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# Prevention of Prescription Stimulant Misuse among Youth

**Key Messages**

- There are serious harms associated with the misuse of prescription stimulants, such as serious cardiovascular events, including death.
- Rates of past-year misuse of prescription stimulants were 3.7%, 2.5% and 1.2% among Canadian post-secondary, high school and middle school students, respectively. Other studies conducted on post-secondary campuses have indicated rates as high as 5.9%,
- Limited information is available on specific programs or interventions for the prevention of prescription stimulant misuse in college and university students. No information was found for middle school or high school students even though it is becoming increasingly recognized that the peak age for initiation of prescription stimulant misuse is between 16 and 19 years of age, and is known to occur in those as young as 12 years old. Because of this potential for early onset, prevention programs aimed at the misuse of prescription stimulants should be initiated among youth before they enter college or university.
- General principles and recommended actions to consider when developing programs for prevention of prescription stimulant misuse in college and university settings have been described in the literature and can be used as a resource by those starting new programs.
- Those developing prevention programs for prescription stimulant misuse should be encouraged to publish descriptions and evaluations of their programs in order to share knowledge on effective and ineffective strategies.

## Background

Stimulants are a broad category of substances that act to increase the level of activity in the central nervous system. The stimulant category includes commonly used substances such as caffeine and nicotine, non-prescription decongestants (e.g., pseudoephedrine), illegal drugs (e.g., cocaine, methamphetamine) as well as prescription medications. Prescription stimulants are most commonly used for the treatment of attention deficit hyperactivity disorder (ADHD) and include drugs such as methylphenidate (e.g., Ritalin®, Concerta®), dextroamphetamine (Dexedrine®), amphetamine and dextroamphetamine (Adderall®) and lisdexamfetamine (Vyvanse®).

Although prescription stimulants provide benefits for those who require them for medical purposes, they also have the potential to be misused because of their psychoactive properties. Prescription stimulants might be misused for cognitive enhancement (e.g., increased wakefulness, alertness,

focus and attention), recreational purposes (e.g., to get high) and physical reasons (e.g., performance enhancement in sports, weight loss). Youth, who comprise both adolescents and emerging adults, are more likely to misuse prescription stimulants. For the purposes of this topic summary, prescription stimulant misuse (PSM) is defined as the use of prescription stimulants that were prescribed to someone else, taking more than what was medically prescribed or taking the stimulant in a manner other than prescribed.

Misuse of prescription stimulants is a growing problem on college and university campuses in the U.S. and in Canada.[1,2] A 2015 meta-analysis of 20 studies found the prevalence of lifetime prescription stimulant misuse rates among college students to be 17% overall, although results of individual studies of varying design and in varying populations ranged from 8% to 43%.[3] Data from Dalhousie University in Nova Scotia indicated that 5.9% of first-year students had misused prescription stimulants.[4] In addition, data from a convenience sample (non-representative) of 32 Canadian post-secondary institutions, published in 2013, indicated that 3.7% of post-secondary students had used stimulants that were not prescribed to them in the past 12 months.[5]

Prescription stimulants are also misused by students in middle and high school. In 2012–2013, 1.2% of Canadian students in grades 7–9 and 2.5% of students in grades 10–12 reported past year use of prescription stimulants to get high and not for medical use.[6] The mean age at first use for these Canadian students was 12.6 years for those surveyed in grades 7–9 and 14.2 years for those surveyed in grades 10–12.[6] In fact, it is increasingly recognized that initiation of PSM often occurs before youth reach the post-secondary level. An analysis of data from the US National Surveys on Drug Use and Health (2004–2012) among a subpopulation of youth aged 12 to 21 years found that the peak age of initiating stimulant misuse was 16 to 19 years.[7] Although the risk of PSM initiation was smaller for those in the 12–15 year age group, the data demonstrated that initiation of PSM occurred in this age group as well. Together, the above data highlight the importance of prevention strategies for PSM, not only at college and university levels, but also in middle school and high school students. Prescription stimulant misuse is not only common among youth, but is also concerning given the potential for harm. In particular, PSM can contribute to hostility, paranoia, the development of a substance use disorder and cardiovascular events, among other harms.[8]

Although PSM is an issue that affects youth from middle school through to college and university, the available information on prevention of PSM in the literature is mainly focused on students attending colleges or universities. As a result, the information in the remainder of this review is focused on prevention in this population, unless otherwise stated.

Researchers have speculated that the increasing numbers of college and university students receiving stimulant medication for treatment of ADHD might be contributing to the increased rates of stimulant misuse on campuses, since the presence of many students with prescriptions might result in a greater supply for potential diversion.[1,3] Studies have shown that most college and university students who misuse prescription stimulants obtain these medications from their peers (e.g., 68%–91%), although some take more of their prescribed medication than directed.[3,9,10] In youth aged 10–18 years, use of other people's stimulants was the most frequently reported form of non-medical use (88.4%), followed by using more than prescribed (38.9%), and using non-prescribed routes of administration (32.2%).*[9]

Key risk factors associated with PSM in college and university students include being male, a member of a college fraternity or sorority, of Caucasian race, in upper levels of college or university, or having a lower grade point average (GPA).[3,11] Psychological factors such as depression and

* Note that these percentages do not add up to 100%, which is because some youth are misusing in more than one way.

inattention might also increase risk.[1] Some of these factors (e.g., inattention, male gender) are also risks for developing conditions that require the appropriate medical use of prescription stimulants. In addition, PSM has been associated with use or problematic use of other substances such as tobacco, marijuana and illicit stimulants (cocaine, amphetamines), and with binge drinking.[3] The influence of socioeconomic status, religion and extracurricular involvement on risk of PSM requires further research.[3]

There are multiple motivations for PSM by youth. College and university students might misuse prescription stimulants to enhance their experience partying and getting high on other substances.[3,11] For example, in the short term, stimulants in low doses can increase alertness, energy and attention, as well as increase levels of dopamine, a neurotransmitter in the brain associated with pleasure, movement and attention.[8] Misuse for weight loss and for performance enhancement in sports has also been reported in college and university students, and students in grades 8 and 10, respectively.[12,13] Because motivations for PSM seem to be unique to this class of drugs, specific prevention messages need to be tailored accordingly. In addition, it is thought that some college or university students might misuse prescription stimulants as a coping strategy to self-medicate undiagnosed ADHD or depressive symptoms.[1,3] However, the most common reason for PSM in youth has been clearly shown to be related to improving academic performance.[1,3] College or university students commonly report taking prescription stimulants to improve attention and alertness while studying, taking exams and writing papers. One study reported that 91.5% of first-year university students who reported misusing stimulants in the last term indicated that they used them as a study aid, and this motivation for use was related to higher sensation seeking and impulsivity.[4] In fact, very few students report misuse only for non-academic reasons.[3] A study in which students could identify multiple motives for PSM showed that 54% misused only for academic reasons, 40% misused for both academic and non-academic reasons, while only 6% misused for non-academic reasons alone.[14] This finding further highlights the importance of academic motivations in PSM and also the importance of assessing multiple motivations for PSM when investigating student motivations.

Because the main motivation for PSM among post-secondary students is related to enhancing academic performance, rather than the recreational motivations often associated with general misuse of substances, prevention approaches that are different from those used to address general substance misuse might be needed to achieve results in reducing PSM.

## Objectives

The objective of this topic summary was to review programs and strategies aimed at preventing or reducing PSM in youth attending middle school, high school or post-secondary school, and to provide information on the effectiveness of the programs and strategies identified. This information is intended to be used by schools and universities seeking to develop their own programs or strategies to address the issue of PSM in their local settings. It can also inform a wider audience including policy makers, practitioners, frontline professionals and the public on the issues related to PSM in youth.

## Methods

A literature search of PubMed, PsycNET and Google Scholar databases, as well as a targeted search of the grey literature was conducted to identify references for specific prevention programs as well as

to identify PSM prevention strategies.† Additional references were included in the Background and Discussion sections of this summary, as relevant.

# Findings

Four citations describing specific programs or approaches to prevent or reduce PSM were found.[15–18] These are described in the subsection, Findings on PSM Prevention Programs. In addition, 11 citations describing more general strategies for prevention of PSM were retrieved.[1–3, 10, 16, 19–24,‡] These are described in the subsection, Findings on Strategies for Prevention of PSM.

## *Findings on PSM Prevention Programs*

Four references were found that described specific programs or approaches to prevent PSM in college and university students. No specific programs addressing PSM in middle school or high school students were found. Of the four references found, one was a randomized controlled trial of a prevention approach, two described different college or university programs related to PSM prevention, and the remaining reference was a tool specifically designed to be used in prevention of PSM with college or university students. Of note, only one study used a randomized controlled trial design and so outcomes related to the other prevention approaches described should be interpreted cautiously as causality cannot be inferred. A summary of each is provided below.

### Expectancy challenge as an approach to prevent PSM

Expectancies are beliefs about drug-related consequences, both positive and negative, that can influence motivations for use. One reference was found that described a randomized controlled trial to determine whether challenging beliefs about positive consequences of taking prescription stimulants — an expectancy challenge — could be effective in preventing PSM in college and university students.[15]

Participants included 18–25 year old college students with no prior PSM, but with at least two risk factors for PSM (being a member in a fraternity or sorority, low GPA, at least one episode of binge drinking in the last two weeks or past-month use of cannabis). Participants were randomized to the expectancy challenge group (n=47) or the control group (n=49) and were scheduled for two laboratory visits (a baseline visit and an expectancy challenge or control intervention visit), as well as a six-month online follow-up survey. A series of questionnaires and cognitive tests were administered at both laboratory visits. The expectancy challenge was conducted at one of the visits and involved administration of a placebo, which participants were told was methylphenidate, followed by a series of questionnaires and cognitive tasks. After the challenge, an explanation of expectancy effects was provided and participants were informed that prescription stimulants do not significantly enhance cognitive functioning in healthy individuals and that PSM can result in negative medical, legal and psychological consequences. In addition, a review of test results with each individual, with and without the placebo methylphenidate, was done to help participants realize that differences in their results had to be due to their expectancies since it could not be due to medication (since a placebo was administered). The control group did not receive any medication, but completed the series of

† A variety of terms related to prescription stimulants and prevention were used in the search. Additional methods of searching included reverse snowballing and scanning the reference lists of relevant articles. The searches produced 2,691 results, which were screened by the information specialist who removed duplicates and any articles that were clearly outside of the scope of this project (based on titles and abstracts). CAMH's Google Custom search of the Centre for Addiction and Mental Health, as well as several sources listed in Grey Matters Light were also searched for grey literature. Eighty-one citations were then passed on to the researcher for further screening.

‡ References focusing on prevention of prescription drug misuse in general were included as part of the 11 citations found, if they provided information directly relevant to prevention of PSM. Additional references were included in the results section on PSM prevention strategies to provide context and explanation for the findings.

questionnaires and cognitive tasks at both laboratory visits, and no explanation of expectancy effects was provided. A six-month follow-up online survey was then conducted in all participants to assess incidence of PSM and to reassess prescription stimulant expectancies.

Results showed that expectancies related to cognitive enhancement were significantly reduced immediately after the expectancy challenge, but that this effect was not maintained at the six-month follow-up point. These results are promising in that they demonstrate that modification of expectancies related to PSM is possible, but the modification does not appear to last, suggesting that more than a single session of an expectancy challenge might be needed to produce a long-lasting effect. Further, in spite of the initial lessening in cognitive enhancement expectancies in the expectancy challenge group, no statistically significant differences between groups in initiation of PSM were found (nine participants in each group initiated PSM) over the six-month follow-up period. This suggests that weaker beliefs about cognitive enhancement might not translate into reduced PSM. However, the duration of the change in cognitive enhancement expectancies produced in this study, beyond the immediate assessment, is unknown and might have contributed to this result if it was very short-lived.

The study also included an additional analysis comparing those who used prescription stimulants in the follow up period and those who did not. The analysis showed that those who used prescription stimulants had weaker expectancies for experiencing negative effects at baseline, such as racing heart, difficulty calming down and feeling nervous and edgy with use of prescription stimulants. Put another way, stronger expectancies for experiencing negative effects of prescription stimulants were protective against later PSM.

## PSM prevention program at Miami University in Oxford, Ohio

Miami University in Oxford, Ohio, implemented an innovative program to address PSM on campus.[18] Any student who seeks medication for ADHD through the university student counselling service must first go through an initial phone screening and then attend a 90-minute “brain booster” workshop to learn how to improve study skills, better manage time and improve sleep. Tips on minimizing distraction, reducing procrastination and managing time effectively (e.g., using their cell phones to keep track of appointments) are also provided. In addition, participants are given a planner and instructed on how to use it. After a couple of weeks, participants fill in a goal completion worksheet to show how well they have adopted the skills they learned. If they decide to go ahead with an evaluation for ADHD at this point, they are required to attend another one-hour workshop (this is required even for students who have been prescribed ADHD medication in the past). This workshop emphasizes keeping medications safe in a college setting and avoiding misuse and diversion. After completing both workshops, participants are scheduled to see the physician. According to Joshua Hersh, MD, Staff Psychiatrist at Miami University student counselling, the approach aims to “minimize abuse by maximizing care.” Similar programs are also in place for anxiety, insomnia and pain. The limitation is that this process is only available in association with campus medical clinics and does not exist in the wider community. By example, this program would not capture students who have prescriptions from doctors outside of campus. While this program sounds promising, no information on evaluation of it was available.

## PSM prevention program at Syracuse University

A 2015 paper from a non-peer reviewed journal described a planned pilot PSM primary prevention program to be undertaken by Syracuse University.[16] The planned program was based on motivational interviewing concepts (a counselling approach that works to facilitate and engage intrinsic

motivation to produce a behaviour change) and was to be delivered to students during freshman orientation. No information on the content of the program to be delivered was provided.

A key component of the program involved use of peer interventionists to deliver the program content. College juniors and seniors were to be trained in motivational interviewing techniques and principles as well as in intervention content so that they could act as peer interventionists.[16] The program also planned to use social media for dissemination of the intervention. Development of a web-based intervention component with real-time assessment and feedback was a desired next step to reinforce the information provided through face-to-face interventions. In addition, a component of the planned program was to collect data to determine whether college students with ADHD and prescriptions for stimulants take "drug holidays" as a usual part of their therapeutic regimen. This information would be used to determine if changes in physician prescribing might be required to ensure that excess medications, which could be diverted and misused, are not provided to patients. Finally, the planned program was also to include an academic preparatory skills intervention based on the data indicating that many students engage in PSM for academic reasons and that students with low GPAs are more likely to consider PSM as a compensatory strategy.[3,16] As the paper described a planned program, no evaluation of the program was included.

### Generation Rx program

Generation Rx is a collaborative program between the Cardinal Health Foundation and Ohio State University's College of Pharmacy.[17] It was initiated in 2007 with the goal of using educational prevention to address increasing misuse of prescription drugs. The program offers free toolkits and other resources geared to different audiences including elementary, teen and college audiences (see www.generationrx.org/). Although this program addresses prescription drug misuse in general, of relevance to this review is a specific resource for the college audience called The Adderall Dilemma – Tr$_x$uth about Prescription Stimulant Abuse (available on the website). This toolkit is designed to engage college students in group discussion after presentation of a skit, and contains facilitator notes, a script for the skit discussion questions, handout and poster. The skits illustrate conversations between students looking to get Adderall from their peers for various reasons (i.e., as a study aid or party enhancer). The discussion questions that follow ask students what they would do in that situation, what they think some of the negative consequences of stimulants could be, and what alternative solutions they could use in the scenarios, among other questions. No information on evaluation of the toolkit was available.

## *Findings on Strategies for Prevention of PSM*

The findings on strategies for prevention of PSM were divided into two categories based on the literature: (1) general principles to consider when developing prevention programs for PSM, and (2) specific actions recommended for inclusion as part of PSM prevention programs. A summary of the literature available for each of these categories is described below.

### Principles for developing programs to prevent PSM

#### Collect data to understand the problem in your local setting

Many studies emphasized the importance of understanding the problem of PSM within the local community before embarking on a prevention program.[2,3,16,21,23] A clear understanding of motivations, risk factors and demographics for PSM is needed to design prevention and education strategies that are tailored to address the specific needs of local communities.[23] In particular, "thoroughly understanding students' motives for stimulant medication misuse" is considered to be "a critical first step in preventing misuse" to target root causes.[2,3,16] Collecting data on the frequency

of the behaviour, students' motivations for misuse, drug sources and perceptions related to misuse by peers (i.e., how often students use certain prescription drugs) to assist in understanding the issues related to prescription drug misuse in individual settings was a key recommendation from a 2012 summit on non-medical prescription drug use attended by 55 campus leaders from more than 18 institutions from the United States.[21] A 2015 study emphasized the importance of acknowledging that different prevention approaches might be needed for those who use prescription stimulants for non-medical reasons only and those who use prescription stimulants for both medical and non-medical reasons.[9] Similarly, different strategies might be required for those misusing for recreational versus those misusing for therapeutic reasons (i.e., using to treat attentional issues either not as prescribed or not under the supervision of a physician).

Benson and colleagues have recommended that a standard measurement tool for PSM be developed, validated psychometrically and used consistently, and they provide a comprehensive survey assessing PSM in the appendix to their paper as a reference for researchers.[3] Weyandt and colleagues have also developed a questionnaire called the Stimulant Survey Questionnaire, which has some psychometric evidence.[25]

In addition, social media might be a potentially useful tool in collecting data to determine the context around PSM in local settings. Hanson and colleagues monitored Twitter status messages that could be viewed publicly, containing the term "Adderall" over a one-year period to identify variations across the year, differences across sets of colleges and universities and commonly mentioned side effects and co-ingested substances. A notable result was the increase in tweets referencing Adderall use around traditional exam periods, consistent with misuse of Adderall as a study aid among college students.[26]

Collecting data related to the problem of PSM not only provides a necessary understanding on which to base prevention programming, but also provides an essential benchmark against which to assess the effectiveness of the prevention strategies in the future.

Finally, as part of understanding the problem of PSM, universities and colleges should also consider whether any existing policies or attitudes could be contributing to PSM.[2] For example, unhealthy competition, "play hard, work hard" attitudes, a lack of clear consequences for those who are caught diverting, or prescribing practices of campus physicians might be contributing factors to PSM in specific settings.[2,3]

## Consider program factors

When possible, prevention programs specific to PSM should be developed and these programs should be located within an overall program of substance misuse prevention on campuses.[23] The rationale for having a prescription stimulant-specific program is that the usual motivations for nonspecific substance misuse, such as feeling good or getting high, are less common in those among college and university students who misuse prescription stimulants. Since motivations for PSM related to academics, weight loss or performance enhancement in sports are unique to this class of drugs, specific prevention messages common to these motivations are needed. However, PSM is also associated with use of other substances such as tobacco, marijuana, illicit stimulants (cocaine, amphetamines) as well as with binge drinking.[3] Therefore situating a PSM-specific program within a larger nonspecific substance misuse prevention strategy might provide additional benefits.[3,23] An additional layer of prevention programming related specifically to prescription drugs (i.e., opioids and sedative-hypnotics) might also require consideration.

Identifying the scope of the prevention program is critical to designing an effective program. Prevention programs might be targeted universally to all college or university students, or to select

groups that are not engaged in PSM but have been shown to be at higher risk of PSM.[21,23] Prevention programs might also include early intervention strategies to reduce use in those who have already started to misuse these drugs experimentally or treatment for those with substance use disorders related to prescription stimulants.[23] Prevention strategies must be tailored to the different groups targeted.[21,23] The scope of the program will likely be influenced by available budget and resources, as well as by the highest priorities of individual settings (based on data collected from individual settings related to the problem).

Prevention programs might also be linked to other health services. For example, since undiagnosed ADHD and depression might play a role in PSM for some individuals, those identified as having misused prescription stimulants might benefit from health evaluations for these conditions,[3] as well as other conditions such as anxiety.

Optimal timing is another consideration for PSM prevention programs. The increasing recognition that PSM starts before post-secondary school might mean that prevention programs must promote prevention of PSM earlier than the post-secondary context.[7] In addition, prevention programming plans might be influenced by knowing particular times of the year when misuse is higher. For example, if PSM is more frequent before and during exam periods, consideration can be given to intensifying prevention messages and prevention resources in anticipation of these times.

It is also wise for PSM prevention programs to consider workforce development and organizational capacity. To be effective, programs must be delivered in the way in which they were designed to be delivered. The program can be significantly compromised by leaders or staff who are not able to deliver the programs properly, or who have not received adequate training.[23]

Finally, when possible, program activities and interventions should include those that have proven efficacy or that show promise.[23] These programs can be difficult to identify because of the lack of data describing or evaluating PSM prevention programs. It is important that information on PSM prevention programs is evaluated and published so that knowledge is shared and best practices for effectiveness of these programs can be determined.

### Involve youth in the design and implementation of the program

Engaging youth meaningfully in PSM prevention program development and implementation was also emphasized in the literature.[2,16,22,23] As stated above, Syracuse University was in the process of developing a pilot PSM prevention program that involved training college juniors and seniors in motivational interviewing techniques and principles as well as in intervention content so that they could act as peer interventionists.[16] The rationale cited for using peers was high reported acceptability and feasibility, based on a study targeting of alcohol use[27], evidence of effectiveness similar to that of professional substance use counsellors[28,29], success of this approach among adolescents with substance use disorders[30,31], and evidence for greater effectiveness of peers compared to teachers or other faculty in delivering primary prevention programs.[32]

In addition, there is a consortium of colleges and universities in Missouri called the Partners in Prevention Program (PIP) that works with each of its 21 members individually to develop a strategic plan to address prescription drug misuse that is tailored to the needs of each institution.[22] While not specific to prescription stimulants, PIP includes peer-to-peer prevention education on the dangers and consequences of non-medical use of prescription drugs (which includes prescription stimulants) as one of its three core strategies.[22]

The incorporation of peer mentorship into academic study skills programs or the use of peers to assist struggling students in improving study habits less formally should also be considered in developing PSM prevention programs.[2]

### Incorporate a multi-disciplinary approach

Prevention programs for PSM should also include a multi-faceted, multi-disciplinary approach.[9,21,23] On post-secondary campuses, multi-disciplinary actions should include campus administrators, health centre staff (physicians, nurses), resident advisors and parents.[10,21] All should be educated about the issue of PSM and should help dispel inaccurate perceptions about increased academic performance and awareness of the risks and consequences related to sharing or selling prescription stimulants.

Ideally, prevention programs for PSM should also go beyond the university, college or other individual program setting, and strive for a comprehensive, coordinated response within the greater community, through recreation programs, community policing and neighbourhood support programs, regulatory elements and the media.[23] Policy makers and law enforcement need to coordinate efforts surrounding regulation, and responses to the diversion and selling of prescription drugs.[21] PSM prevention programming could also target children and youth at different stages of development, refreshing and reinforcing prevention messages at each successive stage.[23]

### Ensure regular program evaluation

The effectiveness of PSM prevention programs should be evaluated by collecting data before and at successive points after initiation of the program.[21,23] Further, sharing this information through reports or publications would be of great benefit in generating knowledge of best practices for improving effectiveness in PSM prevention in the future. The limited information available on specific PSM prevention programs, as well as on effectiveness of programs or controlled trials to assess their efficacy, is a critical gap in the literature in this area.

**Summary of principles for developing prescription stimulant misuse prevention programs**

- Collect data to understand the problem in your local setting;
- Conduct research to establish an evidence base for PSM prevention programs;
- Consider program factors such as PSM specific vs. non-specific programming, scope, linkage to health services, optimal timing, workforce and capacity, and use of proven interventions;
- Involve youth in the design and implementation of the program;
- Incorporate a multi-disciplinary approach; and
- Ensure regular program evaluation.

## Recommended actions for PSM prevention programs

### Dispel myths by providing accurate information

Many studies emphasized the importance of dispelling the myths or providing accurate information about the benefits and harms of prescription stimulants as part of a prevention program.[1–3,10,21] The myths include myths about the effectiveness of stimulants for getting better grades, the lack of harms and perceptions that “everybody” is doing it.

*Myth 1: PSM helps you get better grades*

In spite of the fact that most college and university students misuse prescription stimulants for academic reasons, those who misuse stimulants have been found to be less successful

academically than those who do not misuse stimulants, with lower GPAs (3.16 vs. 3.28), more skipping classes (16% vs. 9%) and less time spent studying (17.2 hours vs. 19.7 hours).[3,13,32] In addition, a large majority of the most successful students do not misuse prescription stimulants.[10]

This information demonstrates that PSM is not effective for increasing academic performance and raises the possibility that the students most likely to turn to prescription stimulants might be those who are already struggling academically.[3] It is critical to educate youth about these facts.[10]

*Myth 2: PSM is relatively safe*

Education is also required to clarify misconceptions about the risks of PSM.[3] There are significant and serious harms associated with PSM of which youth should be aware.[16] It is possible that the more common side effects of PSM, which include decreased appetite, insomnia, irritability, headaches, stomachaches, sadness and social difficulties, might not be threatening or long lasting enough to create a strong reason for youth to avoid PSM.[3,21] However, youth might not be aware of the additional risks. Specific warnings are included in the product monograph (product prescribing information approved by Health Canada) of prescription stimulants used to treat ADHD, indicating that misuse of these drugs might be associated with sudden death or other serious cardiovascular events.[2] Even when used at therapeutic doses for legitimate medical purposes, sudden death and other serious cardiovascular events can occur.[2,34,35] Additional significant risks include dangerously high core body temperature, seizures and paranoia.[34] When prescription stimulants are used with unapproved routes of administration or dosages, or without the supervision of a physician, risks of these adverse events are much higher.[35,36]

There is evidence to indicate that increasing perceived risk might be associated with lower PSM. When students perceive higher risks or have less positive expectations about misuse, they might also be less likely to misuse these drugs. In one study, those who associated prescription stimulants with low perceived harmfulness were over 10 times more likely to report use in the last year than those who associated misuse with high perceived harms.[28] The randomized controlled trial involving an expectancy challenge to prevent PSM, described above, also supported the view that negative expectancies (harm or negative outcomes from use) can be associated with decreases in PSM in the future.[15]

Therefore, increasing perceived harmfulness by providing more accurate information on potential adverse events of prescription stimulants could be an effective prevention strategy for many students. This strategy should be seen as only one strategy of many that should be considered in combination with others. While it might be an effective strategy for many, there is also a group of high sensation seeking individuals for whom a different strategy is likely needed, as these individuals are at a greater risk for substance use in general.[38] For example, personality-matched coping skills training has been effective in reducing cannabis use in youth,[37] but it has yet to be examined for its efficacy in treating or preventing PSM among youth. It is also important that prevention messages consider the balance between correcting misperceptions to show that prescription stimulants have risk, without creating stigma or fear in those who use these drugs for legitimate medical reasons.[24]

*Myth 3: Everybody is engaging in PSM*

Another distorted perception is that prescription stimulants are being misused by “everybody.” While an estimated 3.7% of college and university students in Canada had engaged in past-year PSM based on a 2013 publication,[5] this means that over 96% of students, by far the majority, did not engage in PSM during that time. Further, as previously stated, studies have also shown that the larger majority of the most successful students do not misuse prescription stimulants.[10]

Using normative education to counter the misperception that everyone is using prescription stimulants has been highlighted as an important part of prescription drug misuse prevention.[24] Using social norming for this purpose is one of the three core approaches used by the previously described PIP for prescription drug misuse in general.[22] However, a meta-analysis indicated that a social norming approach was not effective for alcohol misuse.[38] It has also been suggested that approaches to de-stigmatize college students who do not divert their medications or engage in illicit drug use are needed[10] and that PSM should be "denormalized" by promoting the view that use for academic purposes is "cheating."[2] However, a concern with this last approach is that it might reinforce the misconception that prescription stimulants are effective in improving academic performance.

*Actions to dispel myths*

In order to dispel the above myths, one suggestion is that universities and colleges need to engage in focused health education campaigns that "debunk myths and expose risks, just like antismoking campaigns."[2] Another way to dispel myths is by disseminating research findings.[10] Yet another suggestion is to use school-based science education in classrooms as a prevention strategy that focuses on providing accurate information about risks of PSM.[24] This approach is generally geared to the high school population and designed to provide accurate information about drugs and how they work from a science-based perspective. The approach usually fits well into the classroom since it is often consistent with educational curriculum requirements. It is different from the traditional prevention approach in that no overt messages against use are put forward. While anti-drug messages might enhance resistance when the persuasive intent is clear, threatens a valued belief, or poses self-image threats (such as appearing gullible), science based education with no overt messages, might increase receptivity to the information.[39,40,41] More specifically, in grade 11 and 12 students, learning about prescription drug misuse through science-based games involving investigation of crimes has been successful at increasing negative attitudes towards misuse of prescription drugs.[39] Although these interventions were not specifically related to PSM, this type of prevention programming could be considered for prevention of PSM among middle school and high school aged youth. The fact that many students in these age groups are either taking prescription stimulants for ADHD or have friends who are taking these medications for ADHD, combined with the fact that initiation of PSM peaks between the ages of 16 and 19 years but might start as early as 12 years of age, suggest that a science-based approach to this topic in middle school or high school might be particularly relevant.

## Offer academic study skills programs

A unique aspect of prevention programs to address PSM is the inclusion of a component related to the teaching of academic study skills, as well as the early identification of those in need of academic assistance support.[1–3,16,18] The main motivation for PSM related to academic performance, combined with the fact that students with lower GPAs might be more likely to consider PSM, suggests that strategies to provide study skills might be an important part of a prevention program. By providing students with academic interventions, instruction in study skills, note-taking and academic goal setting, as well as information on the link between lack of sleep and poor concentration, the desire to misuse might be reduced.[3] Using interventions that focus on planning, organizing and improving memory with incorporation of cognitive behavioural therapy approaches has been recommended.[16] Additional resources, including access to peer mentorship and tutoring, and a more structured environment, might also help encourage proper study habits.[2] The PSM prevention program at Miami University in Ohio, described above, provides an example of how a study skills program was integrated into a PSM prevention program.[18]

## Promote awareness of legal consequences for diversion and misuse

Another consistent recommendation related to strategies to prevent PSM is to promote awareness of the legal consequences for misuse and for diversion of prescription stimulants.[3,10,16,20] Since most college students obtain prescription stimulants from peers, introducing policies and interventions specifically targeted at students with prescriptions for stimulants could be critical in reducing diversion and associated misuse.[3,10] It is important to promote awareness that it is illegal to share or sell prescription stimulants with others and that it is illegal to use prescription stimulants that belong to someone else. Since many students might be unware of legal risks and consequences, illegality and legal consequences should be disseminated widely.[10] Physicians, pharmacists, teachers and parents can all play a role.[10]

In addition, school policies, student handbooks and orientation programs can increase awareness of illegality and legal consequences. University and college orientation should include an overview of policies on diversion and misuse of controlled substances, including prescription stimulants, and emphasize that the legal consequences of diversion and misuse are the same for prescription drugs as they are for illicit drugs. School policies and student handbooks should also clearly state the consequences of diversion and misuse of prescription stimulants.[10] Universities and colleges could also hold prescription take-back days on campus to reduce the supply of excess prescription stimulants and other drugs available for diversion and misuse.[21,22]

Strategies and training to resist peer pressure have also been suggested to prepare students to refuse offers to misuse prescription stimulants or to share their own legitimate supply of prescription stimulants.[3]

## Encourage physicians to consider specific practices to prevent diversion and misuse

Strategies to prevent PSM should include those aimed at the level of individual prescribing physicians.[2,3,10,16,18,20] These strategies are easier to implement in the setting of college or university campuses, where policies that apply to all medical clinics on campus can be created.[18] Key proposed strategies include those related to physician prescribing practices, education and counselling by physicians and physician monitoring.

*Prescribing practices*

It is important that those who require prescriptions stimulants for ADHD receive a physician's diagnosis and prescriptions for the medications to treat their condition. Ensuring access for those who require prescription stimulants might help curb PSM that is related to self-medication.[2,20]

Physicians should also be encouraged to increase their vigilance about prescription stimulants to ensure proper and safe use and to prevent diversion among youth.[9] To do this, physicians might consider dispensing stimulants one week at a time or having a clear policy that early refills will not be provided.[3,20] Requiring a signed agreement from patients with each fill indicating that the consequences of misuse and diversion are understood and that patients will not engage in these activities can help reinforce the seriousness of these activities and clarify the patient's responsibility.[3,20] Requiring attendance at an informal information session on misuse of prescription stimulants before filling a prescription for first time has also been suggested as a strategy to reduce diversion and misuse.[3,18] The program at Miami University, described above, provides an example of this approach.[18]

An additional consideration related to the prescribing of prescription stimulants is whether drug holidays are part of the therapeutic plan for college- or university-aged patients with ADHD, as they often are in children with ADHD. If so, patients could be accumulating extra medications that might

become available for diversion and misuse. If this is the case, there might be a need to modify prescribing practices, as was suggested in association with the planned pilot program at Syracuse University, described above.[16]

*Counselling and education by physicians*

Most students who misuse prescription stimulants obtain these medications from peers or friends who have ADHD.[3,10] Further, many students with ADHD and a prescription for a stimulant report that they have been approached to share, trade or sell their medications.[3,11,16] Physicians can play a key role in preparing students for this situation by educating them on the medical, ethical and legal consequences of diverting and misusing medications.[10,20] Students with ADHD who are given a prescription for stimulants must be told that they can expect to be asked by their peers to share or sell their medication. They need to know that selling or distributing an "excess" supply of stimulant medication is illegal and will be reported to the authorities.[2,20] They should also be informed about the potential harms of PSM.[3] Although it might be difficult to do depending on living arrangements, physicians might wish to recommend that students keep their diagnosis and treatment confidential and keep their medications secure to prevent others from requesting or stealing medication.[20] Circulating written information with every prescription for a stimulant can also be considered as a way to disseminate information and reinforce education that occurred through in-person office discussions.[10]

*Monitoring by physicians*

Physicians can also help reduce PSM by monitoring for signs of diversion or misuse in patients, such as finishing prescriptions early, switching physicians, switching medications, lost medications, legal programs or worsening academic performance.[3,20] Physicians can also monitor for physical symptoms of misuse such as anxiety or panic attacks, anorexia or weight loss, depression or mood changes, paranoia or psychosis, aggression, tremors or seizures.[20].

Routine urine toxicology for those at high risk of misuse or in those with previous substance use disorders, or random urine drug screens to monitor for marijuana and alcohol use might be considered.[10] Occasional rescreening for depression, anxiety or substance use disorder might also be warranted.

### Equip parents to dispel myths, promote good study habits and identify diversion and misuse

Programs aimed to prevent PSM should include outreach to parents for all youth, including those attending university or college.[10,21,24] Parents should be provided with information and concrete strategies on which to base conversations with their children. They should also be educated on specific actions they can take to reduce the risk of diversion and misuse of medications in their homes, such as the need to keep prescription drugs secure in the house and the need to monitor the supply in the house. Parents should also be educated on the different possible motivations for PSM to help them identify misuse in their children.[24]

Once educated, the role of parents in preventing PSM is to discuss myths, provide accurate information and promote good study habits, emphasizing that attending class, completing assignments on time and keeping up with schoolwork is the best strategy to achieve superior academic performance. Crash dieting compared to a healthy lifestyle has been suggested as a useful analogy.[10] It is also important that parents advocate on behalf of their children for access to university and professional resources when academic problems occur. Further, parental tolerance of PSM should be discouraged. Instead, parents should emphasize that giving away, selling or buying

prescription stimulant medications is illegal and could result in serious harms to those misusing the medication as well as in legal consequences for all involved.[10]

### Use technology to disseminate prevention messages and to collect data needed to inform program needs and evaluation

Social media such as Facebook, Twitter and Instagram are used by many adolescents and emerging adults in Canada and present a variety of opportunities to disseminate prevention messages to this population.[19] These opportunities are particularly attractive since they can be brief, low cost and easy to implement.[16] In addition, as described as part of the future plans for the PSM prevention program at Syracuse University, web-based prevention intervention components with real-time assessment and feedback could also be used to reinforce in-person information delivered in freshman orientation sessions.[16]

PSM prevention programs should consider the use of technology, not only for dissemination of prevention messages, but also for collection of data to inform program design and program evaluation. Technology in the form of smartphone apps can be made available for free and used to collect information that is needed to determine the site-specific needs of prevention programs, as well as the effectiveness of the programs once implemented.[16]

**Summary of recommended actions for prescription stimulant misuse prevention programs**

- Dispel myths by providing accurate information on both positive and negative effects;
- Offer academic study skills programs;
- Promote awareness of legal consequences for diversion and misuse;
- Encourage physicians to consider specific practices to prevent diversion and misuse;
- Equip parents to dispel myths, promote good study habits and identify diversion and misuse by youth; and
- Use technology to disseminate prevention messages and to collect data needed to inform program needs and evaluation.

## Discussion

PSM is an important issue in students from middle school through to post-secondary school. They need to know that misuse of prescription stimulants does not increase overall academic performance and can result in serious harms such as sudden death and other cardiovascular events.

There are few published studies describing or evaluating specific programs or interventions for prevention of PSM in university and college students and none in middle school and high school students. The lack of prevention programs found in the literature for middle school and high school students is an important gap since it is increasingly being recognized that PSM often starts prior to post-secondary school.

The expectancy challenge intervention described above has potential as it was able to shift expectancies, but, given that the effects were not long-lasting, further work is needed before this program can be recommended. As well, it might have limited application to prevention programs on a larger scale due to its complexity; however, evaluating adaptations of this type of program might be worth consideration. However, the results suggest that PSM prevention programs should consider

aiming to decrease the expectancies for cognitive enhancement (i.e., clarify that prescription stimulants do not improve academic performance) and increase the expectancies for negative side effects of prescription stimulants (i.e., provide accurate information on harms of prescription stimulants), as part of their programming goals. Reinforcement or repetition of messages is likely needed and it is critical that programs are evaluated to confirm effectiveness.

Although no information on evaluation was available for the Miami University of Ohio and Syracuse University programs or the Generation Rx Adderall toolkit, the information provided offers concrete examples and resources that might be useful references for those developing PSM prevention programs. Moving forward, it is critical that PSM programs are evaluated to build evidence on effective programs that can be shared more widely to successfully prevent or reduce PSM in youth. In line with this view, more research that uses robust designs (i.e., randomized controlled trials) is needed, as well as research that provides a better understanding of theories about why youth engage in PSM in order to better target prevention efforts.

In contrast to the lack of information available on specific programs for prevention of PSM, more literature was available on general strategies for prevention of PSM. The information described above on principles for developing programs to prevent PSM and recommended actions for these programs provides an additional resource to be considered by those developing PSM prevention programs.

In March 2013, the Canadian Centre on Substance Abuse (CCSA), together with over 40 partners that comprised the National Advisory Council, released *First Do No Harm: Responding to Canada's Prescription Drug Crisis* (FDNH).[42] FDNH is a 10-year, pan-Canadian strategy to address the harms associated with psychoactive prescription drugs. It outlines 58 concrete recommendations for collective action in a number of key areas, including prevention, education, treatment, monitoring and surveillance, enforcement, and legislation and regulation. The principles and recommended actions described in this review are consistent with the recommendations in the prevention stream of the FDNH strategy. In an effort to move PSM prevention initiatives forward, individuals developing and implementing prevention programs for PSM should look to evaluate and share information on the effectiveness of PSM prevention approaches.

## Additional Resources

- Prescription Stimulants (Drug Summary)
- Neuroscience in Youth Drug Prevention Programs (Topic Summary)
- Stimulants, Driving and Implications for Youth (Topic Summary)
- First Do No Harm: Responding to Canada's Prescription Drug Crisis
- Canadian Standards for Youth Substance Abuse Prevention

To find out more about how CCSA's Canadian Standards for Youth Substance Abuse Prevention can help you in your prevention efforts, contact youth-jeunes@ccsa.ca.

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