



Non-medical Prescription Stimulant Use among Post-secondary Students

Key Messages

- The rates of non-medical prescription stimulant use among post-secondary students vary substantially, but are significantly higher than the general emerging adult population. Among Canadian post-secondary students past-year prevalence use is approximately 4–6%.
- Post-secondary students who perceive prescription stimulants as less harmful are more likely to report non-medical use.
- The most common reported motivation for non-medical prescription stimulant use among post-secondary students is for academic enhancement, despite research to suggest that those who do use such stimulants have **lower** grades compared to those who do not use.
- Factors frequently associated with non-medical prescription stimulant use include being male, Caucasian or a member of a fraternity or sorority. Engaging in polysubstance use, reporting greater perceived stress and more negative mood and a desire for weight loss, have also been associated with non-medical use in post-secondary students.
- In some cases, non-medical prescription stimulant use can result in significant harm to the individual (e.g., cardiovascular events), and appears to be associated with risk behaviours (e.g., hazardous drinking) and poorer well-being.
- Increasing prevention efforts on campuses are needed, including strategies aimed at enhancing awareness among students of the potential risks and consequences of inappropriate prescription stimulant use.

Introduction

A stimulant is a type of substance that increases brain activity. There are many forms of stimulants, such as caffeine, nicotine, methamphetamine or cocaine. Prescription stimulants, for example Ritalin® (methylphenidate) or Adderall® (amphetamine), are often used to treat attention deficit hyperactivity disorder (ADHD) (Canadian Centre on Substance Abuse, 2016a). Prescription stimulants used as prescribed can be of significant benefit to those who need them. However, the inappropriate use of these drugs can lead to significant harm, and is of particular concern with respect to emerging adults, aged 18–25 (Lakhan & Kirchgessner, 2012; McCabe, Knight, Teter, & Wechsler, 2005).

Inappropriate or non-medical use occurs when an individual takes a prescription stimulant without a prescription, for purposes other than prescribed, more frequently or in higher doses than prescribed, by non-intended routes or with other substances that are contraindicated (Barrett, Meisner, & Stewart, 2008). Non-medical prescription stimulant use can have a negative impact on other aspects of a



youth's life, including educational achievement, despite beliefs among some youth that using stimulants will enhance academic performance (Arria, O'Grady, Caldeira, Vincent, & Wish 2008).

In recent decades, concerns about the non-medical use of prescription stimulants, particularly among post-secondary students, have been growing (Rosenfield, Hébert, Stanbrook, Flegel, & MacDonald, 2011). Recognizing these escalating concerns, in 2016 the Canadian Centre on Substance Use and Addiction (CCSA) released a topic summary on preventing non-medical prescription stimulant use among youth (Canadian Centre on Substance Abuse, 2016b). That summary describes specific programs and approaches aimed at preventing or reducing non-medical prescription stimulant use in middle school and high school, and among post-secondary students. Two key findings of the topic summary were that 1) information on effective programs and interventions geared towards youth populations is currently limited and 2) understanding the scope and context of non-medical prescription stimulant use within the local community is essential before developing a prevention program.

Objective

The objective of the current summary is to describe the patterns, perceptions, motivations, risk factors and potential consequences associated with non-medical prescription stimulant use among post-secondary students. This review includes a literature review and the results from focus groups that CCSA conducted in Canadian post-secondary institutions to gain information about the nature of substance use on Canadian campuses. By better understanding the surrounding issues and factors contributing to non-medical prescription stimulants use, people who work in harm-reduction will be better equipped to identify at-risk student populations and develop prevention programs that are grounded in evidence. This summary is intended for a broad audience, including those working with post-secondary students, healthcare professionals, educators, researchers and policy makers.

Method

Literature Review

The PubMed and PsycNET databases were searched. The search was limited to English articles published from 2006 to May 2017. Search terms related to prescription stimulants (e.g., dextedrine, methylphenidate, Adderall, etc.) and post-secondary institutions (e.g., college, community college, university, etc.) were used (see the appendix for more details on the search strategy).

Focus Groups

The focus groups were conducted from August 2016 to February 2017. A total of 56 students and 66 staff from six post-secondary institutions across Canada participated in 27 focus groups; 43 students and 37 staff were female. Participants included undergraduate and college students and staff representing student success services, health and counselling services, mentorship and tutoring services, campus security, professors and residence services. This sample was not intended to be representative, yet there was an attempt to capture breadth. Separate focus groups were conducted for students, student mentors and advisors, and staff. Participants were asked about student substance use on campus, excluding alcohol. Only findings specific to non-medical prescription stimulant use among Canadian university students are discussed in this report.



Findings

Patterns of Use

According to the 2015 Canadian Tobacco, Alcohol and Drug Survey (CTADS), 0.2% of the general population report the non-medical use of prescription stimulants (Statistics Canada, 2015). This statistic was not reportable among emerging adults, aged 18–25, in the 2015 CTADS due to high sampling variability, but other survey results suggest rates are highest among this subgroup. For example, the 2015 National Survey on Drug Use and Health in the United States showed that 2.2% of emerging adults, aged 18–25, reported past month non-medical prescription stimulant use, compared to 0.6% of the general population (Center for Behavioral Health Statistics and Quality, 2016). Not only are prevalence rates highest among emerging adults, evidence also suggests that these rates are on the rise. Between 2006 and 2011, a 67% increase in non-prescribed use of Adderall in young adults, aged 18–25, was observed, along with a 156% increase in associated emergency room visits (Chen et al., 2016).

Prevalence rates are even higher when comparing the post-secondary student population to the general youth population. For example, data from the 2016 Spring College Health Assessment Survey, which is drawn from a convenience sample of 41 Canadian post-secondary institutions, indicated that 4.5% of post-secondary students had used stimulants that were not prescribed to them in the past 12 months, up from 3.7% in 2013 (American College Health Association, 2016). In addition, one report from Dalhousie University in Nova Scotia observed a past-year prevalence rate of close to 6% (Chinneck et al, 2017). Several U.S. studies also reported higher prevalence rates of non-medical prescription stimulant use among post-secondary students than the general youth population. According to the 2015 Monitoring the Future survey, the annual prevalence rate of Adderall use without medical supervision was 10.7% in college students compared to 7.1% in their non-college counterparts, a difference that has remained consistent over the past five years (Johnson et al., 2016). A 2015 meta-analysis of 20 studies estimated the prevalence of lifetime non-medical prescription stimulant use to be 17% among college students (Benson, Flory, Humphreys, & Lee, 2015).

The prevalence rate varied between 8 and 43% for the individual studies that comprised the meta-analysis. Factors such as regional variations, question wording and sample characteristics might all influence reported prevalence rates. Some of this variability could be due to differences in survey designs, such as web-based surveys that are able to assure greater levels of anonymity and tend to have reported rates in the higher range (Hildt, Lieb, & Franke 2014; Dietz et al, 2013).

Regardless of these issues, the evidence suggests that non-medical prescription stimulant use among post-secondary students is prevalent, a finding supported by the recent focus groups conducted by CCSA. When students were asked to comment on the prevalence of the use of “other substances” on campus (i.e., anything except alcohol and tobacco), after cannabis, prescription stimulants were often the next substance commonly reported, though in some cases non-prescription stimulants (i.e., party drugs) were more common (McKiernan, Fleming, & Smith, 2017).

Some studies have examined how non-medical prescription stimulant use progresses over the course of post-secondary education. For example, in a cohort of 1,253 college students from the U.S., small increases in lifetime use of analgesics, cocaine and hallucinogens were observed between the first and second year of school, whereas prevalence rates of stimulant use doubled during this same timeframe. This trend continued into the next year, when reports of non-medical stimulant use were found to double again (Arria, Caldeira, O’Grady, Vincent, Fitzelle, et al., 2008). Moreover, approximately 62% of students had been offered prescription stimulants, most often by a friend with a prescription, at least once in their lifetime by their fourth year of college (Garnier-



Dykstra, Caldeira, Vincent, O'Grady, & Arria, 2012). These findings are consistent with other reports that found that younger students were less likely to report non-medical prescription stimulant use. One factor that might account for these results is that a greater number of younger students live in residence where there might be more monitoring and less opportunity to engage in use (Clegg-Kraynok, McBean, & Montgomery-Downs, 2011).

Other temporal factors could also influence levels of use. For example, a study conducted among 5,389 students in the U.S. found that students who were first prescribed stimulants for ADHD during college were 13 times more likely to inappropriately use their prescriptions compared to those who were never prescribed a stimulant. Students who were first prescribed stimulants during college were also more likely to report alcohol and other drug use, compared to students first prescribed stimulants earlier in their educational development (i.e., from kindergarten to grade four) (Kaloyanides, McCabe, Cranford, & Teter, 2007).

Some studies have examined patterns of non-medical stimulant use among post-secondary students through less conventional methods. For example, wastewater originating from the sewage system of a campus dormitory that housed approximately 476 students showed higher amphetamine levels during times of greater academic stress (e.g., midterm exams) compared to times of lower stress (e.g., the first week of classes), and this difference was particularly evident during the final exam period of the second semester (Burgard, Fuller, Becker, Ferrell, & Dinglasan-Panlilio, 2013). Likewise, another study found that stimulant concentrations in campus wastewater were higher during exam time (Moore, Burgard, Larson, & Fern, 2014).

Patterns of use have also been assessed through tracking discussions of Adderall on Twitter. Using GPS data to examine tweets that originated from regions close to universities and college, one report observed that 213,633 tweets from 132,099 Twitter accounts mentioned Adderall. These tweets were highest during typical college and university final exam times (Hanson et al., 2013).

Students' Area of Study

Researchers have not directly compared levels of non-medical prescription stimulant use among students enrolled in different areas of study. However, some research has examined subpopulations of students in certain specialties (e.g., medicine, pharmacy and dentistry) (Herman et al., 2011). In a study of 2,732 U.S. medical students, 11% reported non-medical use of stimulants while in medical school; as with general populations of students, stimulant use was significantly related to other substance use and to being male (Emanuel et al., 2013). Among a group of medical sciences students, behavioural intention (i.e., plan to use during exams) was a strong predictor of non-medical Ritalin use (Eslami et al., 2014). Another study of medical students found that 9% of students reported non-medical methylphenidate use at least once in their lifetime. This study indicated that students had low knowledge about methylphenidate and its effects or the legal consequences associated with its non-medical use (Habibzadeh et al., 2011). A study conducted among 388 medical students found that 10.1% of students reported non-medical prescription stimulant use in their lifetime (Tuttle, Scheurich, & Ranseen, 2010). Taken together, it appears that non-medical stimulant use among medical students follows a similar pattern to that of general post-secondary student populations.

Stimulant use among students enrolled in other specialties has also been examined. For example, in a study of dentistry students, the prevalence of non-medical prescription stimulant use was 12.4% (McNiel et al., 2011). A study examining non-medical prescription stimulant use among pharmacy students suggested that few students attain their stimulants from the workplace. However, the study was based on self-reporting, so there is potential for under reporting of the workplace as a source (Lord et al., 2009). Among a sample of 807 multi-disciplinary masters- and doctoral-level graduate



students, past-year levels of non-medical stimulant use were found to be approximately 6%, and like undergraduate students, non-medical use was associated with various factors, including higher anxiety, stress and ADHD-related symptoms (Verdi, Weyandt, & Zavras, 2014). Unlike studies of undergraduate students, the study of graduate students indicated that non-medical prescription stimulant use was not associated with lower academic efficacy, which suggests that improving academic efficacy might not be an effective argument against non-medical stimulant for this population.

Perceptions of Risk, Expectations and Attitudes

Examining attitudes, expectations and perceptions of risk among post-secondary students is important, as lower perceived risk has been consistently associated with increased substance use (Johnson et al., 2016). Some studies indicate that post-secondary students perceive non-medical prescription stimulant use as having low risk. A longitudinal prospective study with a cohort of 1,235 college students in the U.S. found that one in four students felt that occasional stimulant use would cause little harm. Low perceived harmfulness at baseline predicted non-medical stimulant use 12 months later, even when taking into account other factors such as sensation seeking and various demographic variables (Arria, Caldeira, Vincent, et al., 2008). In fact, students who reported low perceptions of harmfulness were 10 times more likely to report non-medical prescription stimulant use compared to those with high perceptions of harmfulness. High levels of perceived harmfulness only lowered non-medical stimulant use among students exhibiting low to moderate sensation seeking.

A qualitative study among 175 U.S. college undergraduates indicated that a common justification for students who used prescription stimulants non-medically was that it had no perceived physical side effects (DeSantis & Hane, 2010). Students frequently contrasted non-medical stimulant use to the greater negative impacts of street drugs, a finding consistent with other qualitative studies (Judson & Langdon, 2009; Kerley, Copes, & Giffin, 2015). Moreover, none of the 175 participants recognized that using prescription stimulants non-medically posed a significant health risk, and felt that because a pharmaceutical company manufactured them they were relatively safe. Other justifications for use included students' beliefs that they were doing it for the right reasons (i.e., academic enhancement), it was not impairing, or they only used stimulants moderately (DeSantis & Hane, 2010).

In line with these findings, a 2014 study found that students reported greater positive attitudes towards prescription stimulants in comparison to cocaine, an illegal stimulant. This finding was particularly true for individuals who reported use compared to individuals who reported no use or reported cocaine use (Looby, Kassman, & Earleywine, 2014). The authors suggested that intervention programs might want to focus on the negative consequences of prescription stimulants by comparing their effects to cocaine in order to raise awareness of the overlap in negative side effects between the two drugs (Looby et al., 2014). Other studies examined comparisons between the non-medical use of stimulants and other substances. For example, a qualitative study among 18 post-secondary students observed that more than half of students felt that there was no moral difference between using caffeine versus using stimulants for cognitive enhancement (Franke, Lieb, & Hildt, 2012).

Results from CCSA's focus groups support the findings about risk perception. Participants noted that prescription stimulant use is appealing as it is easy to hide (compared to smoking cannabis) and can be perceived as safe because it is legal and "everyone is on medication." Students did not seem to be aware of the risks related to non-medical use. Participants mentioned that students might forget how many pills they had taken in one sitting and use more, which they said could lead to "O.D'ing." Students might also be unaware that if they use prescription medications non-medically early in the day and then begin drinking alcohol in the evening, they are mixing substances, possibly resulting in more pronounced impairment (McKiernan et al., 2017).



Examining attitudes, perceptions and expectations is informative, as they can be influenced or altered, whereas many of the known risk factors for non-medical stimulant use cannot be modified (e.g., age, ethnicity) or might be challenging to change (e.g., membership in a fraternity or sorority). One study examined academic self-efficacy and cognitive enhancement expectations, which are modifiable risk factors. Both low academic self-efficacy and high cognitive enhancement expectations were associated with non-medical stimulant use (Looby, Beyer, & Zimmerman, 2015).

Students' perceptions of the use of non-medical stimulants by fellow students have also been explored. One study of 1,106 undergraduate students reported that they overestimated the prevalence of other students' lifetime non-medical use of prescription stimulants. Such perceptions were associated with greater non-medical prescription stimulant use and hazardous drinking behaviour (Kilmer, Geisner, Gasser, & Lindgren, 2015). Other reports indicated that students overestimated the number of their peers using stimulants and this misperception was associated with a greater likelihood of personal use of non-medical prescription stimulants (Silvestri & Correia, 2016; Helmer et al., 2016). In line with these results, a study of 4,145 Dutch students revealed that subjective norms – the perceived acceptance of a behaviour, even if that perception is inaccurate – were the strongest predictor of students' intention to use stimulants non-medically (Ponnet, Wouter, Walrave, Heirman, & Van Hal, 2015).

Factors Associated with Use

Student Characteristics

Many studies have investigated whether some characteristics of post-secondary students are associated with non-medical prescription stimulant use. Compared to students who do not report non-medical prescription stimulants use, those who do are more likely:

- To be Caucasian (Arria, O'Grady et al., 2008; Benson et al., 2015; McCabe, Teter, Boyd, Knight, & Wechsler, 2005),
- To be a member of a fraternity or sorority (Arria, O'Grady, et al., 2008; Benson et al., 2015; McCabe et al., 2005),
- To have higher test anxiety (Sattler & Wiegel, 2016), and
- To have lower grades (Bavarian, Flay, Ketcham, & Smit, 2013).

One study of approximately 11,000 students found that athletes were marginally more likely than non-athletes to report non-medical stimulant use (Ford, 2008). In contrast, in another study of a smaller sample (682 participants), college athletes were less likely to report non-medical stimulant use than non-athletes (Gallucci & Martin, 2015).

Studies that have examined certain personal attributes have found significant relationships between factors such as sensation seeking (Lookatch, Dunne, & Katz, 2012; Chinneck et al, 2017) and lower self-control (Maahs, Weidner, & Smith, 2016), which is in line with reports that those who use stimulants non-medically might engage in more risky behaviours (Arria, Caldeira, Vincent, et al., 2008). As well, a study of 484 college students indicated that those who scored high on measures of delinquent peers, greater past-year deviance and lower moral beliefs were more likely to report non-medical stimulant use (Maahs et al., 2016).

The association of increasing use of non-medical stimulant with times of academic stress (Burgard et al, 2013; Moore et al, 2014), might be paralleled by the association of use with other kinds of stress. Evidence suggests that non-medical prescription stimulant use among undergraduate



students is associated with psychological stress (Ponnet et al., 2015), higher anxiety (Dussault & Weyandt, 2011) and depressive symptoms (Ford & Schroeder, 2008; Gibbs et al., 2016; Weyandt et al., 2009; Zullig & Divin, 2012). The ways in which post-secondary students cope with stress could contribute to the likelihood of use. A qualitative study of 38 university Australian students indicated that those who reported non-medical stimulant use were more likely to endorse the use of less effective coping methods during times of stress or approaching deadlines. Specifically, students endorsed more avoidant-coping – avoiding feelings of distress by engaging in activities such as sleeping, eating, cleaning and so on – and emotion-focused coping – behaviours that reduced distress in the short term, including avoidance, support seeking and switching activities (Jensen, Forlini, Partridge, & Hall, 2016). Together, these findings suggest that post-secondary students who report non-medical stimulant use might also experience greater levels of psychological distress and resort to maladaptive means of coping.

Other factors such as self-worth have been examined in a sample of 3,038 undergraduate students and some were found to be related to non-use or inappropriate use of prescription stimulants (Giordano et al., 2015). Identifying with external self-worth components, including personal appearance and approval by others, was related to non-medical prescription stimulant use. Components of self-worth related to academics were not related to such use. The authors suggested that these findings point to other self-worth components outside of academics on which interventions with post-secondary students could focus.

Studies have also examined post-secondary students who have ADHD and use prescription stimulants inappropriately. Having a diagnosis of ADHD has been associated with non-medical prescription stimulant use, possibly owing to greater access through the patient's own prescription (Bavarian et al., 2013; Gudmundsdottir, Weyandt, & Ernudottir, 2016). One study of post-secondary students observed that among those who self-identified as having ADHD, 18% reported using a medication that was not theirs at least once in their lifetime and 33% reported over-use of their own stimulant prescription (Arria, Caldeira, O'Grady, Vincent, Fizzle, et al., 2008).

Gender

The link between non-medical prescription stimulant use and gender is not consistent across studies. Several studies indicated males are at a greater risk (Emanuel et al., 2013; McCabe et al., 2005; Gudmundsdottir et al., 2016), several reported no difference (e.g., Gallucci, Usdan, Martin, & Bolland, 2014; Herman-Stahl, Krebs, Kroutil, & Heller, 2007; Mache, Eickenhorst, Vitzthum, Klapp, & Groneberg, 2012), and at least one reported that females are more likely to engage in non-medical stimulant use (Zullig & Divin, 2012). One study initially observed that males were more likely than females to report non-medical stimulant use; however, once exposure opportunity was controlled for (males were offered prescription stimulants for non-medical use more often than females), the difference between the two genders was no longer apparent (Garnier-Dykstra, et al., 2012). Despite these mixed findings, a meta-analysis indicated that males tend to use stimulants non-medically more than females, although the effect of gender ranged in size. It was suggested that moderating variables, such as differences in academic achievement or areas of study, as well as differences in methods across the studies, could account for the variability in findings (Weyandt et al., 2014).

Polysubstance Use

A link between the non-medical use of prescription stimulants and use of the other substances, including alcohol, cannabis and illicit drugs (hallucinogens, cocaine, ecstasy), is well documented in the literature (Arria, Caldeira, O'Grady, Vincent, Johnson, et al., 2008; Blevins, Stephens, & Abrantes, 2017; Jardin, Looby, & Earleywine, 2011; Messina et al., 2014; Ponnet et al., 2015; Rabiner,



Anastopoulos, Costello, Hoyle, McCabe, & Swartzwelder, 2009). Furthermore, there is evidence of an association between non-medical prescription stimulant use and dependence on other substances, including alcohol and cannabis (Arria, Caldeira, O'Grady, Vincent, Johnson, et al., 2008). In line with these findings, one study conducted among 3,639 undergraduate students in the U.S. indicated that participants who reported non-medical prescription stimulant use were close to five times more likely to experience three or more indicators on a problematic substance use screening test (McCabe & Teter, 2007).

The concurrent use of other substances with prescription stimulants is concerning as it might increase the risk for pharmacological interactions that could result in harms (e.g., cardiovascular events). For example, in a sample of 4,000 U.S. students, nearly 5% of participants reported simultaneous use of prescription stimulants and alcohol in the past year. Further, of those students who reported prescription stimulant use, nearly half (46.4%) reported using them with alcohol (Egan, Reboussin, Blocker, Wolfson, & Sutfin, 2013).

Concerns about using alcohol and prescription stimulants together go beyond the potential for negative physiological side effects. Students who report co-use also report lower grade point averages, greater levels of illicit substance use and greater experience of severe alcohol-related consequences (e.g., driving while impaired, motor vehicle accidents, physical violence, being a victim of a crime, negative sexual encounters), even when controlling for sensation seeking (Egan et al., 2013). This increase in alcohol-related harms might be due to the ability of stimulants used while drinking to counteract the sedative effects of alcohol, thus delaying the cessation of drinking.

Energy drink consumption has also consistently been found to be associated with non-medical prescription stimulants use (Arria et al., 2010; Gallucci & Martin, 2015; Woolsey et al., 2015). The co-use of these substances with energy drinks is concerning as some energy drink ingredients (e.g., ginseng, yohimbine, etc.) as well as the high caffeine content could increase the risk of harm from prescription stimulants (Woolsey et al., 2015).

Motivations for Use

Motivational theories propose that students use substances to achieve valued outcomes. Students use stimulants non-medically for a wide range of reasons or motives. Some of these motives are riskier than others in terms of their associations with adverse outcomes.

Cognitive Enhancement

Several reviews of studies have indicated that the most commonly reported motive is to enhance academic performance (Bennett & Holloway, 2017; Drazdowski, 2016; Finger, Silva, & Falavigna, 2013; Forlini & Racine, 2009; Wilens et al., 2008). In a systematic review of 35 studies, every study but three found the primary motivation was for academic purposes (e.g., to increase focus or attention) (Drazdowski, 2016). In a qualitative study among 18 post-secondary students, all participants interviewed reported using stimulants non-medically to enhance academic performance, particularly for exam preparation, increased focus to allow for greater study time and for writing papers. Interestingly, one report indicated that use of prescription stimulants as a study aid tends to be viewed less negatively by students than use for weight loss or recreational use (Lookatch, Moore, & Kratz, 2014).

Findings from Canadian focus groups on campus supported these findings. Focus group participants reported that students use Adderall to help them study, especially during stressful times such as exam periods. They reported that “the fear of failure” influenced their use, as well as the feeling a student would get from the substance (e.g., feeling invincible). Adderall was said to be used to “perk someone up” after a long day to help them study late into the evening. It was reported that some



students might come to rely on the increased focus and corresponding productivity provided by stimulants, causing them to continue use of the drug beyond stressful periods. Participants theorized that this drug is popular because a majority of students are arriving at post-secondary institutions without the skills to cope with academic stress and manage their time, making it more likely for them to seek a “quick fix” during such times. Participants also felt that some students could not function successfully in their academics without this type of help (McKiernan et al., 2017).

Self-Medication

Some studies have suggested that people might engage in non-medical prescription stimulant use to self-medicate for issues with inattention or because they might have undiagnosed ADHD (Rabiner, Anastopoulos, Costello, Hoyle, & Swartzwelder, 2010). In a sample of 1,153 undergraduate university students, those who reported non-medical prescription stimulant use had significantly higher levels of hyperactivity and inattention than those who did not report such use (Hartung et al., 2013), which is consistent with other reports (Bavarian et al., 2014). Similarly, higher levels of ADHD symptoms were observed among post-secondary students who persistently used stimulants non-medically (i.e., at least once in the past year during all three consecutive years in which participants were assessed), compared to those who did not use stimulants persistently or those who reported persistent cannabis use. However, only 17% of those who used prescription stimulants persistently met the clinical criteria for ADHD (Arria et al., 2011). In contrast, another study of 190 post-secondary students reported that 71% of those who used prescription stimulants non-medically had a positive screening result for ADHD, suggesting they had enough symptoms to warrant further medical attention (Peterkin, Crone, Sheridan, & Wise, 2010).

It is not clear whether self-reporting measures of ADHD are valid, as there is preliminary evidence to suggest that some diagnostic tools for self-reported ADHD are not sensitive enough to detect faked symptoms. For example, one study that compared self-reports with clinical evaluations to assess ADHD behaviours reported that 22% of college students were falsifying deficits (Marshall et al., 2010). Therefore, it has been suggested that clinicians use symptom validity tests to ensure that college students are not fabricating symptoms in an effort to access stimulants (Jasinski et al, 2011).

Weight Loss

One of the common side effects of stimulant use is appetite suppression and related weight loss, which might also serve as a motivator for use among post-secondary students. Weight loss was indicated as a secondary reason for using Adderall non-medically, especially among females, in CCSA’s focus groups (McKiernan et al., 2017). Participants said that some students forget to eat while using Adderall, causing them to lose weight and making the drug more appealing.

Some studies that examined motivations for using prescription stimulants related to weight loss indicated prevalence rates ranging from 4–10% (Kilwein, Goodman, Looby, & De Young, 2016). In a sample of 707 American college students, non-medical prescription stimulant use for weight loss was associated with frequent dieting and purging, lower self-esteem and body image issues, as well as laxative misuse (Jeffers & Benotsch, 2014). In addition, there is evidence to suggest that the use of prescription stimulants non-medically might be associated with symptoms of eating disorders among young adult women. A study of female university students screened them for an eating disorder, determining those who were at low risk, at high risk or who already had a clinical diagnosis. Ten percent of this group reported inappropriate stimulant use and those who so reported had a greater clinical severity of eating disorder (i.e., those at high risk or those with a subclinical or clinical eating disorder)(Gibbs et al, 2016). It has been suggested that healthcare practitioners who prescribe this



medication should be made aware of its link to eating disorder symptomatology to ensure that the prescription recipient is not at an elevated risk for non-medical use and harms (Kilwein et al., 2016).

Other Motives

Two systematic reviews of the literature identified other potential motives for non-medical prescription stimulant use (Drazdowski, 2016; Bennett & Holloway, 2017). Reports have identified that students might engage in such use out of curiosity (Lord et al, 2009), for recreational purposes (DeSantis, Webb, & Noar, 2008), as a sexual enhancement (Lookatch et al., 2012), as a physical activity or athletic performance enhancement (Judson & Langdon, 2009; Lookatch et al., 2012; Low & Gendaszek 2002), or to increase confidence or sociability (Clegg-Kraynok et al., 2011). In addition, some students have said that use of stimulants allowed for a better work–life-balance by increasing energy for other activities (Hildt et al., 2014). It is worthy of note that, unlike alcohol (Cooper, 1994) and cannabis (Simons, Correia, Carey, & Borsari, 1998), there are no motivational models for non-medical prescription stimulant use that could be useful areas for future investigation.

Potential Consequences of Non-medical Prescription Stimulant Use

Although the results from several studies report improved academic performance as the motivator for using prescription stimulants among students, the results from several cross-sectional studies indicate that those who use stimulants non-medically tend to have **lower** grades than students who do not (Maahs et al., 2016; McCabe et al., 2005). It is useful to know whether non-medical stimulant use improves academic performance in order to dispel students' misperceptions about the effects of stimulants. In a longitudinal study of 1,253 first-year university students, those who reported non-medical use at baseline were found to study less, socialize more and report skipping more classes than those who did not use stimulants (assessed during their first year). They also received lower grades at the end of first year, even when taking into account several factors, including high school grades (Arria, O'Grady et al., 2008).

Supporting this finding, a recent study that looked at academic records across two years showed no improvement in grade point averages in students who used stimulants non-medically. In contrast, grade point averages increased significantly between the two years for students who did not use stimulants (Arria et al., 2017). Unfortunately, there are reports that a majority of students believe that using prescription stimulants creates the outcome they hope for or increases their grades (Bavarian et al., 2013; Peterkin et al., 2010). Information that dispels these misperceptions about the academic benefit of prescription stimulants should be incorporated into intervention strategies.

Studies that have looked at whether prescription stimulants can improve cognition have generally found that their effects on cognitive functioning among healthy individuals are subtle (Lakhan & Kirchgessner, 2012). For example, in a review of 40 studies conducted among healthy adults, no memory benefits were observed immediately following encoding tasks, although later recall and recognition was improved (Smith & Farah, 2011). One study of 27 healthy adults found that a single dose of methylphenidate improved error detection (i.e., the conscious recognition of errors in an error awareness task)(Hester et al., 2012). In sum, it seems that stimulants might enhance cognitive functioning on some tasks for certain individuals, but their effects are likely more apparent among those who perform poorly at baseline on tasks (Smith & Farah, 2011).

Placebo effects might also play an important role on the perceived cognitive effects of stimulants among post-secondary students. Students who were at high risk for non-medical prescription stimulant use (e.g., lower grades, sorority or fraternity members, risky alcohol use) and were given a



placebo that they believed to be methylphenidate reported that they had a greater ability to focus, especially for longer periods of time (Looby & Earleywine, 2011).

A large number of the studies conducted on the cognitive enhancing effects of drugs, such as methylphenidate, were completed in otherwise healthy adult humans or animals (Urban & Gao, 2014). This raises concerns about the effects of non-medical stimulant use among youth whose brains are not fully developed until approximately their mid-20s. Ingesting stimulants, which are known to alter dopamine and other neurotransmitters systems that are still maturing in areas of the brain (e.g., the prefrontal cortex which is involved in executive functioning) (Casey, Jones, & Hare, 2008), could disrupt normal brain maturation (Urban & Gao, 2014).

More severe medical outcomes have been observed in association with prescription stimulant use. The brand formulation Adderall XR™ was removed from the Canadian pharmaceutical market by Health Canada in 2005 due to rare spontaneous deaths caused by cardiovascular events among pediatric and adult populations outside of Canada. As well, case reports of cardiovascular side effects, mental health disorders (i.e., psychosis, depression) and death have resulted in warnings being issued for methylphenidate (Lakhan & Kirchgessner, 2012). For example, a case report described acute myocardial infarction among a young man who had combined Adderall with alcohol (Jiao et al., 2009). Other health concerns have been observed among post-secondary students, including poor sleep quality and greater sleep disturbances among those who use stimulants in comparison to those who do not (Clegg-Kraynok et al., 2011).

Sources and Availability of Prescription Stimulants

A systematic review indicated that the most common source of prescription stimulants among college students are peers (Benson et al., 2015). There is also evidence to suggest that students often receive the drugs for free, typically from friends (Garnier, Arria, Caldeira, Vincent, O'Grady et al., 2010; Garnier-Dykstra et al., 2012). For instance, in one study by Arria, Caldeira, O'Grady, Vincent, Johnson and Wish (2008), approximately three quarters of participants reported obtaining their pills for free. If students did purchase them, they reported paying between 1 to 10 dollars per pill (Arria, Caldeira, O'Grady, Vincent, Johnson et al., 2008). In a sample of 3,407 undergraduate students in the U.S., of those who had a valid prescription for stimulants, more than half had been approached to divert their medication in the past six months, and more than a quarter reported that they had diverted their medications (Rabiner et al., 2009).

As to perceived availability, the results from a couple of studies indicate that post-secondary students tend to view stimulants as being readily available. One study reported that 82% of students felt that it was somewhat or very easy to attain prescription stimulants (DeSantis et al, 2008). Similarly, more than half of students in another study reported that it was somewhat or very easy to obtain stimulants (Sharp & Rosén, 2007).

CCSA's Canadian campus focus group results support these findings (McKiernan et al., 2017). Participants cited a number of ways that students could acquire Adderall. For instance, some mentioned it was sold in the library during exam time, with sellers advertising to clients through anonymous social media apps. Others mentioned that students can approach those students who are known to have a prescription for the medication and ask to buy some, which is consistent with diversion through peers as a prominent source of prescription stimulants.

The strongest predictor of willingness to divert their supply among prescription holders was their own use of the medication in a manner not prescribed (Sepúlveda et al., 2011). Common motivations to engage in diversion among post-secondary students were to help out a fellow student during a time of high academic stress, to make extra money or to supply a peer who had run out of their prescription



(Gallucci & Martin, 2015). These findings speak to the potential for prevention strategies that target students with prescriptions, as they appear to be a crucial source of diversion. One study found that students are less likely to divert medications if their healthcare practitioners frequently communicated with them by asking if they shared their medications and by explaining the negative consequences of diversion (DeSantis, Anthony, & Cohen 2013).

Implications and Conclusion

This topic summary reviewed the various risk and contributing factors associated with non-medical prescription stimulant use that could inform prevention strategies. Post-secondary students appear to have misperceptions related to the safety of use, the level of use of other students and the ability of stimulants to improve academic performance. The non-medical use of prescription stimulants is in fact associated with decreased academic performance. Increasing the awareness of post-secondary students of the evidence of the effects of stimulants and potential harms associated with non-medical prescription stimulant use will help equip them with the knowledge they require to make informed decisions about use. This review also identified populations for whom prevention efforts could be focused or tailored (e.g., for sorority and fraternity members, students experiencing high levels of stress, etc.).

There is a general lack of studies conducted outside of the U.S. While results from Canadian focus groups of post-secondary students suggest that the findings summarized in this review may well translate to the Canadian context, there is a need for large-scale prevalence studies in Canada.

As described in CCSA's *Prevention of Prescription Stimulant Misuse among Youth* (2016b), limited information is available on programs aimed at preventing non-medical prescription stimulant use in post-secondary students. It is crucial for prevention programs aimed at reducing or preventing the non-medical use of prescription stimulants to evaluate and disseminate information about their efficacy. Healthcare practitioners can play a role in reducing potential harms of stimulants by communicating with students with a prescription to ensure they are aware of the possible negative consequences of diversion. Likewise, post-secondary institutions can also explore ways to correct perceptions of stimulant safety, subjective norms about prevalence of non-medical stimulant use and efficacy for academic enhancement, and promote positive coping skills for dealing with academic stress.

This review supports the prevention and education streams of the *First Do No Harm* strategy. The *First Do No Harm: Responding to the Canadian Prescription Drug Crisis* (National Advisory Committee on Prescription Drug Misuse, 2013) strategy is a 10-year plan that outlines 58 recommendations for action, focusing on several areas aimed at reducing the harms of prescription drugs, including stimulants. The findings of the current review can serve to promote an understanding of the evidence to better support strategies aimed at reducing the harms of non-medical prescription stimulant use among post-secondary students.

Additional Resources

- Prevention of Prescription Stimulant Misuse among Youth (Topic Summary)
- Stimulants, Driving and Implications for Youth (Topic Summary)
- Prescription Stimulants (Canadian Drug Summary)
- First Do No Harm: Responding to Canada's Prescription Drug Crisis.



Appendix: Search Strategy

The search initially retrieved 2,761 articles. An information specialist screened the resulting titles and abstracts, and removed duplicates and articles that were outside of the scope of the project. The Research and Policy Analyst screened the remaining 238 articles and excluded 127 articles for various reasons. Excluded studies:

- Used samples from populations that were not post-secondary students;
- Combined prescription stimulants with other illicit non-prescription stimulants in their analyses;
- Examined prescription drugs as a broad class and did not conduct a sub-analysis of stimulants;
- Were narrative reviews; or
- Had purposes that did not fit within the objectives of the current review.

One hundred and one articles were included in the current review.



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