20,21].

When compared to studies that used similar reference periods for consumption, my findings on the non-medical use of sedative and sleeping pills agree with previous research. Specifically, a survey of Canadian university students reported 2.1% of respondents reported past year non-medical sedative use[1]. Similarly, an American study reported that 2.3% and 3% of students reported using non-prescription sleeping medications and anxiety medications respectively[19] and a study from Ecuador reported that 3.9% of students report current non-medical use of sedatives[20]. The results of my thesis show slightly lower frequency of use among respondents than the only other previous study I found that examined frequency of sedative medication use[58]. However, the results of my thesis are agreeable with other studies that have found monthly or weekly use is more common than daily, or more frequent use[23,58].

Generally, my results agree with previous finding of prevalent mental illness or symptoms on university campuses[1-4,59]. However, the reported prevalence of symptoms of depression, anxiety, and stress are difficult to compare to other studies because most studies used different measurement methods and investigated different populations. Some studies asked about past diagnosis of mental illnesses[2], whereas other used different tools to assess symptoms or experiences of mental health issues[3-5,59]. However, previous studies that used the DASS (either the 21 or 42 item versions) reported similar results. For example, the study by Baryam et al.[60] reported that similar prevalence of moderate to extremely severe symptoms of depression (27%), anxiety (47%), and stress (27%) in a sample of Turkish university students. My results are also comparable to those found by Beiter et al.[61], who reported moderate to extremely severe symptoms of depression (23%) and stress (26%) in a sample of American university students. Even when comparing to similar studies there are concerns over methodology and the reliability of their results.

3.7.2.3 Associations between non-medical sedative and sleeping pill use and depression

My results that non-medical use of sedative and sleeping pill is not associated with moderate to extremely severe symptoms of depression, anxiety, and stress does not agree with previous research. Previous studies reported that those who engage in the non-

medical use of prescription medications, such as opioids, stimulants, and sedatives, report higher symptoms of mental health issues[11,24,57,58]. Many of these studies, however, examine groups of prescription medications together and do not assess sedatives independently. In fact, I found only one study that explored the association between sedative use and depression[11] and that study found that students reporting sedative use were more likely to report feelings of depression.

The differences in results may be due to differences in methodology between my study and previous studies. Specifically, Zullig et al.[11] relied on data from the 2008 American ACHA survey. This survey assessed the past year non-medical use of sedatives and defined non-medical use as only including taking medications "not prescribed to you." In contrast, my study asked about more recent non-medical sedative use defined as off label use or taking medications that are not prescribed to you. It is likely that the ASSIST is a more valid measure of non-prescription medication use which may have reduced measurement bias. Differences in findings may also be a function of the instruments used to assess mental health. My study uses the DASS 21 to assess symptoms of depression, anxiety, and stress, whereas Zullig et al.[11] asks about feelings of depression.

3.7.2.4 Associations between non-medical sedative and sleeping pill use and anxiety, stress

I did not find previous studies that examined the association between non-medical use of sedative and sleeping pills and symptoms of stress or anxiety in university students. However, the results of the current study are not surprising because sedatives are commonly prescribed for anxiety and sleep difficulties. They are CNS depressants that are designed to induce a calming effect. So it may be that those using sedatives, whether prescribed or not, will experience fewer symptoms of mental health issues because that is the intended effect of those medications. Therefore, it is possible that students engage in self-medication. Another possible reason for the lack of associations between non-medical sedative and sleeping pill use and mental health may be the low reported frequency of use. I showed that although 3.7% of students reported use in the past 3 months, most (2.5%) reported having only used 1-2 times in that period. Since

frequency of use of other substances (marijuana and alcohol use) is a predictor of mental health, it is possible that the lack of association is due to low frequency if use[12,62-64].

It is important to note that there was a significant crude negative association between non-medical use of sedatives and sleeping pills and moderate to extremely severe symptoms of stress. This relationship remained negative, but was no longer significant once covariates were controlled for. This change could be due to a low sample size or due to the effect of the covariates "marijuana use in the past 3 months", "past week neck pain", and "diagnosis of a mood disorder" on the variables of interest. For example, marijuana use in the past 3 months could contribute to the relationship between sedative and sleeping pill use and symptoms of stress through the finding that polysubstance use is common in those who report the non-medical use of prescription medications, and those who experience mental health issues may self-medicate[13-15,65]. Neck pain may also be related to sedative and sleeping pill use through self-medication, and may be related to stress through pains connection to poor mental health. Finally, the covariate mood disorder may be related to stress through patterns of comorbidity, and may be related to sedative and sleeping pill use through self-medication.

3.7.3 Strengths

My study has several strengths. First, I was able to assess the representativeness of our sample by comparing study participants to students enrolled in each faculty. The analysis suggests that our sample is representative of our population with regards to gender, year of study, and residency status. Second, I measured my dependent variable, independent variable, and covariates using standardized and psychometrically sound questions and instruments, which minimize measurement bias. Third, data was collected online which minimized biases related data transfer, coding, and completeness. Finally, I measured and used a wide range of covariates to test the independence of the association in my regression models.

3.7.4 Limitations

My study also had limitations. First a potential limitation of the study is social desirability bias. My study asked sensitive questions about health and wellness, so it was

possible students did not answer honestly. Second, participation rate for this study was 40%. Although higher than previous similar studies, this could have resulted in our sample not capturing a true range of mental health and sedative use behaviours; biasing the results. For example, only capturing healthy students, or only capturing those with experience with mental health issues. Finally, we studied students enrolled in two of the faculties at our university and therefore, my results may not be generalizable to other faculties or universities.

3.7.5 Future Directions

A cohort study is needed to understand whether non-medical sedative use is a risk factor for poor mental health in university students. Qualitative research may also be helpful to understand students' experiences with substance use and mental health. Future research should also assess the motivations for substance use and investigate other mental health disorders and substances. For example, opioids are a significant public health problem in Ontario, and especially the areas surrounding Durham Region[66].

3.7.6 Conclusion

My thesis is the first to investigate the association between the non-medical use of sedatives and sleeping pills and symptoms of mental health in Canadian University students. I reported on the lifetime and past 3 month prevalence of non-medical sedative and sleeping pill use and past week symptoms of depression, anxiety, and stress. I was also able to examine the association between the non-medical use of sedative and sleeping pills and student mental health. The results suggest that the non-medical use of sedatives and sleeping pills is not associated with symptoms of moderate to extremely severe symptoms of depression, anxiety, and stress in undergraduate students. However, my findings do not allow me to determine whether non-medical sedative and sleeping pill use is a risk factor for mental health because of the cross-sectional nature of the study.

My thesis demonstrates that poor mental health presents a significant issue on the UOIT campus and that some students are engaging in the non-medical use of sedative and sleeping pills. This information can inform future policies at our university to address

student health. Future research is needed to better understand student mental health and explore other potential risk factors for mental health issues on campus.

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Table 1. Comparison of faculty of health sciences and faculty of education population with study sample.

	Faculty of Health Sciences			**Faculty of Education**		
Comparison Variable	**Population (n=1931)**	**Sample (n=675)**		**Population (n=268)**	**Sample (n=207)**	
Age	24	22.1		28	25.6	
Gender	75.9% F	79.9% F		66.7% F	68.1% F	
Year of Study:						
Year 1	18.1%	25.3%		52.4%	33.3%	
Year 2	26.3%	25.6%		47.6%	34.5%	
Year 3	27.2%	21%		0%	0%	
Year 4	25.5%	26.5%		0%	0%	
Year5+	2.9%	1.5%		0%	31.9%	
Residency	98.3% Domestic	98.3% Domestic		99.6% Domestic	99.5% Domestic	

Table 2. Characteristics of students enrolled in the faculty of health sciences and the faculty of education.

Variable	Faculty of Health Sciences (n=675)	Faculty of Education (n=207	Total sample (n=882)
Age (Mean; SD)	22.1 (SD:5.5)	25.6 (SD:4.8)	22.98 (SD:5.5)
Gender			
Female	79.9%	68.1%	77.1%
Make	19%	31.4%	21.9%
Female to Male	0.3%	-	0.2%
Male to Female	-	-	-
Queer	0.3%	0.5%	0.3%
Do Not Disclose	0.3%	-	0.2%
Other	0.3%	-	0.2%
Program		NA	
Nursing	29.8%		22.8%
Kinesiology	29.2%		22.3%
Public Health	12.6%		9.6%
HH	11.4%		8.7%
MedLab	7.1%		5.4%
Allied Health	2.1%		1.6%
Health	1.3%		1%
Sciences Comprehensive			
Fitness	1.8%		1.4%
Nursing Bridge	4.6		3.5%
Other	0.1%		0.1%
Year of Study			
1	25.3%	33.3%	27.2%
2	25.6%	34.8%	27.8%
3	21%	0	16.1%
4	26.5%	0	20.3%
5+	1.5%	31.9%	8.6%
Comorbidities (yes)	52.6%	54.1%	52.9%

PASB-Q			
Physical Activity			
Excellent	18.1%	14.2%	17.2%
Very Good	8%	5.9%	7.5%
Good	13.9%	14.2%	14%
Fair	25.1%	26.5%	25.4%
Poor	34.8%	39.2%	35.9%
Muscle Strength			
Excellent	19.3%	13.5%	17.9%
Very Good	14.8%	9.3%	13.6%
Good	16.7%	15.5%	16.5%
Fair	13.4%	19.2%	14.8%
Poor	35.7%	42.5%	37.3%
Perceived Fitness			
Excellent	6.7%	6.3%	6.6%
Very Good	20%	17.9%	19.5%
Good	38.2%	40.1%	38.7%
Fair	24.9%	26.6%	25.3%
Poor	10.2%	9.2%	10%
Sedentary			
Excellent	0	0	0
Very Good	1.3%	0.5%	1.1%
Good	6.8%	2.4%	5.8%
Fair	33.2%	24.2%	31.1%
Poor	58.7%	72.9%	62%
DASS-21 (Moderate-extremely severe)	31.9%	25.1%	30.3%
Depression	48.6%	43%	47.3%
Anxiety	25.9%	24.2%	25.5%
Stress			
WHO DQ (3-5)			
Depression	43.3%	42%	43%
Anxiety	61.9%	63.7%	62.4%
Stress	60.4%	59.9%	60.2%
Coping	62.2%	65.7%	62.9%
PSQI (poor sleep)	63.6%	64.7%	63.8%
Food Security			
Secure	72.1%	77.3%	73.3%
Moderate	12.2%	10.6%	11.8%
Moderate	11%	6.3%	9.9%
Severe	4.6%	5.8%	4.9%
Neck Pain (yes)	63.7%	54.6%	61.6%

Neck Pain (rating)	3.5 (SD: 2.5)	3.1 (SD: 2.4)	3.4 (SD: 2.5)
Back Pain (yes)	67.4%	60.9%	65.9%
Back Pain (rating)	3.8 (SD: 2.7)	3.6 (SD: 2.8)	3.7 (SD: 2.7)
ASSIST-Tobacco life	33.5%	42%	35.5%
ASSIST-Tobacco 3 month	14.1%	20.8%	15.6%
ASSIST-Alcohol life	78.2%	86%	80%
ASSIST-Alcohol 3 month	72.3%	82.1%	74.6%
ASSIST-Marijuana life	44.1%	51.2%	45.8%
ASSIST-Marijuana 3 month	24%	28.5%	25.2%
ASSIST-Cocaine life	5.2%	7.7%	5.8%
ASSIST-Cocaine 3 month	1.5%	2.4%	1.7%
ASSIST-Stimulants life	9.2%	9.7%	9.3%
ASSIST-Stimulants 3 month	4%	3.9%	4%
ASSIST-Inhalant life	0.9%	2.9%	1.4%
ASSIST-Inhalant 3 month	0.4%	0.5%	0.5%
ASSIST-Sedative life	7.4%	9.2%	7.8%
ASSIST-Sedative 3 month	3.4%	4.8%	3.7%
ASSIST-Hallucinogen life	5.9%	8.7%	6.6%
ASSIST-Hallucinogen 3 month	1.3%	1.4%	1.4%
ASSIST-Opioid life	2.7%	2.4%	2.6%
ASSIST-Opioid 3 month	0.1%	0.5%	0.2%
ASSIST-Injection (yes, but not in past 3 months)	0.3%	0.5%	0.3%
Student Life 1 (sometimes and always)	95.4%	93.7%	95%
Student Life 2 (sometimes and always)	96.6%	87.9%	94.6%

Student Life 3 (agree and strongly agree)	89.5%	89.9%	89.6%
Student Life 4 (agree and strongly agree)	17.6%	15.9%	17.2%
Marital Status			
Single	89%	83.1%	87.6%
Married	8.7%	15.5%	10.3%
Separated	1.9%	1.4%	1.8%
Widowed	0.3%	0%	0.2%
Dependents			
0	72.6%	78.3%	73.9%
1	7.4%	3.9%	6.6%
2	13%	14.5%	13.4%
Academic Average in the Last Year			
A	51%	82.1%	58.3%
B	34.2%	16.4%	30%
C	11.9%	1.4%	9.4%
D	3%	2.3%	2.3%
Annual Personal Income			
0-4999	47.6%	41.1%	46%
5-9999	27.3%	30.9%	28.1%
10-19999	13.9%	17.4%	14.7%
20000+	10.2%	9.7%	10.1%
Household Income			
0-49999	23.6%	20.3%	22.8%
50-59999	15.3%	15.9%	15.4%
60-79999	15.4%	18.8%	16.3%
80000+	44.4%	41.1%	43.7%
Hours of work a week			
0	35.7%	37.2%	36.1%
1-9	18.2%	19.8%	18.6%
10-19	25.3%	28%	26%
20-29	12.4%	12.6%	12.5%
30-39	6.2%	1.9%	5.2%
40+	2.1%	0.5%	1.7%

Living arrangement			
Relatives	64.4%	72.5%	66.3%
Non Relatives	15.7%	5.8%	13.4%
Residence	11.9%	1.9%	9.5%
Alone	3.7%	4.8%	4.0%
With a partner	9.8%	15.9%	11.2%
Commute			
Less than 15 min	36.1%	17.4%	31.7%
15-29 min	23.4%	18.4%	22.2%
Citizenship (Canadian)	79.6%	83.6%	80.5%
Residency (domestic)	98.4%	99.5%	98.6%
Ethnicity			
Aboriginal	5.2%	2.4%	4.5%
Black	8.6%	3.9%	7.5%
Caucasian	51.7%	60.9%	53.9%
Parents Marital Status			
Single	5%	4.3%	4.9%
Married	18.5%	18.4%	18.5%
Divorced	73.3%	72%	73%
Widowed	3.1%	5.3%	3.6%
Parental Employment Status			
Fulltime	77.8%	62.3%	74.1%
Part time	6.2%	3.9%	5.7%
Parental Employment Status			
Fulltime	50.4%	49.3%	50.1%
Part time	12.6%	5.8%	11%

Table 3. Crude association between non-medical sedative and sleeping pill use in the past 3 months and symptoms of depression, anxiety, and stress in the past week.

	Faculty of Health Sciences			**Faculty of Education**		
	Depression OR (95% CI)	**Anxiety OR (95% CI)**	**Stress OR (95% CI)**	**Depression OR (95% CI)**	**Anxiety OR (95% CI)**	**Stress OR (95% CI)**
Past 3 Month Sedative Use	1.071 [0.434, 2.642]	0.597 [0.255, 1.399]	0.367 [0.159, 0.847]	1.361 [0.28, 6.621]	0.672 [0.176, 2.571]	0.457 [0.124, 1.689]

Table 5. Bivariate associations between non-medical sedative and sleeping pill use in the past 3 months and past week symptoms of depression, anxiety, and stress.

Covariates (+Sedative Use)	**Depression OR (95% CI)**	**Anxiety OR (95% CI)**	**Stress OR (95% CI)**
PSQI	1.302 (0.577-2.938)*	0.679 (0.324-1.424)	0.391 (0.185-0.827)
Medical Cond	1.256 (0.574-2.753)*+	0.718 (0.353-1.459)*+	0.439 (0.316-0.891)*+
Mood Dis	NA	0.866 (0.411-1.823)*	0.577 (0.257-1.203)*
Caucasian	1.128 (0.516-2.465)*+	0.635 (0.314-1.285)	0.401 (0.198-0.810)
Black	1.165 (5.34-2.542)	0.649 (0.321-1.312)	0.392 (0.194-0.791)
HFSD	1.186 (0.538-2.613)*+	0.653 (0.320-1.334)	0.397 (0.195-0.808)
Sedentary Behaviour	1.132 (0.517-2.475)*	0.631 (0.311-1.279)	0.377 (0.185-0.766)
Physical Activity	1.157 (0.529-2.529)	0.657 (0.324-1.331)	0.398 (0.197-0.804)
Age	1.091 (0.498-2.390)*	0.615 (0.303-1.247)*	0.384 (0.190-0.777)
Gender	1.224 (0.554-2.703)*	0.655 (0.324-1.327)	0.400 (0.197-0.810)
Alcohol	1.131 (0.517-2.472)*	0.659 (0.326-1.334)	0.399 (0.197-0.807)
Marijuana	1.303 (0.591-2.871)*	0.714 (0.350-1.455)*	0.439 (0.215-0.896)*
Cocaine	1.122 (0.512-2.460)*+	0.631 (0.310-1.283)	0.410 (0.202-0.834)
Stimulant	1.360 (0.600-3.080)*+	0.786 (0.377-1.637)*	0.416 (0.200-0.867)
Neck Pain	1.254 (0.572-2.747)*	0.727 (0.355-1.487)*	0.440 (0.214-0.905)*
Back Pain	1.244 (0.568-2.723)*+	0.718 (0.351-1.467)*	0.423 (0.208-0.861)
Average	1.176 (0.537-2.578)	0.648 (0.320-1.310)	0.394 (0.195-0.796)
Marital Status	1.150 (0.526-2.514)	0.643 (0.318-1.302)	0.392 (0.194-0.792)
Annual Income	1.089 (0.495-2.396)*	0.664 (0.325-1.355)	0.369 (0.181-0.752)
Year of Study	1.160 (0.530-2.535)	0.644 (0.318-1.305)	0.390 (0.192-0.791)
Canadian Citizenship	1.178 (0.539-2.572)	0.654 (0.323-1.323)	0.420 (0.207-0.852)
Household Income	1.131 (0.515-2.484)*	0.648 (0.320-1.312)	0.391 (0.193-0.791)

*Bivariate models that resulted in a more than 10% change in the Beta for past 3 month sedative use.

+Covariates that were removed from the adjusted model because their significance level was more than 0.40

CHAPTER 4: THESIS DISCUSSION

4.1 THESIS SUMMARY

Through the implementation of the UOIT Mental Health and Wellness Study, I explored the association between the non-medical sedative and sleeping pill use and moderate to extremely severe symptoms of depression, anxiety, and stress in undergraduate university students in two faculties at the UOIT. My study is one of the first epidemiological examinations of this association in university students and my research was informed by the available peer-reviewed literature and a pilot study conducted in the target population at UOIT.

4.1.1 Pilot Study

We conducted a pilot study to determine the feasibility of completing a cross-sectional study of mental health in undergraduate students. We developed a survey instrument that included valid and reliable tools and questions to measure student mental health and identify potentially modifiable risk factors. The pilot study confirmed that studying mental health at UOIT was feasible and that the survey instrument was clear, acceptable in length and adequate for in-class administration. The data collected during the pilot study also confirmed that students were comfortable with answering sensitive questions about their mental health and substance use. Finally, it confirmed that it was feasible to study the association between non-medical sedative and sleeping pill use and symptoms of depression, anxiety, and stress.

4.1.2 Cross-sectional Study

The general objectives of the cross-sectional study were to examine the association between student mental health, sociodemographic variables, comorbidities and lifestyle factors. The specific objectives of my thesis were to: 1) measure the lifetime and past 3-month prevalence of non-medical sedative and sleeping pill use; 2) measure the one-week prevalence of moderate to extremely severe symptoms of depression, anxiety, and stress; and 3) measure the association between the non-medical use of sedative and sleeping pills, and moderate to extremely severe symptoms of depression, anxiety, and stress.

The results of my thesis advance the knowledge in this field because previous studies on the association between sedative use and mental health in university students have important methodological limitations. First, the definition of "sedatives" and "non-medical use" was not standardized in several studies[1-4]. Second, it is not clear whether previous studies used valid and reliable methods to measure mental health issues[1-3,5-7.] For example, some studies ask about motivations for use[2,6,7], while others asked about symptoms or presence of mental health issues [1,4]. In addition, many studies had low participation rates and were therefore liable to selection bias[1,2,7,8]. Finally, studies in this field do not adequately control covariates when measuring the association between non-medical sedative and sleeping pill use and symptoms of depression, anxiety, and stress[1,2,6]. Overall, these issues likely introduced bias and reduced the validity of the available research. My thesis sought to address these methodological limitations by using psychometrically sounds assessments in the questionnaire and maximizing participation.

I found that the lifetime and 3-month prevalence of non-medical sedative and sleeping pills use were 7.8% (95% CI [6.1, 9.8]) and 3.7% (95% CI [2.6, 5.2]) respectively, with 2.5% (95% CI [1.6, 3.8]) reporting using sedatives or sleeping pills once or twice in the past three months. The reported lifetime prevalence is within the range of previous studies[3,4,6-10], while the past 3 month prevalence is consistent with previous research[6,10,11].

I also found that the one-week prevalence of moderate to extremely severe symptoms of depression, anxiety, and stress were 30.3% (95% CI [27.3, 33.4]), 47.3% (95% CI [43.9, 50.6]), and 25.5% 95% CI [22.7, 28.5]) respectively. My estimates of the prevalence of mental health symptoms are similar to those of previous studies from Turkey and the United States that used the DASS 21[12,13]. However, my results may not be directly comparable to previous studies that use different measurement methods of mental health. Nevertheless, my results agree with the finding that mental health symptoms are common on university campuses[11,14-17].

My multivariable logistic regression analysis suggest that the use of non-medical sleeping pill and sedatives is not associated with moderately to extremely severe symptoms of depression, anxiety, or stress. These results disagree with previous research which found that sedative use was associated with feelings of depression[1]. Similarly,

previous research suggests that some students report the non-medical use of sedatives to help cope with stress, anxiety, and depression [6,7]. The differences in results may be explained by differences in the: 1) definition and measurement of sedative use and 2) definitions and measurement of mental health symptoms (for example self-reported diagnosis versus measurement with a valid and reliable tool).

Conceptually, the lack of association between non-medical use of sleeping pills and sedative and moderately to extremely severe symptoms of depression, anxiety, or stress is not surprising because sedative medications are commonly prescribed for sleep and anxiety issues[18]. Therefore, participants who reported using sedative non-medically may report fewer symptoms of mental health because the medication is effective in reducing their symptoms. It may also be due to the low frequency of use in my study. Previous studies have noted that the frequency of use of a substance may be associated with mental health outcomes[19-21].

4.2 IMPLICATIONS

The one-week prevalence of symptoms of moderately to extremely severe symptoms of depression, anxiety, and stress in my sample of UOIT students is concerning for several reasons. First, it suggests that the student population struggles with significant symptoms of poor mental health. This is alarming because previous research has shown that students with poor mental health may not seek care or support for mental health[22-24]. This is also important because poor mental health is associated with poor academic outcomes, substance use, and suicide/self- harm[1,17,26-28].

Similar concerns can be noted when considering non-medical sedative and sleeping pill use. Although a relatively small number of students reported use in the past three months, the risks of use are still present for those students. Even though I found no association between non-medical sedative and sleeping pill use and symptoms of mental health, the use of sedative medications can lead to dependence, cognitive issues, health complications, early death, and overdose risk[29-34]. Therefore, the findings of my thesis cannot be used to validate the non-medical use of sleeping pills and sedatives without a valid prescription. In fact, I believe that the use of medications should be avoided because

of the associated health risks, and universities should consider developing plans to address this issue on their campuses.

When considering an intervention for substance use in this population, the initial thought may be to encourage students not to use substances. However, prohibition or encouraging someone not to use a substance may not effectively reduce use[35]. The concept of prohibition ignores the idea that not all use is problematic. For example, in a study conducted by Holloway et al.[2] only 10% of those reporting non-medical medication use reported experiencing a negative consequence. In a study by Boyd et al.[36] of sedative misuse in the general population, it was revealed that few individuals that misused sedative went on to develop a substance use problem. Moreover, it is the frequency of use that may play a role in the development of poor mental health. In a study by McCabe et al.[20] more frequent use of stimulant medication was associated with higher scores on a measure of problematic substance use. This finding is echoed by other studies examining stimulant use and marijuana use[19,21]. Therefore, encouraging students to avoid using may discourage an open dialogue about substance use. Instead, a well-informed harm reduction approach that focuses on education and policy changes at the university level may be more beneficial to students.

Harm reduction is a drug intervention approach that strives to reduce the risks associated with use, without calling for abstinence[37]. It acknowledges that individuals may not be able or willing to stop their substance use, but that risks associated with use can be reduced to improve outcomes for users. Some well-known examples of harm reduction include safe injection sites, needle exchanges, and providing clean drug kits[38]. However, the implementation of harm reduction programs is challenging. Specifically, the difficulty with employing a harm reduction approach is the lack of formal processes and stigma[39,40]. Harm reduction is one of the pillars of Canadas' drug strategy, however a recent review of policies and frameworks revealed that few provinces have a formal strategy for this type of intervention[39,41]. Harm reduction, although a specific practice could be accepted as a philosophy for care at universities and integrated into student education and policy changes.

Harm reduction strategies have been used by universities to address substance use on campuses[42-45]. In reviews by Marlatt et al.[44] and Neighbors et al.[45], harm reduction

strategies to address harmful alcohol consumption on campuses were discussed. The authors reported that programs that utilize a harm reduction approach to minimize harmful drinking in university students have reduced drinking related harms and consequences. These studies point to programs that focus on educating students around the harms of alcohol use, safe drinking practices, as well as motivational interviewing skills to help with self-reflection regarding personal alcohol use.

Harm reduction research involving the non-medical use of medications is less common than research exploring alcohol or illicit drug use. Nevertheless, recommendations have been developed for education and policy on reducing non-medical prescription medication use in university students; many of which embrace a harm reduction philosophy. For example, Arria et al.[46] recommended education and policy changes to address stimulant use on university campuses, and state that their recommendations could be applied to other medications. They suggest providing information to students about the risks of use by highlighting research findings and real-life consequences of use. Moreover, the authors recommend encouraging students to discuss use and its potential harms to destigmatize the topic and creating an atmosphere where students can talk about use. The authors also make recommendations for university policy. These include encouraging campus doctors to be aware of substance use patterns in the community and prescribe medications cautiously, as well as the creation of university actions plans to reduce use. In their study, Holloway et al.[47] recommended that universities should understand drug use patterns in their own community by searching trends online, and provide up-to-date and accurate information to students about the harms of use. Other studies have recommended early assessment of mental health and substance use, and the development of intervention strategies based off understanding motivations for use[48,49].

The above studies make general recommendations that could be applied to the non-medical use of any medication. When applied to the non-medical use of sedatives, education could involve the risk of specific harms (such as overdose risks when mixed with other nervous system depressants and cognitive decline) associated with misusing sedatives. Students may be particularly interested in, and unaware of, the negative impact of sedatives on academic performance. Previous research suggests that students often

report the non-medical use of stimulants as a means to increase their academic performance, but the actual benefits are understated and do not outweigh the risks of use[50]. Education strategies could also address the underlying reasons for use (ie. to cope with mental health symptoms) by providing information about improving coping skills, resiliency, organizational/academic skills, and on campus mental health and substance use supports.

Students will likely continue to use prescription sedatives non-medically, and although not all will develop an issue as a result of their substance use, the risks associated with non-medical use are substantial. Research about the non-medical use of sedatives should be used to inform university policies and education directed at students, with the aim of reducing the risks associated with use.

4.3 STRENGTHS

The primary strength of the study is the use of valid and reliable assessment tools to measure constructs. We also included a wide range of covariates to be used in our models. Another key strength was the recruitment strategy and data collection methods. The study design allowed for consistent data collection that minimized data transcription and transfer errors. Finally, my sample was also representative of the student population enrolled in the two faculties.

4.4 LIMITATIONS

The first limitation of my thesis relates to selection bias. The overall participation rate was 40%. Although our sample was representative of the population of students enrolled in the two faculties, it is nevertheless possible that they differ on factors related to mental health and sedative use. Second, it is possible that the measurement of sedatives, sleeping pills and mental health were influenced by social desirability bias. Due to the nature of the survey, students may not have been comfortable providing answers; resulting in an underestimation of mental health and substance use. Finally, my results may not be generalized to other faculty at the university, or other universities.

4.5 FUTURE DIRECTIONS

My thesis focused on the one-week prevalence of moderate to extremely severe symptoms of depression, anxiety, and stress. Future research should investigate other mental health issues and illnesses, such as specific anxiety and mood disorders, psychosis, and substance dependence. Late teenage years to early 20s are a common time for the development of mental health symptoms and illnesses[51,52]. Therefore, the assessment of other mental health issues or illnesses is needed to get a fuller picture of mental health on university campuses. Motivations for substance use are also an important area to study. Reasons for use are a key consideration when developing and implementing a prevention program. For example, if students are reporting substance use to cope with mental health, then an intervention aimed at addressing underlying mental health issues and teaching coping skills may be more effective. On the other hand, if students use sedatives to cope with the demands of the academic programs, then interventions focused on developing healthy academic skills and dispelling the myths associated with use (ie. substances may hinder cognitive abilities not improve them) may be needed. Motivations for non-medical sedative use could be explored through questionnaires or qualitative studies that inquire about reasons for substance use. Finally, a cohort study to determine whether non-medical sedative and sleeping pill use is associated with mental health problems is needed to understand the etiology of depression, anxiety and stress in university students.

4.6 CONCLUSIONS

Mental health is a public health concern in Canada. University students are a particularly vulnerable population when it comes to mental health and its impact. My professional and personal experiences with mental health have highlighted to me the challenges that youth face when experiencing the pressures of school and personal life while separated from their support networks. I am also aware through my various experiences that the non-medical use of sedatives does occur. I have been told by individuals using sedatives non-medically that they have done so for a variety of reasons, but one of the most common is to cope with their mental health.

My thesis found that symptoms of depression, anxiety, and stress are prevalent in the faculty's surveys, and a small number of students are engaging in the non-medical use of sedative and sleeping pills. I did not find an association between sedative use and mental health. This may be due to the fact that sedative and sleeping pills use may not impact mental health at the levels being reported by students in my study, or because use of these medications reduces mental health symptoms. This information provides necessary background information to further explore mental health and sedative use on university campuses. Cohort and qualitative studies that assess the link between sedative use, frequency of use, and motivations for use could shed more light onto this issue.

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APPENDICES

Appendix A

Literature Search Results:

Sedative Use and Mental Health in University Students

Initial Search:

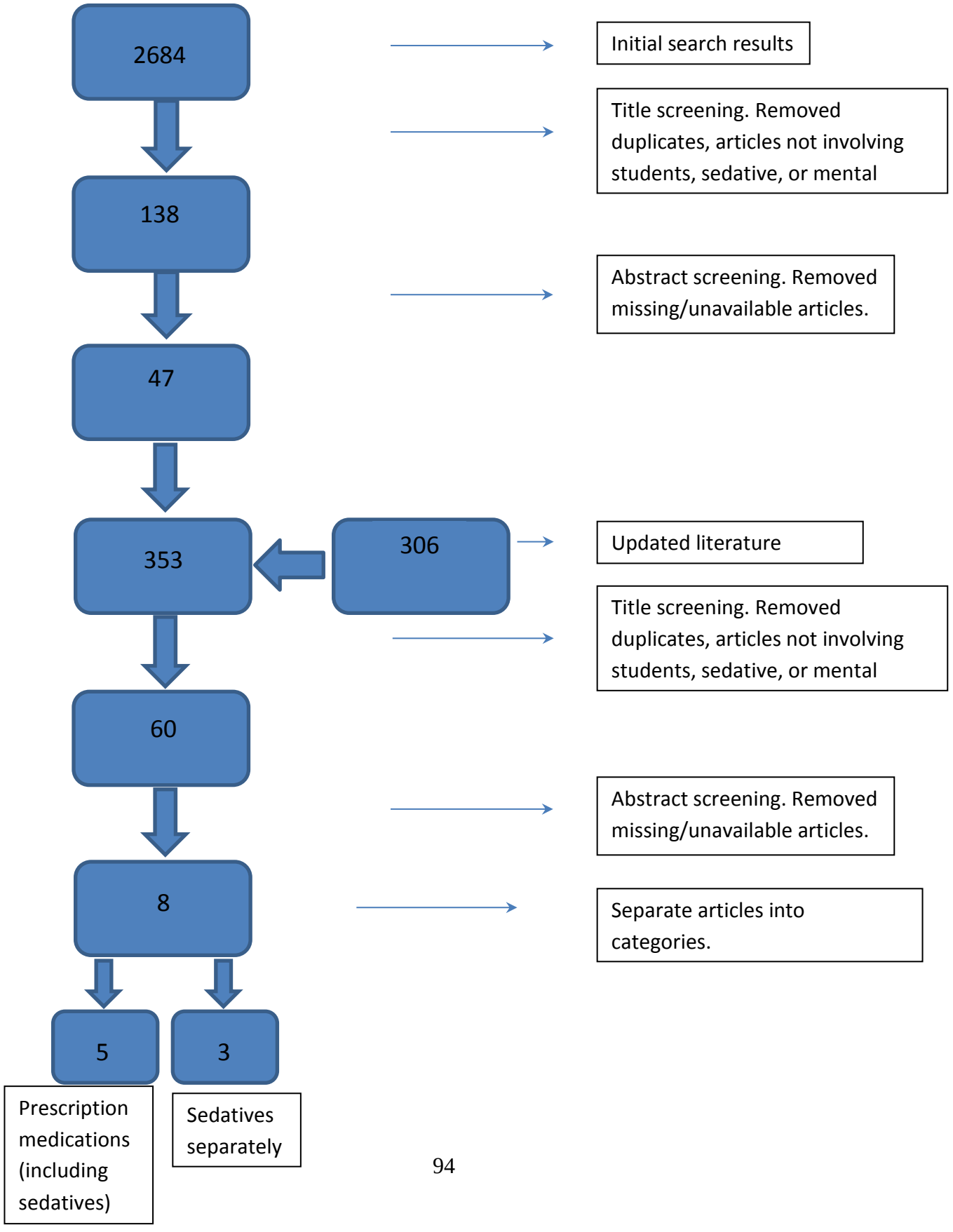
Database	**Date**	**Search Terms**	**Articles**
PsychInfo	February 21, 2017	Student AND (college OR university OR undergraduate OR Postsecondary)) AND (sleeping pills OR sedatives OR benzodiazepine OR clonazepam OR Ativan OR Valium) AND (mental health OR depression OR anxiety OR stress) – last 10 years and peer reviewed	3
PubMED	Feb 26, 2017	((student) AND college OR university OR undergraduate OR postsecondary) AND (sleeping pills OR sedatives OR non-medical use of prescription* Or benzodiazepine OR clonazepam OR Ativan OR Valium) AND (mental health OR depression OR anxiety OR stress)) Sort by: Relevance Filters: published in the last 10 years; Humans	2681

Updated Search:

PsychInfo	January 7, 2018		4
PubMED	January 5, 2018		302

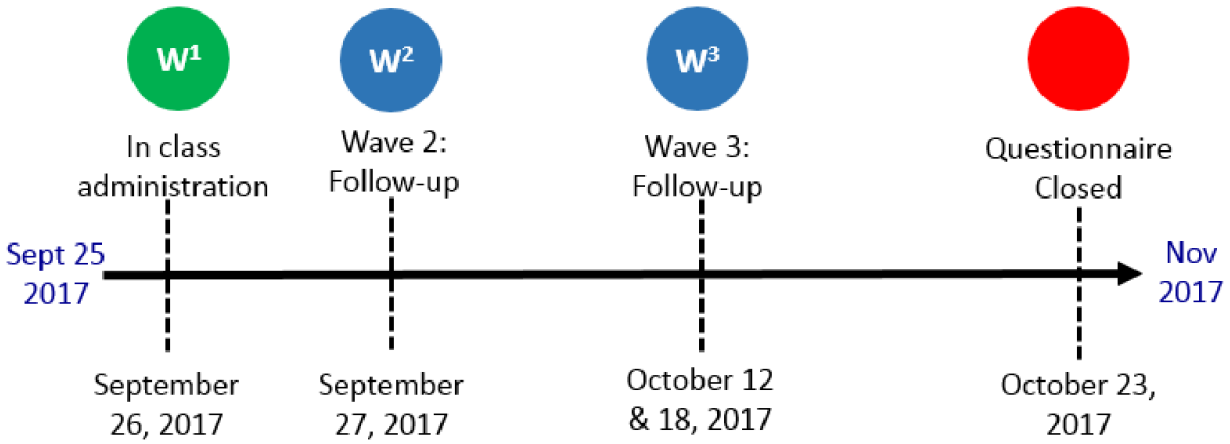
Appendix B

Literature Screening Results



Appendix C

Recruitment Waves



Appendix D

In-Class Script (MHWS): Professor

In class introduction script (for professors)

Good Morning/Afternoon. Hoping you read the email sent out to you regarding exciting research university student mental health and wellness supervised by Dr. Pierre Côté and Graduate students here at CMCC (& UOIT). Please welcome members of the research team here to conduct the pilot administration of the questionnaire they have developed.

UNIVERSITY OF ONTARIO INSTITUTE OF TECHNOLOGY | FACULTY OF HEALTH SCIENCES

UOIT-CMCC Centre for Disability Prevention and Rehabilitation

In-Class Script (MHWS): Research Team

Good Morning/Afternoon. My name is Michael Short/Nayantara Hattangadi/Andrew Reynolds. I am a Graduate student in the Faculty of Health Sciences. My thesis supervisor is Dr. Pierre Côté and I am studying mental health and wellness in undergraduate students. Therefore, we are conducting an online survey to better understand mental health and wellness in undergraduate university students.

In order to conduct the study at the university, we need to understand if it is adequate and acceptable to you. We have spoken with your professors about testing the questionnaire in your class and they have agreed. The study is also supported by the Dean, of your Faculty.

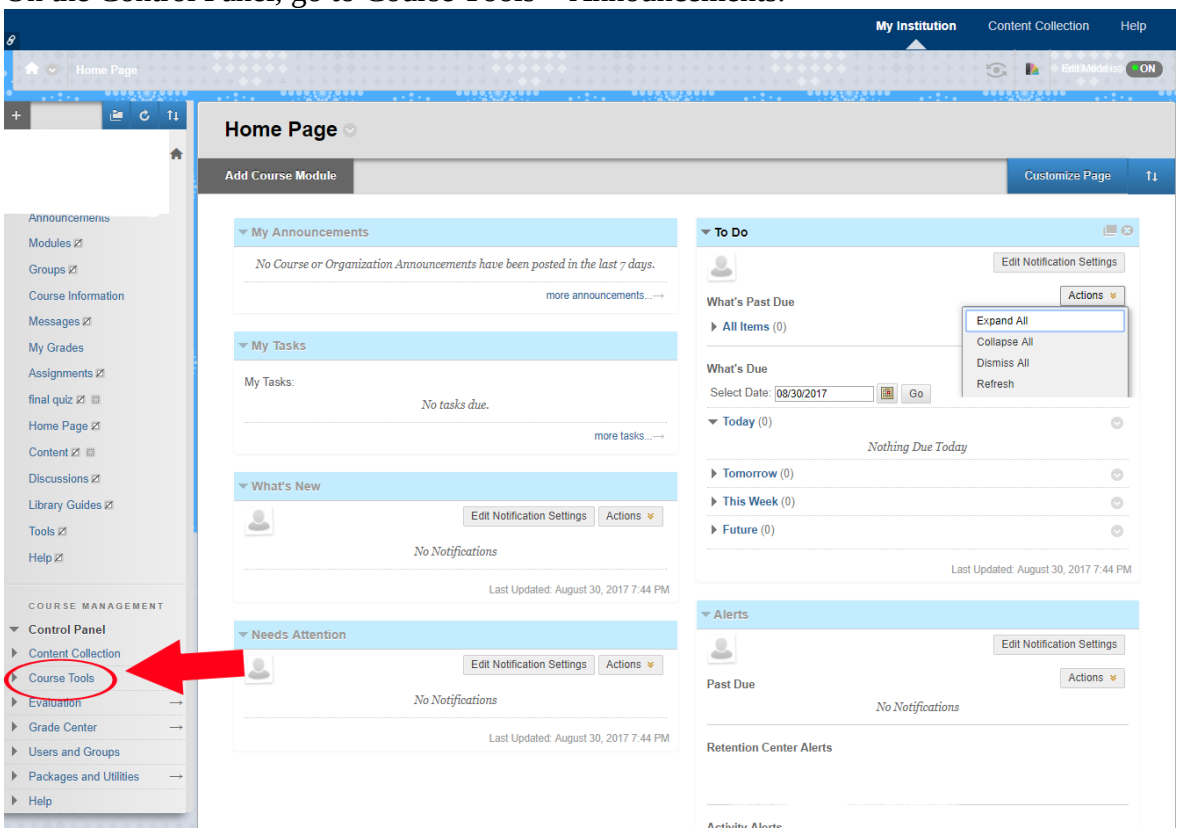
Your participation in this study is completely voluntary. You will be asked to read an informed form that explains the study and what is required form you. The consent form also outlines the risks and benefits of participating in the study. If you agree to participate, we will ask you to complete the questionnaire today in class. Students who start to complete the questionnaire can drop out at any time if they wish to however, once the questionnaire has been submitted, the information will be maintained for data analysis. If you do not wish to participate in this study, you may quietly remain in the classroom.

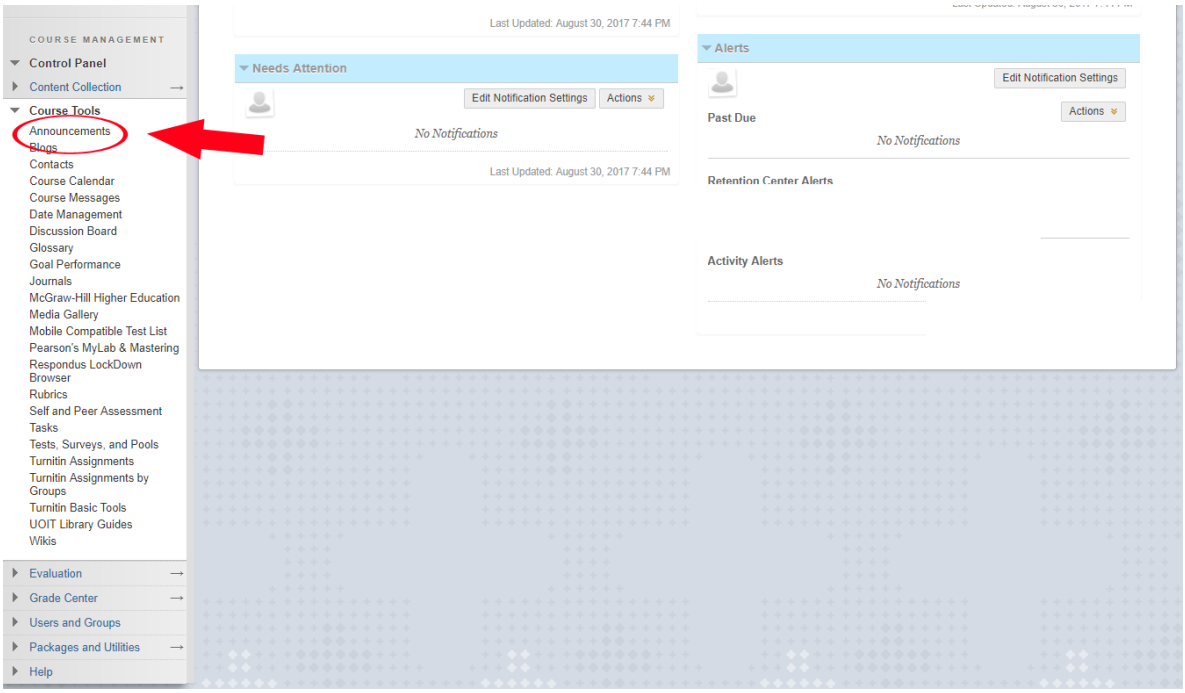
You will be required to use your UOIT.net login to access the questionnaire. Your UOIT.net user name and/or student ID number will be deleted from the data set prior to Dr. Côté receiving the data. This will ensure that that your confidentiality and anonymity are maintained. All of the data will be stored on a secure network, which IT has assisted in creating to guarantee that no one else will have access to this data.

Creating an Announcement on Blackboard

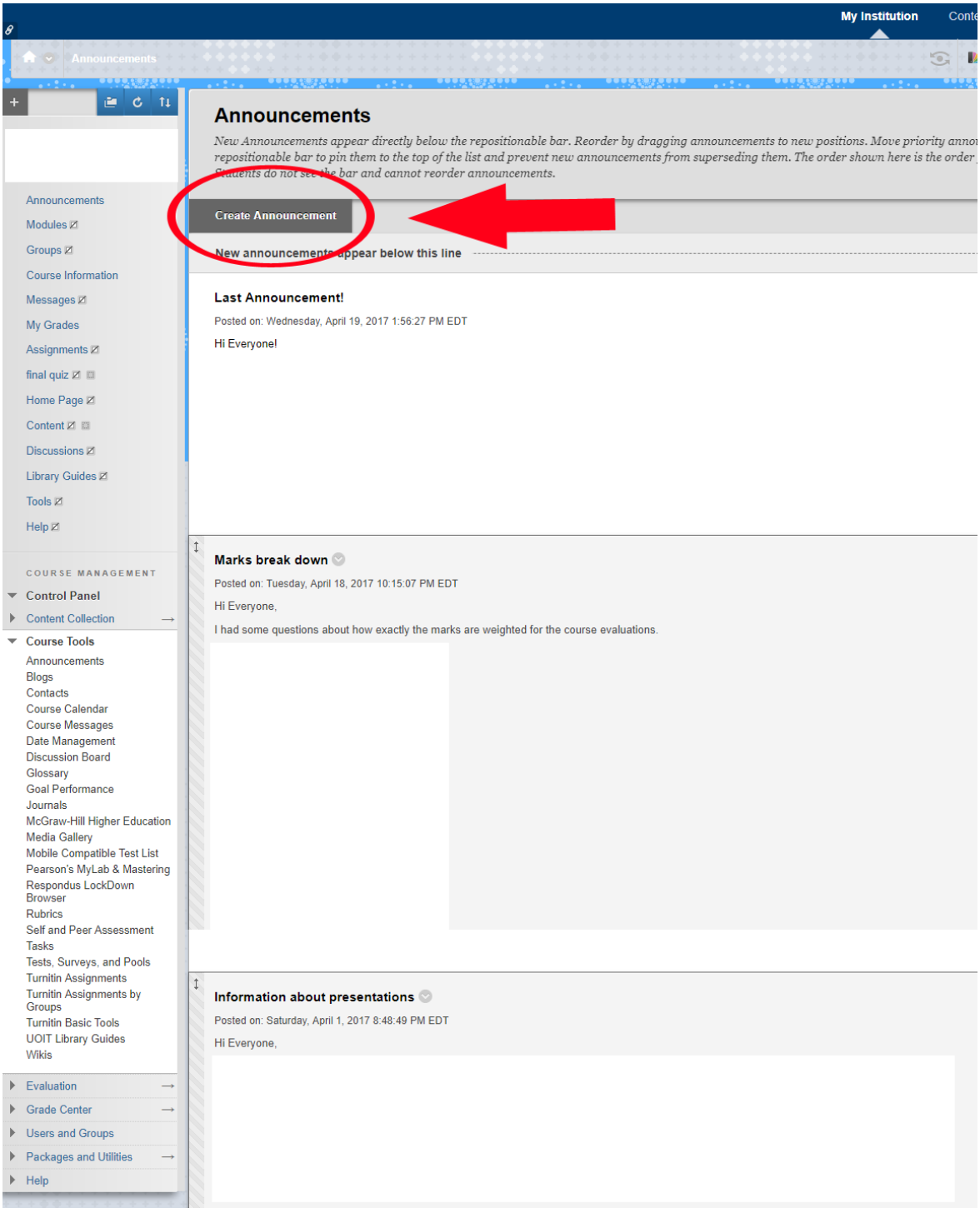
Announcements appear in the order you post them. The most recent announcement appears first.

1. On the Control Panel, go to Course Tools > Announcements.

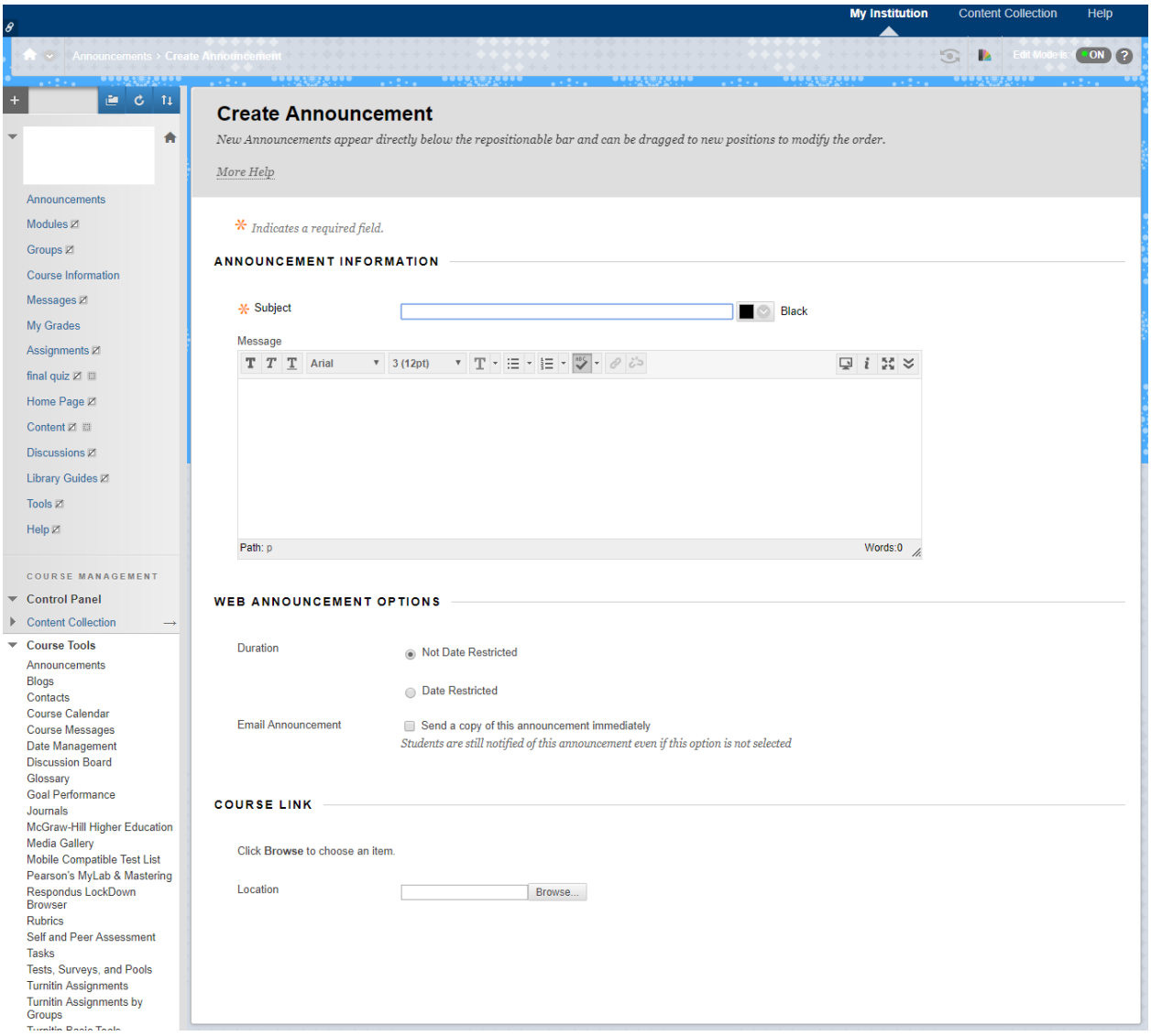



COURSE MANAGEMENT
Control Panel
Content Collection
Course Tools
Announcements
Blogs
Contacts
Course Calendar
Course Messages
Date Management
Discussion Board
Glossary
Goal Performance
Journals
McGraw-Hill Higher Education
Media Gallery
Mobile Compatible Test List
Pearson's MyLab & Mastering
Respondus LockDown Browser
Rubrics
Self and Peer Assessment
Tasks
Tests, Surveys, and Pools
Turnitin Assignments
Turnitin Assignments by Groups
Turnitin Basic Tools
UOIT Library Guides
Wikis
Evaluation
Grade Center
Users and Groups
Packages and Utilities
Help
Last Updated: August 30, 2017 7:44 PM
Needs Attention
Edit Notification Settings
Actions
No Notifications
Last Updated: August 30, 2017 7:44 PM
Alerts
Edit Notification Settings
Past Due
Actions
No Notifications
Retention Center Alerts
Activity Alerts
No Notifications

2. Select Create Announcement on the action bar.



3. Type a Subject, which appears as the title on the Announcements page.
4. Type your message.

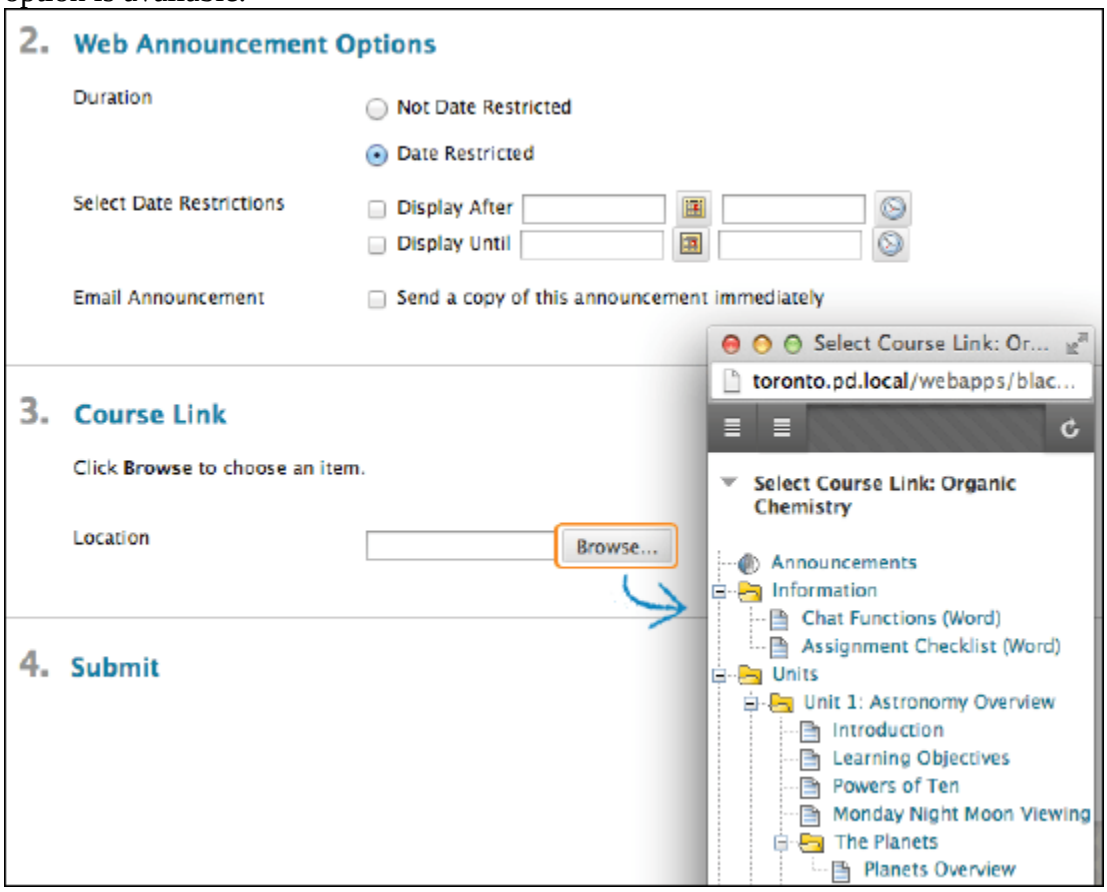


5. In the Web Announcements Options section, choose to restrict the announcement by date or not.

- If you choose Not Date Restricted, the announcement is visible until you remove it.
- If you choose Date Restricted, select the Display After and Display Until check boxes to enable the date and time selections. Provide the date and time restriction settings.

6. Select the Email Announcement check box to send students an email containing the announcement. The email is sent to all students, even those who choose not to

receive announcement notifications through email. Your institution controls if this option is available.



7. Optionally, in the Course Link section, select Browse to link to a course area, tool, or item.

Links to course content won't appear in the email announcement if you choose to send one.

8. Select Submit.

Appendix E

UOIT Mental Health and Wellness Study

Thank you very much for your willingness to participate in this survey. Your answers to the questionnaire will remain confidential. Once completed and submitted, the researchers will not be able to trace your answers back to you. If you agree to participate please check the box which is located at the bottom of the informed consent form.

The purpose of this study is to assess the test feasibility of a conducting a large study to describe the burden and lifestyle factors associated with mental health and wellness in undergraduate university students.
This questionnaire inquires about mental health and wellness and factors that may be related to it. These factors include sleep quality, physical activity, food access, neck and back pain, substance use and
socio-demographic variables.

You must be 18 years or older to participate in this study.

We would like to remind you that if you are concerned about your well-being, or feel that, you may benefit from support and assistance, please contact Student Mental Health Services to set up an appointment. You can contact student services in one of three ways:

- email studentlifeline@uoit.ca
- call 905.721.3392
- drop by Student Life suite (U5 Building at North Campus or 2nd floor of 61 Charles St for the downtown campus) for a chat.

There are also community resources available 24/7, they are: Distress Centre Durham at 905-430-2522 and Durham Crisis Line at 905-666-0483
Thank you very much for considering participating in this important study which will help us better understand mental health and wellness in university students.

* Required

Informed Consent

Title of Research Study:
UOIT-CMCC Mental Health and Wellness study

Researcher(s):
Dr. Pierre Côté, Dr. Victoria Smye, Dr. Robert Weaver, Dr. Efrosini Papaconstantinou, Dr. Jennifer Laffier, Dr. Ellen Vogel, Dr. Tyler Frederick, and Dr. Cindy Malachowski, Kathy Smith, MHSc, Nayantara Hattangadi , Andrew Reynolds, Michael Short and Nancy Flynn
Faculty of Health Sciences,
University of Ontario Institute of Technology Contact number: (905) 721-8668 Ext 3674
Email: Kathy.smith@uoit.ca

You are invited to participate in a research study at the University of Ontario Institute of Technology in the Faculty of Health Sciences and Faculty of Education. This study (REB File # 17-xxxx) has been reviewed by the University of Ontario Institute of Technology Research Ethics Board and has been approved as of Month day 2017 Please read this form carefully, and feel free to ask any questions you might have. If you have any questions about your rights as a participant in this study, please contact the Ethics and Compliance Officer at 905 721 8668 ext 3693 or compliance@uoit.ca.

Before agreeing to participate in this study, it is important that you read and understand the following explanation of the proposed study procedures. The following information describes the purpose, procedures, benefits, and risks associated with this study. It also describes your right to refuse to participate or withdraw from the study at any time. 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 known as the informed consent process.

Please read through this document carefully, and ask Kathy Smith or Dr. Pierre Côté to explain anything that you don't understand before consenting to this study. Make sure all your questions have been answered to your satisfaction before signing this document.

Purpose and Procedure:
The purpose of this study is to enhance our understanding of lifestyle factors that may be associated with mental health issues and help identify students who may be at risk of developing mental health problems. This information is necessary to mitigate the disabling effects of mental health problems.

The mental health and well being in university students is a public health concern in Canada. However, we know very little about the prevalence of depressive symptoms, anxiety and stress among undergraduate university students. Therefore, we need to investigate these issues to better prevent and manage mental health problems in university students.

We would appreciate if you could work with us in gaining knowledge about mental health and wellness in undergraduate students by consenting to participate in this study and completing an online questionnaire. You will complete this questionnaire once during the class time. The questionnaire will take approximately 15 minutes to complete, and all information provided is confidential.

Time commitment:
The questionnaire is a one-time, only, administration and will take approximately 15 minutes to complete. The one-time administration will be in-class first. However if you are not able to participate in class there will be two follow emails sent that will provide a link to the questionnaire to enable you to complete the questionnaire.

Potential Benefits:

There are no direct benefits for participating in the study. However, participating will provide indirect benefits to the student community by reducing stigma and improving awareness of mental health and wellness.

Potential Risk or Discomforts:
There are no known risks associated with participating in the study. However, participants may experience psychological or emotional discomfort. We remind you that UOIT students who needs support or help should feel free to contact UOIT Student Mental Health services at the Student life suite.

We're here to support you! UOIT offers a range of services for students to support their positive mental health, strengthen their resilience, and help them manage the multiple demands of university life. If you are concerned about your well-being, or feel that, you may benefit from support and assistance, please contact Student Mental Health Services to set up an appointment. You can email (studentlifeline@uoit.ca), call 905.721.3392 or drop by Student Life suite (U5 Building at North Campus or 2nd floor of 61 Charles St for the downtown campus).

For more information, and to learn about the services offered please visit the Student Mental Health website: http://studentlife.uoit.ca/mentalhealth/index.php

Informed Consent (Continued)

Storage of Data:
All data and consent forms will be kept on a secure UOIT network, which the UOIT IT Department has assisted with. The IT department at UOIT will have access to the raw data and will remove and destroy all identifiers (Banner ID, UOIT.net login and date of birth). This data will be stored on a secure Google Drive account. Dr. Pierre Côté, Dr. Efrosini Papaconstantinou, Ms. Kathy Smith, Ms. Nayantara Hattangadi, Mr. Andrew Reynolds, Mr. Michael Short and Ms Nancy Flynn will have access to the de-identified amalgamated data but not to the raw data.

Confidentiality:
You will be using your UOIT.net account to login and answer the questionnaire. Once the data is collected, the UOIT net administration will take the data from the first administration of the questionnaire and assign a Study ID. The Study ID will bear no resemblance to any of your personal identifiers. The Study ID will maintain your anonymity. The UOIT net administration will then send a study data file without identifiers to Dr. Pierre Côté; the IT department will also destroy any original data files with identifiers once the study data file has been sent to Dr. Pierre Côté. Data files will be stored within UOITs Google Drive Suite for Education instance, which is hosted by Google.
Anonymity:
The raw data will be de-identified of any Banner ID or UOIT.net login information and replaced with a Study ID. The de-identified files will be sent to the research team to ensure your anonymity is maintained. Neither Dr. Côté, nor any of the researchers, will

have information relating to personal identifiers so the release of these findings will be completely anonymous.

Right to Withdraw:
Your participation in this study is completely voluntary and will not affect your standing within this course. You are free to withdraw at any point in time. If you do not wish to take part in the study, you do not need to complete the consent form and may remain seated in the class. If you wish to withdraw after giving informed consent but before submitting the questionnaire, you may do so by leaving the webpage where the questionnaire is available. This data will not be recorded.

You can also withdraw at anytime before November 15, 2017 by contacting Neil Hopkins or Bevin Moolenschot from the UOIT IT Department by emailing Ask@uoit.net. They will delete your data and you information will be used in the analysis.

Compensation for Participation:
There will be no compensation to participants for involvement with this study.

Debriefing and Dissemination of Results:
The results of this study will be completed by December 2017. If you desire to receive information regarding the results of this study, please contact the researchers at (905) 721-8668 Ext 5922 or by email at kathy.smith@uoit.ca or pierre.cote@uoit.ca. You will also be invited to a debriefing session were the results of the study will be presented to participants.

Participant Concerns and Reporting:
This research project has been approved by the University of Ontario Institute of Technology Research Ethics Board (REB File # 17-xxxxx) as of Month day 2017.

If you have any questions concerning the research study, or experience any discomfort related to the study please contact the researcher(s) at (905) 721-8668 Ext 5922 or by email at kathy.smith@uoit.ca or pierre.cote@uoit.ca.

Any questions regarding your rights as a participant, complaints or adverse events may be addressed to Research Ethics Coordinator at researchethics@uoit.ca or (905) 721 8668 ext 3693.

1. **Informed Consent *** *Check all that apply.*

☐ I consent to voluntarily take part in the study with the understanding I may withdraw at any time. I have had an opportunity to ask questions and my questions have been answered. I am aware of all the risks and benefits associated with my participation and have read the entire consent form. I am free to ask questions about the study in the future.

2. **Secondary Use of Data**

The information collected for this study may be used for secondary research in the future. This could include secondary data analysis, future research studies etc.

Check all that apply.

☐ I agree to allow the data collected in the study to be used for future secondary research

Ready to begin

Thank you for participating in the University of Ontario Institute of Technology Student Mental Health and Wellness study. Your answers will remain completely confidential. Once completed and submitted, the researchers will not be able to trace your answers back to you. The questionnaire includes questions regarding lifestyle behaviours (sleep habits, physical activity, alcohol and drug use, food access, socio- demographic variables, neck and back pain) on mental health.

About yourself

3. How old are you? *

Mark only one oval.

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60

4. What gender do you identify with? *
Mark only one oval.

Female
Male
Transgender Male/Trans Man/Female-to-Male (FTM)
Transgender Female/Trans Woman/Male-to-Female (MTF)
Genderqueer, neither exclusively male nor female (or Gender Fluid, or Non-Binary Gender)
Choose not to disclose
Other:

5. What is your program of study? *
Mark only one oval.

Nursing
Kinesiology
Public Health
Human Health
Medical Laboratory Science
Allied Health Science
Health Science Comprehensive
Fitness and Health Promotion Bridge
Nursing (Registered Practical Nurse Bridge)
Other:

6. What is your year of study? *
Mark only one oval.

1st year
2nd year
3rd year
4th year
5+ year

7. Have you been diagnosed with any of the following medical conditions by a healthcare provider?
Please check all that may apply
Check all that apply.

- Allergies (including hay fever or nasal allergy)
- Arthritis, for example osteoarthritis, rheumatoid arthritis, gout or any other type, excluding fibromyalgia
- Asthma
- Attention disorder or learning disability (e.g., attention deficit disorder, attention deficit hyperactivity disorder, learning disability)
- Bowel disorder such as Crohn's Disease, ulcerative colitis, Irritable Bowel Syndrome or bowel incontinence
- Chronic fatigue syndrome
- Eating disorder (e.g., anorexia nervosa, bulimia nervosa)
- High blood pressure
- Intestinal or stomach ulcers
- Migraine headaches
- Mood disorder such as depression, bipolar disorder, mania or dysthymia
- Scoliosis
- Sexually transmitted infection(s)
- Other:

About your physical activity in the past 7 days

Please answer the following questions based on what you do in a typical week. To increase accuracy, you may wish to think about your physical activity and sedentary behaviour for one week prior to answering the questions.

Aerobic Physical Activity

8. In a typical week, how many days do you do moderate-intensity (like brisk walking) to vigorous-intensity (like running) aerobic physical activity ? *
Mark only one oval.

- 1 day
- 2 days
- 3 days
- 4 days
- 5 days
- 6 days
- 7 days

9. On average for days that you do at least moderate-intensity aerobic physical activity (as specified above), how many minutes do you do?

Please answer the following questions based on what you do in a typical week. To increase accuracy, you may wish to think about your physical activity and sedentary behaviour for one week prior to answering the questions.

Muscle Strengthening Physical Activity

10. In a typical week, how many times do you do muscle strengthening activities (such as resistance training or very heavy gardening)?

Please answer the following questions based on what you do in a typical week. To increase accuracy, you may wish to think about your physical activity and sedentary behaviour for one week prior to answering the questions.
Perceived Aerobic Fitness

11. In general, would you say that your aerobic fitness (ability to walk/run distances) is: *
Mark only one oval.

- Excellent
- Very Good
- Good
- Fair
- Poor

Please answer the following questions based on what you do in a typical week. To increase accuracy, you may wish to think about your physical activity and sedentary behaviour for one week prior to answering the questions.

Sedentary Behaviour

12. On a typical day, how many hours do you spend in continuous sitting: at work, in meetings, volunteer commitments and commuting (i.e., by motorized transport)? *
Mark only one oval.

- None
- less than 1 hour
- 1 to less than 2 hours
- 2 to less than 3 hours
- 3 to less than 4 hours
- 4 to less than 5 hours
- 5 to less than 6 hours
- more than 6 hours

13. On a typical day, how many hours do you watch television, use a computer, read, and spend
sitting quietly during your leisure time? *
Mark only one oval.

- None

less than 1 hour
1 to less than 2 hours
2 to less than 3 hours
3 to less than 4 hours
4 to less than 5 hours
5 to less than 6 hours
more than 6 hours

14. When sitting for prolonged periods (one hour or more), at what interval would you typically take a break to stand and move around for two minutes? *
Mark only one oval.

less than 10 minutes
10 to less than 20 minutes
20 to less than 30 minutes
30 to less than 45 minutes
45 to less than 1 hour
1 to less than 1.5 hours
1.5 to less than 2 hours
more than 2 hours

About your Mental Health

Please read each statement and place a check beside the option which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.
The rating scale is as follows:
- Never: Did not apply to me at all
- Sometime: Applied to me to some degree, or some of the time
- Often: Applied to me to a considerable degree, or a good part of time
- Almost Always: Applied to me very much, or most of the time

15. Your Mental Health *
Check the one best response (below) regarding your mental health in the past week.
Mark only one oval per row.

Never/Sometimes/Often/Almost Always

a) I found it hard to wind down
b) I was aware of dryness of my mouth
c) I couldn't seem to experience any positive feeling at all
d) I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)
e) I found it difficult to work up the initiative to do things
f) I tended to over-react to situations
g) I experienced trembling (e.g. in the hands)
h) I felt that I was using a lot of nervous energy

i) I was worried about situations in which I might panic and make a fool of myself
j) I felt that I had nothing to look forward to
k) I found myself getting agitated
l) I found it difficult to relax
m) I felt down-hearted and blue
n) I was intolerant of anything that kept me from getting on with what I was doing
o) I felt I was close to panic
p) I was unable to become enthusiastic about anything
q) I felt I wasn't worth much as a person
r) I felt that I was rather touchy
s) I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)
t) I felt scared without any good reason
u) I felt that life was meaningless

16. Please think about the last 30 days, taking both good and bad days into account. For each
question, please tell me how much of a problem it is for you on a scale from 1 to 5. 1 means
no problem and 5 means extreme problem. *
Mark only one oval per row.

1/2/3/4/5/Don't Know

a) How much of a problem do you have with feeling sad, low or depressed?
b) How much of a problem do you have with feeling worried, nervous or anxious?
c) How much of a problem is handling stress, such as controlling the important things in your life?
d) How much of a problem is coping with all the things you have to do?

About your Sleep

The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

17. During the past month when have you USUALLY gone to bed at night? *
Please indicate the hour (Hrs) and minute (Mins) and ensure you have chosen AM or PM.
Example: 8:30 AM

18. During the past month, how long has it USUALLY taken you to fall asleep each night? *
Mark only one oval.

15 minutes or less
16 - 30 minutes

31 - 60 minutes
more than 60 minutes

19. During the past month, when have you USUALLY gotten up in the morning? *
Please indicate the hour (Hrs) and minute (Mins) and ensure you have chosen AM or PM.
Example: 8:30 AM

20. During the past month, how many HOURS of actual sleep did you get a night? (This may be different than the number of hours you spend in bed.) *
Please indicate the number of hours (Hrs) and minutes (Mins).
Mark only one oval.

more than 7 hours sleep/night
6 to 7 hours sleep/night
5 to 6 hours sleep/night
less than 5 hours sleep/night

21. During the past month, how often have you had trouble sleeping because you... *
For each of the remaining questions, check the one best response.
Mark only one oval per row.

	Not during the past month/Less than once a week/Once or twice a week/Three or more times a week
a)	Cannot get to sleep within 30 minutes
b)	Wake up in the middle of the night or early morning
c)	Have to get up to use the bathroom
d)	Cannot breathe comfortably
e)	Cough or snore loudly
f)	Feel too cold
g)	Feel too hot
h)	Have bad dreams
i)	Have pain
j)	Other reason(s), please describe, including how often you have had trouble sleeping of this reason(s):

22. If you have checked Other reason(s) above, please describe:

23. During the past month... *
For each of the remaining questions, check the one best response.
Mark only one oval per row.

	Not during the past month/Less than once a week/Once or twice a week/Three or more times a week
a)	During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?
b)	During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?
c)	During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?

24. During the past month, how would you rate your sleep quality overall? *
Mark only one oval.

Very good
Fairly good
Fairly bad
Very bad

About your access to Food

These next questions (statements) are about the food eaten in your household in the last 12 months, since March of last year and whether you were able to afford the food you need. Select the appropriate option from the choices listed below each statement depending on the number of persons in the household.

25. "The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more." * Was that often, sometimes, or never true for (you/your household) in the last 12 months?
Mark only one oval.

Often true
Sometimes true
Never true
Don't know/refuse to answer

26. "(I/we) couldn't afford to eat balanced meals." *
Was that often, sometimes, or never true for (you/your household) in the last 12 months?
Mark only one oval.

Often true
Sometimes true
Never true
Don't Know/refuse to answer

27. In the last 12 months, since last March, did you and/or other persons in your household ever cut the size of your meals or skip meals because there wasn't enough money for food? *
Mark only one oval.

Yes *Skip to question 28.*
No *Skip to question 29.*
Don't know *Skip to question 29.*

28. How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

Mark only one oval.

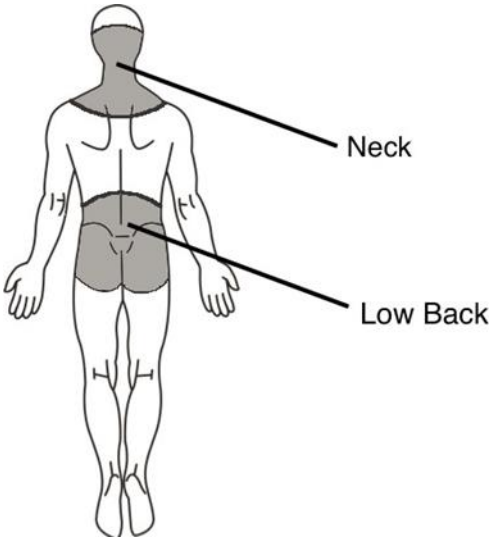
Yes, almost every month
Yes, some months but not every month
Yes, only 1 or 2 months

No

29. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food? *
Mark only one oval.
Yes
No
Don't Know

30. In the last 12 months, were you ever hungry but didn't eat because there wasn't enough money for food?
Mark only one oval.
Yes
No
Don't Know

About your Neck and Back Pain



31. In the past 7 days, have you experienced any pain in your NECK? *
Mark only one oval.
Yes
No *After the last question in this section, skip to question 33.*

32. If yes, please indicate the intensity of your average NECK pain over the past 7 days on a scale of 0 (no pain) to 10 (worst pain imaginable).
Mark only one oval.
0 1 2 3 4 5 6 7 8 9 10

About your Low Back Pain

33. In the past 7 days, have you experienced any pain in your LOW BACK? *

Mark only one oval.

Yes

No *After the last question in this section, skip to "About your Alcohol and Drug use."*

34. If yes, please indicate the intensity of your average LOW BACK pain over the past 7 days on a scale of 0 (no pain) to 10 (worst pain imaginable).
Mark only one oval.

0 1 2 3 4 5 6 7 8 9 10

About your Alcohol and Drug use

This is a brief survey about alcohol, tobacco products and other drugs. Some questions will be asked about your experience of using these substances across your lifetime and in the past three months. These substances can be smoked, swallowed, snorted, inhaled, injected or taken in the form of pills. Some of the substances listed may be prescribed by a doctor (like amphetamines, sedatives, pain medications). Please do not report MEDICATIONS AS PRESCRIBED by your doctor unless used outside the prescription (e.g. increased frequency or higher doses). While we are also interested in knowing about your use of various illicit drugs, please be assured that information on such use will be treated as strictly confidential.

Tobacco use
cigarettes, chewing tobacco, cigars, etc.

35. In your life, have you ever used tobacco products (cigarettes, chewing tobacco, cigars, etc.)? (NON-MEDICAL USE ONLY) *
Mark only one oval.

No *Skip to question 41.*

Yes

Tobacco use
cigarettes, chewing tobacco, cigars, etc.

36. In the past 3 months, how often have you used tobacco products (cigarettes, chewing tobacco, cigars, etc.)? *
Mark only one oval.

Never *Skip to question 39.*

Once or Twice

Monthly

Weekly

Daily or Almost Daily

Tobacco use
cigarettes, chewing tobacco, cigars, etc.

37. During the past three months, how often have you had a strong desire or urge to use tobacco products (cigarettes, chewing tobacco, cigars, etc.)?
Mark only one oval.

- Never
- Once or Twice
- Monthly
- Weekly
- Daily or Almost Daily

38. During the past three months, how often has your use of tobacco products (cigarettes, chewing tobacco, cigars, etc.) led to health, social, legal or financial problems?
Mark only one oval.

- Never
- Once or Twice
- Monthly
- Weekly
- Daily or Almost Daily

Tobacco use
cigarettes, chewing tobacco, cigars, etc.

39. Has a friend or relative or anyone else ever expressed concern about your use of tobacco products (cigarettes, chewing tobacco, cigars, etc.)?
Mark only one oval.

- No, Never
- Yes, in the past 3 months
- Yes, but not in the past 3 months

40. Have you ever tried and failed to control, cut down or stop using tobacco products (cigarettes, chewing tobacco, cigars, etc.)?
Mark only one oval.

- No, Never
- Yes, in the past 3 months
- Yes, but not in the past 3 months

Alcohol use
beer, wine, spirits, etc.

41. In your life, have you ever used alcoholic beverages (beer, wine, spirits, etc.)? (NON-MEDICAL USE ONLY) *
Mark only one oval.

- No *Skip to question 48.*
- Yes

Alcohol use
beer, wine, spirits, etc.

42. In the past three months, how often have you used alcoholic beverages (beer, wine, spirits, etc.)? *
Mark only one oval.

Never *Skip to question 46.*
Once or Twice
Monthly
Weekly
Daily or Almost Daily

Alcohol use
beer, wine, spirits, etc.

43. During the past three months, how often have you had a strong desire or urge to use alcoholic beverages (beer, wine, spirits, etc.)?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

44. During the past three months, how often has your use of alcoholic beverages (beer, wine, spirits, etc.) led to health, social, legal or financial problems?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

45. During the past three months, how often have you failed to do what was normally expected of you because of your use of alcoholic beverages (beer, wine, spirits, etc.)?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

Alcohol use
beer, wine, spirits, etc.

46. Has a friend or relative or anyone else ever expressed concern about your use of alcoholic beverages (beer, wine, spirits, etc.)?
Mark only one oval.

No, Never
Yes, in the past 3 months
Yes, but not in the past 3 months

47. Have you ever tried and failed to control, cut down or stop using alcoholic beverages (beer, wine, spirits, etc.)?
Mark only one oval.

No, Never
Yes, in the past 3 months
Yes, but not in the past 3 months

Cannabis use
marijuana, pot, grass, hash, etc.

48. In your life, have you ever used Cannabis (marijuana, pot, grass, hash, etc.)? (NON-MEDICAL USE ONLY) *
Mark only one oval.

No *Skip to question 55.*
Yes

Cannabis use
marijuana, pot, grass, hash, etc.

49. In the past three months, how often have you used Cannabis (marijuana, pot, grass, hash, etc.)? *
Mark only one oval.

Never *Skip to question 53.*
Once or Twice
Monthly
Weekly
Daily or Almost Daily

Cannabis use
marijuana, pot, grass, hash, etc
.
50. During the past three months, how often have you had a strong desire or urge to use Cannabis (marijuana, pot, grass, hash, etc.)?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

51. During the past three months, how often has your use of Cannabis (marijuana, pot, grass, hash, etc.) led to health, social, legal or financial problems?

Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

52. During the past three months, how often have you failed to do what was normally expected of you because of your use of Cannabis (marijuana, pot, grass, hash, etc.)?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

Cannabis use
marijuana, pot, grass, hash, etc.

53. Has a friend or relative or anyone else ever expressed concern about your use of Cannabis (marijuana, pot, grass, hash, etc.)?
Mark only one oval.

No, Never
Yes, in the past 3 months
Yes, but not in the past 3 months

54. Have you ever tried and failed to control, cut down or stop using Cannabis (marijuana, pot, grass, hash, etc.)?
Mark only one oval.

No, Never
Yes, in the past 3 months
Yes, but not in the past 3 months

Cocaine use
coke, crack, etc.

55. In your life, have you ever used Cocaine (coke, crack, etc.)? (NON-MEDICAL USE ONLY) *
Mark only one oval.

No *Skip to question 62.*
Yes

Cocaine use
coke, crack, etc.

56. In the past three months, how often have you used Cocaine (coke, crack, etc.)? *
Mark only one oval.

Never *Skip to question 60.*
Once or Twice
Monthly
Weekly
Daily or Almost Daily

Cocaine use
coke, crack, etc.

57. During the past three months, how often have you had a strong desire or urge to use Cocaine (coke, crack, etc.)?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

58. During the past three months, how often has your use of Cocaine (coke, crack, etc.) led to health, social, legal or financial problems?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

59. During the past three months, how often have you failed to do what was normally expected of you because of your use of Cocaine (coke, crack, etc.)?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

Cocaine use
coke, crack, etc.

60. Has a friend or relative or anyone else ever expressed concern about your use of Cocaine (coke, crack, etc.)?
Mark only one oval.

No, Never
Yes, in the past 3 months
Yes, but not in the past 3 months

61. Have you ever tried and failed to control, cut down or stop using Cocaine (coke, crack, etc.)?
Mark only one oval.

No, Never
Yes, in the past 3 months
Yes, but not in the past 3 months

Amphetamine type stimulant use
speed, diet pills, ecstasy, Adderall, Dexedrine, bennies, uppers, amps, etc.

62. In your life, have you ever used Amphetamine type stimulants (speed, diet pills, ecstasy, Adderall, Dexedrine, bennies, uppers, amps, etc.)? (NON-MEDICAL USE ONLY) *
Mark only one oval.

No *Skip to question 69.*
Yes

Amphetamine type stimulant use
speed, diet pills, ecstasy, Adderall, Dexedrine, bennies, uppers, amps, etc.

63. In the past three months, how often have you used Amphetamine type stimulants (speed, diet pills, ecstasy, Adderall, Dexedrine, bennies, uppers, amps, etc.)? *
Mark only one oval.

Never *Skip to question 67.*
Once or Twice
Monthly
Weekly
Daily or Almost Daily

Amphetamine type stimulant use
speed, diet pills, ecstasy, Adderall, Dexedrine, bennies, uppers, amps, etc.

64. During the past three months, how often have you had a strong desire or urge to use Amphetamine type stimulants (speed, diet pills, ecstasy, Adderall, Dexedrine, bennies, uppers, amps, etc.)?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

65. During the past three months, how often has your use of Amphetamine type stimulants (speed, diet pills, ecstasy, Adderall, Dexedrine, bennies, uppers, amps, etc.) led to health, social, legal or financial problems?
Mark only one oval.

Never

Once or Twice
Monthly
Weekly
Daily or Almost Daily

66. During the past three months, how often have you failed to do what was normally expected of you because of your use of Amphetamine type stimulants (speed, diet pills, ecstasy, Adderall, Dexedrine, bennies, uppers, amps, etc.)?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

Amphetamine type stimulant use
speed, diet pills, ecstasy, Adderall, Dexedrine, bennies, uppers, amps, etc.

67. Has a friend or relative or anyone else ever expressed concern about your use of Amphetamine type stimulants (speed, diet pills, ecstasy, Adderall, Dexedrine, bennies, uppers, amps, etc.)?
Mark only one oval.

No, Never
Yes, in the past 3 months
Yes, but not in the past 3 months

68. Have you ever tried and failed to control, cut down or stop using Amphetamine type stimulants (speed, diet pills, ecstasy, Adderall, Dexedrine, bennies, uppers, amps, etc.)?
Mark only one oval.

No, Never
Yes, in the past 3 months
Yes, but not in the past 3 months

Inhalant use
nitrous, glue, gas, paint thinner, etc.

69. In your life, have you ever used Inhalants (nitrous, glue, gas, paint thinner, etc.)? (NONMEDICAL USE ONLY) *
Mark only one oval.

No *Skip to question 76.*
Yes

Inhalant use
nitrous, glue, gas, paint thinner, etc.

70. In the past three months, how often have you used Inhalants (nitrous, glue, gas, paint thinner, etc.)? *
Mark only one oval.

Never *Skip to question 74.*
Once or Twice
Monthly
Weekly
Daily or Almost Daily

Inhalant use
nitrous, glue, gas, paint thinner, etc.

71. During the past three months, how often have you had a strong desire or urge to use Inhalants (nitrous, glue, gas, paint thinner, etc.)?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

72. During the past three months, how often has your use of Inhalants (nitrous, glue, gas, paint thinner, etc.) led to health, social, legal or financial problems?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

73. During the past three months, how often have you failed to do what was normally expected of you because of your use of Inhalants (nitrous, glue, gas, paint thinner, etc.)?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

Inhalant use
nitrous, glue, gas, paint thinner, etc.

74. Has a friend or relative or anyone else ever expressed concern about your use of Inhalants (nitrous, glue, gas, paint thinner, etc.)?
Mark only one oval.

No, Never

Yes, in the past 3 months
Yes, but not in the past 3 months

75. Have you ever tried and failed to control, cut down or stop using Inhalants (nitrous, glue, gas, paint thinner, etc.)?
Mark only one oval.

No, Never
Yes, in the past 3 months
Yes, but not in the past 3 months

Sedative or Sleeping Pill use
Valium, Rohypnol, Ativan, Xanax, Clonazepam, downers, tranks, blue heaven, yellow jackets, etc.

76. In your life, have you ever used Sedatives or Sleeping Pills (Valium, Rohypnol, Ativan, Xanax, Clonazepam, etc.)? (NON-MEDICAL USE ONLY) *
Mark only one oval.

No *Skip to question 83.*
Yes

Sedative or Sleeping Pill use
Valium, Rohypnol, Ativan, Xanax, Clonazepam, downers, tranks, blue heaven, yellow jackets, etc.

77. In the past three months, how often have you used Sedatives or Sleeping Pills (Valium, Rohypnol, Ativan, Xanax, Clonazepam, downers, tranks, blue heaven, yellow jackets, etc.)? *
Mark only one oval.

Never *Skip to question 81.*
Once or Twice
Monthly
Weekly
Daily or Almost Daily

Sedative or Sleeping Pill use
Valium, Rohypnol, Ativan, Xanax, Clonazepam, downers, tranks, blue heaven, yellow jackets, etc.

78. During the past three months, how often have you had a strong desire or urge to use Sedatives or Sleeping Pills (Valium, Rohypnol, Ativan, Xanax, Clonazepam, downers, tranks, blue heaven, yellow jackets, etc.)?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly

Daily or Almost Daily

79. During the past three months, how often has your use of Sedatives or Sleeping Pills (Valium, Rohypnol, Ativan, Xanax, Clonazepam, downers, tranks, blue heaven, yellow jackets, etc.) led
to health, social, legal or financial problems?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

80. During the past three months, how often have you failed to do what was normally expected of you because of your use of Sedatives or Sleeping Pills (Valium, Rohypnol, Ativan, Xanax,
Clonazepam, downers, tranks, blue heaven, yellow jackets, etc.)?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

Sedative or Sleeping Pill use
Valium, Rohypnol, Ativan, Xanax, Clonazepam, downers, tranks, blue heaven, yellow jackets, etc.

81. Has a friend or relative or anyone else ever expressed concern about your use of Sedatives or Sleeping Pills (Valium, Rohypnol, Ativan, Xanax, Clonazepam, downers, tranks, blue heaven, yellow jackets, etc.)?
Mark only one oval.

No, Never
Yes, in the past 3 months
Yes, but not in the past 3 months

82. Have you ever tried and failed to control, cut down or stop using Sedatives or Sleeping Pills (Valium, Rohypnol, Ativan, Xanax, Clonazepam, downers, tranks, blue heaven, yellow jackets, etc.)?
Mark only one oval.

No, Never
Yes, in the past 3 months
Yes, but not in the past 3 months

Hallucinogen use
LSD, acid, mushrooms, PCP, Special K, etc.

83. In your life, have you ever used Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)?
(NON-MEDICAL USE ONLY) *

Mark only one oval.

No *Skip to question 90.*

Yes

Hallucinogen use
LSD, acid, mushrooms, PCP, Special K, etc.

84. In the past three months, how often have you used Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)? *
Mark only one oval.

Never *Skip to question 88.*

Once or Twice

Monthly

Weekly

Daily or Almost Daily

Hallucinogen use
LSD, acid, mushrooms, PCP, Special K, etc.

85. During the past three months, how often have you had a strong desire or urge to use Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)?
Mark only one oval.

Never

Once or Twice

Monthly

Weekly

Daily or Almost Daily
86. During the past three months, how often has your use of Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.) led to health, social, legal or financial problems?
Mark only one oval.

Never

Once or Twice

Monthly

Weekly

Daily or Almost Daily

87. During the past three months, how often have you failed to do what was normally expected of you because of your use of Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)?
Mark only one oval.

Never

Once or Twice
Monthly
Weekly
Daily or Almost Daily

Hallucinogen use
LSD, acid, mushrooms, PCP, Special K, etc.

88. Has a friend or relative or anyone else ever expressed concern about your use of Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)?
Mark only one oval.

No, Never
Yes, in the past 3 months
Yes, but not in the past 3 months

89. Have you ever tried and failed to control, cut down or stop using Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)?
Mark only one oval.

No, Never
Yes, in the past 3 months
Yes, but not in the past 3 months

Opioid use
heroin, morphine, methadone, codeine, Percocet, Fentanyl, Ts, cody, vike, etc.

90. In your life, have you ever used Opioids (heroin, morphine, methadone, codeine, Percocet, Fentanyl, Ts, cody, vike, etc.)? (NON-MEDICAL USE ONLY) *
Mark only one oval.

No *Skip to question 97.*
Yes

Opioid use
heroin, morphine, methadone, codeine, Percocet, Fentanyl, Ts, cody, vike, etc.

91. In the past three months, how often have you used Opioids (heroin, morphine, methadone, codeine, Percocet, Fentanyl, Ts, cody, vike, etc.)? *
Mark only one oval.

Never *Skip to question 95.*
Once or Twice
Monthly
Weekly
Daily or Almost Daily

Opioid use
heroin, morphine, methadone, codeine, Percocet, Fentanyl, Ts, cody, vike, etc.

92. During the past three months, how often have you had a strong desire or urge to use Opioids (heroin, morphine, methadone, codeine, Percocet, Fentanyl, Ts, cody, vike, etc.)?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

93. During the past three months, how often has your use of Opioids (heroin, morphine, methadone, codeine, Percocet, Fentanyl, Ts, cody, vike, etc.) led to health, social, legal or financial problems?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly

Daily or Almost Daily
94. During the past three months, how often have you failed to do what was normally expected of you because of your use of Opioids (heroin, morphine, methadone, codeine, Percocet, Fentanyl, Ts, cody, vike, etc.)?
Mark only one oval.

Never
Once or Twice
Monthly
Weekly
Daily or Almost Daily

Opioid use
heroin, morphine, methadone, codeine, Percocet, Fentanyl, Ts, cody, vike, etc.

95. Has a friend or relative or anyone else ever expressed concern about your use of Opioids
(heroin, morphine, methadone, codeine, Percocet, Fentanyl, Ts, cody, vike, etc.)?
Mark only one oval.

No, Never
Yes, in the past 3 months
Yes, but not in the past 3 months

96. Have you ever tried and failed to control, cut down or stop using Opioids (heroin, morphine, methadone, codeine, Percocet, Fentanyl, Ts, cody, vike, etc.)?
Mark only one oval.

No, Never
Yes, in the past 3 months
Yes, but not in the past 3 months

Injection

97. Have you ever used any drug by injection? (NON-MEDICAL USE ONLY) *
Mark only one oval.

No, never
Yes, in the past 3 months
Yes, but not in the past 3 months

Student Life and Experience

The following section will ask questions about how you feel about your universities policies and environment, and about your relationships with other people.

98. I find university's learning environment conducive. *
Conducive meaning: favourable, beneficial, advantageous, encouraging etc
Mark only one oval.

Never
Sometimes
Always

99. I find academic policies of my university student-friendly. *
Mark only one oval.

Never
Sometimes
Always

100. I have no close relationships that make me feel good. *
Mark only one oval.

Strongly Disagree
Disagree
Agree
Strongly Agree

101. There is no one I feel comfortable talking about my problems with. *
Mark only one oval.

Strongly Disagree
Disagree
Agree
Strongly Agree

Demographic information

General information

102. What is your marital status? *

Mark only one oval.

Single, never married
Married/Common law
Separated/Divorced
Widowed

103. Number of Dependents *

Dependent is a person who relies on another person for support (especially financial support)

Mark only one oval.

0 - None
1
2
3
4
5
6 or more

104. What was your academic average in your last year? *

If you are in 1st year, then report the average for your last year of high school. If you are in 2nd year, then report the average for your 1st year.

Mark only one oval.

below 60
between 60 to 65
between 66 to 69
between 70 to 75
between 76 to 79
between 80 to 85
between 86 to 89
between 90 to 95
between 95 to 100

105. What is your annual personal income?

Mark only one oval.

$0 - $4,999
$5,000 - $9,999
$10,000 - $19,999
Above $20,000

106. What is your households' annual combined personal income?

Mark only one oval.

$0 - $49,999
$50,000 - $59,999
$60,000 - $79,999
Above $80,000

107. How many hours a week do you work for pay? *
During the academic calendar year (i.e. September - April)
Mark only one oval.

- 0
- 1 - 9 hours
- 10 - 19 hours
- 20 - 29 hours
- 30 - 39 hours
- more than 40 hours

108. What is your current household living arrangement? *
During the academic calendar year (i.e. September - April)
Check all that apply.

- Living with relatives
- Living with non-relatives (roommates/housemates)
- Living in a student residence
- Living alone
- Living with a partner

109. On average how long is your commute time to the University? *
Mark only one oval.

- Less than 15 minutes
- 15 to 29 minutes
- 30 to 44 minutes
- 45 minutes or more

110. Were you born in Canada? *
Mark only one oval.

- Yes *Skip to question 111.*
- No

111. Please check if you are registered at the University as: *
Mark only one oval.

- An International student
- A Domestic student

112. What were the ethnic or cultural origins of your ancestors? *
An ancestor is usually more distant than a grandparent.
Check all that apply.

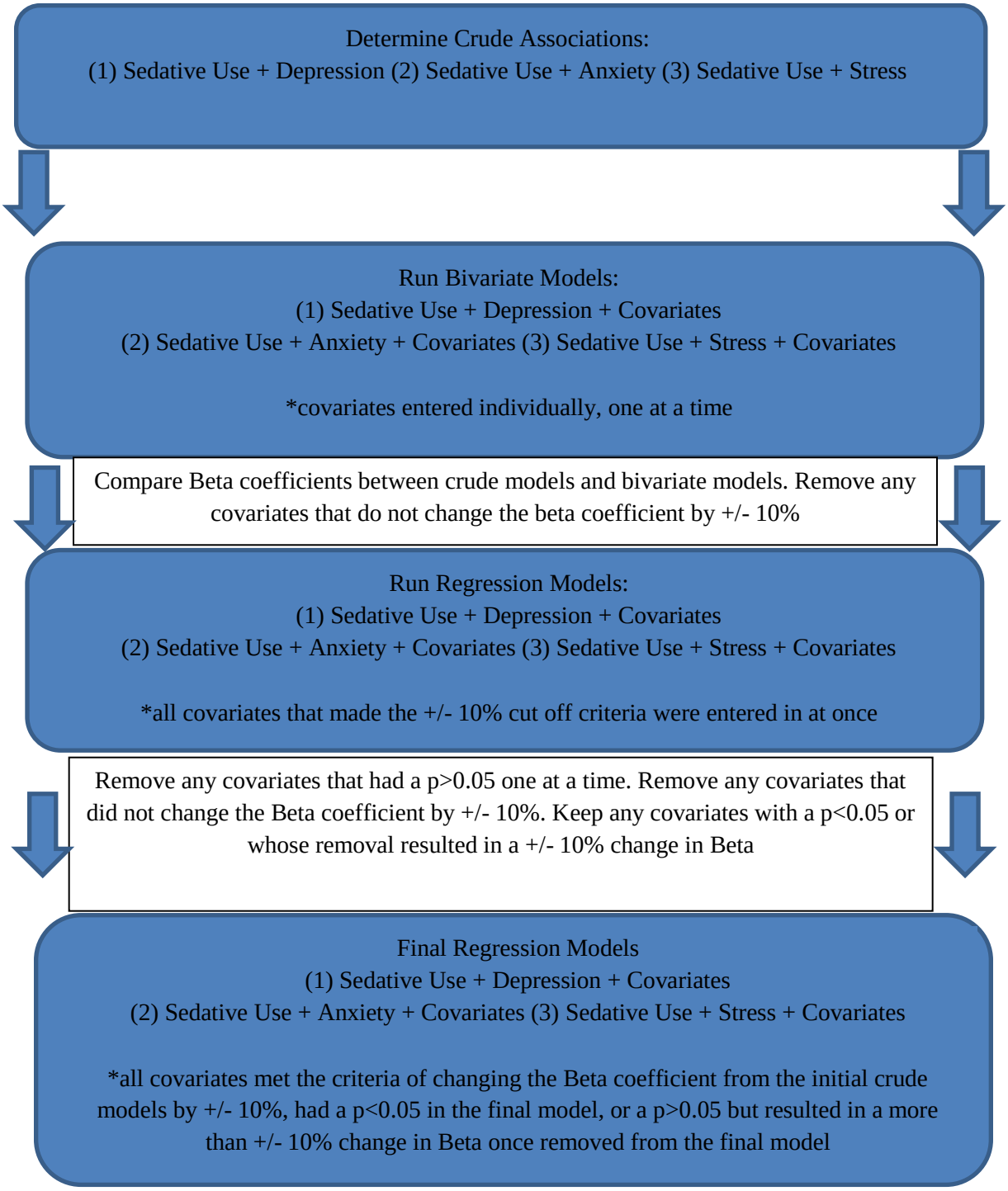
- Aboriginal/First Nations/Métis
- Black
- Caucasian
- East Asian
- South Asian
- South East Asian
- Latin American

Middle Eastern
Don’t know
Other:

113. What is your parents marital status? *
Mark only one oval.
Single, never married
Separated/Divorced
Married/Common law
Widowed

114. What is the employment status of your primary guardian? *Please check all that apply *
Check all that apply.
Full-time employment
Part-time employment
Homemaker
Temporary or seasonal work
Retired
Disability leave
Unemployed
Student
Not applicable
I Don't know

115. What is the employment status of your secondary guardian? *Please check all that apply *
Check all that apply.
Full-time employment
Part-time employment
Homemaker
Temporary or seasonal work
Retired
Disability leave
Unemployed
Student
Not applicable
I Don't know

Appendix F

Data Analysis Steps