Predictors of Cannabis Use Among Canadian University Students

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ABSTRACT

Objective: To examine the correlates between cannabis use, motives to use, related psychosocial outcomes and academic behaviours among a sample of Canadian university students. **Methods**: A random sample of 6,000 students who were enrolled in at least one class and were 18 years or over were asked to complete a cross-sectional online survey. Of the 920 students that responded, 478 (ages 18-55; mean age = 25.02, *SD* = 5.95) identified as having used cannabis within the past six months and thus were included as participants in the current study. Participants completed a battery of measures designed to examine cannabis use and associated constructs (i.e., substance use risk, personal well-being, non-specific psychological distress, academic behaviours, and motivations for use). **Results**: Among the participants, 31% (*n* = 148) were found to be frequent (i.e., hazardous) users. Using cannabis for enhancement, coping, expansion, sleep difficulties, and conformity purposes, as well as impulsive personality traits were found to be predictors of cannabis use severity, with the enhancement motive identified as the strongest predictor for the total sample, males, and hazardous users. The coping motive was the strongest predictor for females, and impulsivity was the strongest predictor for non-hazardous users. **Conclusion**: Findings will help inform the development of campus guidelines for lower risk cannabis use. Information gleaned from this study will also provide important information for those that use cannabis, policymakers, and health care providers in considering optimal personal use, prevention, and intervention plans.

Key words: = cannabis; psychosocial outcomes; motivations; substance use risk

Cannabis is one of the most used drugs in Canada (Government of Canada, 2021). In 2018, the recreational use of cannabis for those 18 or 19 years and older was legalized (Government of Canada, 2021). Due to the novel nature of these laws, there are several unknowns regarding the understanding of cannabis use among young adults. These new laws have increased the availability and use of cannabis, making it important to gain a better understanding of the implications of legalization on use patterns and outcomes associated (Keith et al., 2015).

Among the university student population, it continues to be found that young adults and youth use cannabis more commonly than any other age group (Canadian Centre on Substance Use and Addiction [CSSA], 2022). High rates of cannabis use among young adults can be associated with poorer psychosocial outcomes (Meier, 2021) such as increased reports of anxiety and depression (Keith et al., 2015), a decrease in academic achievement (e.g., fewer graduates, skipping class, conduct problems, lower grade point averages; Arria et al., 2013a; Arria et al., 2013b; Arria et al., 2013c; Fergusson et al., 2003), an increase in psychotic disorders (Volkow et al., 2016) and cognitive impairments (e.g., reduced intelligent quotient, memory impairment; Meier et al., 2012; Zalesky et al., 2012), along with higher risk of other illicit drug use (Lynskey et al., 2003).

But the relationship between cannabis and adverse outcomes is complex as causality is not always firmly established, with some of the associations stronger than others (Meir, 2021). Moreover, the vast majority of those who consume

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cannabis and who could be characterized as occasional users do not experience cannabis use related problems (Fischer et al., 2022). Given this context, the perceptions of cannabis risk among young adults appear to be decreasing, as many believe that cannabis is not harmful (Miech et al., 2017; Okaneku et al., 2015; Pacek et al., 2015). For example, within university student samples, it has been found that students' perception of harm has decreased over time. According to Johnston et al. (2015), 35.1% of students perceived regular cannabis use as harmful in 2015, compared to 57.2% a decade prior. It has also been found that legalization in some jurisdictions may have impacted an individual's perceptions of cannabis, as policy change has been associated with increased perceptions of health benefits of cannabis use and decreased perceptions of harm (Friese, 2017; Gali et al., 2021; O'Callaghan & Joyce, 2006; Park & Levenson, 2002). With this decrease in harm perception, there has been an increase in daily use of cannabis among the university student population (Johnston et al., 2015) where there continues to be a specific subgroup of high intensity frequent users of cannabis who are at greater risk. It has been found that within this subgroup, over half are more likely to experience cannabis use disorder (CUD), and many of the use-related problems tend to be concentrated among young adult males (Fischer et al., 2022).

CUD involves a problematic pattern of cannabis use which leads to clinically significant distress (American Psychiatric Association [APA], 2013). Those who have a CUD may use cannabis daily over a period of months or years in which they spend much of their time under the influence. Others with CUD may not use cannabis as frequently, but when they do use it causes recurring difficulties related to either their family, school, work, or other important aspects of life (e.g., repeated absences from work; APA, 2013). Subsequently, the diagnostic criteria for CUD have been revised to combine both dependence and abuse criteria into a single disorder (APA, 2013).

According to the results of the United States National Epidemiological Survey conducted in 2012-13, nearly 30% of those who used cannabis had problematic usage patterns (Hasin et al., 2015). It has also been reported that individuals who started using cannabis before the age of 18 are more likely to develop a CUD (Winters & Lee, 2008). Within a university student sample (ages 17-20), Caldeira et al. (2008) found that nearly one fourth of past-year students met the criteria for a CUD. Additionally, a more recent cross-sectional study of Canadian university students found that of the students who used cannabis for medicinal purposes, 13.6% met the criteria for CUD (Smith et al., 2019).

However, not all consumers of cannabis are high intensity frequent users. As such the relationship between cannabis use and adverse psychosocial outcomes remains unclear, as research has demonstrated inconsistent results. Some studies have found that cannabis use was associated with increased reports of anxiety and depression (Feingold et al., 2015; Keith et al., 2015) while others suggest the opposite (Danielsson et al., 2016; Moore et al., 2007), or that anxiety and depression are possible motivations for using cannabis (Patten, 2021). Mixed results are also reported for the relationship between cannabis use affecting academic outcomes (Fergusson et al., 2003; Keith et al., 2015) and the association between age of onset and cognitive deficits (Kroon et al., 2020; Meier et al., 2019; Scott et al., 2018). As to why, Meier (2021) postulates that a possible causal effect exists and that, over time, the cascading effects of shared risks (i.e. deviant peer groups, genetic predisposition, or adverse social conditions) reinforce the associations between psychosocial risk and the use of cannabis.

In Canada, the consumption of cannabis is legalized and the argument for legalization is based on the premise that better regulation practices will result in the removal of cannabis from the illicit market and thereby facilitate the ability to provide more targeted interventions allowing for a reduction in the social and health related costs associated with the potential harms of cannabis consumption (CSSA 2022). Thus, an understanding of an individual's reasons for initiating and/or continuing cannabis consumption can help clarify various cannabis related behaviours and risks, which in turn can inform prevention and treatment efforts. For example, past research has found that using cannabis for experimentation was associated with less cannabis use and fewer cannabis related

problems, whereas using cannabis for enjoyment, habit, activity enhancement, and altered perception purposes has been associated with increased use and problems (Lee et al., 2007), while using cannabis routinely and as a means to cope was shown to be moderately correlated with severity of use (Genrich et al., 2021). When comparing adults who use cannabis medicinally to those who use it recreationally, Lin et al. (2016) found that medicinal users were more likely to have poorer health and more likely to use cannabis daily than those who used recreationally. In another more recent study that compared medicinal users to recreational users in a community sample, it was found that medicinal users were more likely to show more psychopathology (e.g., anxiety, depression, trauma), substance use, and problematic cannabis use, and that the majority of medicinal users also used cannabis recreationally (Turna et al., 2020). It was also found that those who use cannabis for both medicinal and recreational purposes report more substance use, with Turna et al. (2020) suggesting that these users may be at greater risk for adverse outcomes.

The purpose of this study was to address the following research questions: 1a) How important are academic behaviors, psychosocial factors, risk profile, recreational motives, medicinal motives, age, and age onset of use when they are used together to predict cannabis use among university students? 1b) Do the aforementioned predictor variables differ between males and females? 1c) Do the aforementioned predictor variables differ between students who endorsed hazardous and non-hazardous cannabis use?

METHODS

Recruitment

The University of Saskatchewan Campus Experiences with Cannabis survey was administered online over a period of one month, July to August 2020, with four weekly reminders sent out. A simple random sample of 6,000 students (including undergraduate students, graduate students, and off campus students) were drawn by the Office of the Registrar and invited to participate through the Student Wellness Centre and the Teaching, Learning, and Student Experience team. Participants had to be at least 18 years of age or older and be enrolled in at least one course. Ethical approval from the University of Saskatchewan Behavioural Ethics Board was received prior to commencing data collection for the survey (Beh ID #1717). Regarding the larger study conducted by Student Wellness, 920 University of Saskatchewan students participated, of which 52% (n = 478) of students endorsed having used cannabis over the past six months, and 48% (n = 442) of students reported that they did not use cannabis over the past six months. The current study examined a subset of the larger study including only those participants that had endorsed cannabis use in the past six months.

The survey, which took approximately 30-45 minutes to complete, was distributed via a third-party website with a link to the online survey provided. A consent form was made available immediately as the participants opened the survey link, to which they agree to consent or not. The consent form explained the study in full in terms of the purpose and procedure, potential benefits, and risks. If participants had any questions or concerns, they were encouraged to contact the researchers, as their emails were provided. As an incentive, all participants who completed the survey were entered into a draw to win one of three $200 gift cards.

Regarding possible risks involved, participants were reminded in the consent form that if this occurs, they must remember that they have the right to not answer any questions they wish or to withdraw their consent at any time without penalty. If participants decided to withdraw their consent, they could also request for their data to be permanently deleted at the end of the survey. In case participants required further support, the information and phone numbers of support services were provided in the consent and debrief forms.

Data Analysis

This study relied on descriptive cross-sectional research. Regarding analyses, descriptive statistics were computed for the demographic information and for students' current motivations for using cannabis. Bivariate correlations were computed to examine the association between the frequency of cannabis use and/or problematic cannabis use and psychosocial factors,

recreational cannabis motives, medicinal cannabis motives, substance use risk, academic behaviors, current age, age onset of use, and gender. An ANOVA was computed to determine if significant differences exist between hazardous and non-hazardous users on the various measures. A stepwise multiple linear regression was computed to determine which (if any) factors (i.e., and psychosocial factors, recreational cannabis motives, medicinal cannabis motives, substance use risk, academic behaviors, current age, age onset of use, and gender) are most predictive of cannabis use. Separate stepwise multiple linear regressions, using the same predictor and outcome variables, were further computed when the sample was split between males and females and hazardous and non-hazardous users.

The decision to refrain from using strict diagnostic criteria by labelling students with CUD and to focus on hazardous and non-hazardous users was made in partnership with Student Wellness and the Teaching, Learning, and Student Experience team who facilitated the survey's administration. Data were analyzed with IBM SPSS Statistics (Version 28).

Instrumentation
Online Survey

Past Six-month Cannabis Use. Problematic cannabis use was assessed using the Cannabis Use Disorders Identification Test-Revised (CUDIT-R; Adamson et al., 2010). The CUDIT-R has 8 items with total scores ranging from 0-32. Using the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; APA, 2013) criteria, the CUDIT-R identifies the pattern of cannabis use among past six-month users as non-hazardous (0-8) or hazardous (scores of 9 or greater; Marshall, 2013). In terms of its total score, the CUDIT-R has demonstrated excellent internal consistency (α=.91; Adamson et al., 2010). Using a sample of college students, Schultz et al. (2019) found that the CUDIT-R demonstrated good internal consistency (α=.83), displayed evidence of concurrent and discriminant validity, and achieved high levels of sensitivity (0.93) and specificity (0.70). The current study demonstrated an acceptable level of internal consistency for the CUDIT-R (α =.79).

Age Onset of Use. To determine the age onset for participants who have used cannabis, currently or in the past, participants were asked how old they were when they first started using cannabis. Response options included: under 10, 10-15, 16-20, 21-25, 26-30, 31-35, and 35+ years of age.

Recreational Cannabis Motives. Motives for using cannabis recreationally were evaluated using items from the 25-item Marijuana Motives Measure (MMM; Simons et al., 1998). The items are scored on a five-point scale. The MMM measures five motives, with each representing a different form of cannabis use behaviour, including: enhancement, conformity, expansion, coping, and social. The five highest loading items for the 5-factor solution reported were used (i.e., social [-.90], coping [-.86], enhancement [.94], conformity [.84], and expansion [-.95]; Simons et al., 1998). The MMM has demonstrated good to excellent internal consistency for the subscales (α=.84 to α=.94).

Medicinal Cannabis Motives. To evaluate motives for using cannabis medicinally, participants were asked to rate how frequently their own cannabis use is motivated by relieving: 1) anxiety, OCD, PTSD; 2) sleep disorder/ insomnia; 3) depression; 4) all types of pain; 5) stress, general mood issues; 6) CNS (migraine headache); and 7) or other psychiatric and/or health related ailments that could be specified via an open-ended item. The items are scored on a five-point scale that ranges from 1 (Almost never/ never), 2 (Some of the time), 3 (Half of the time), 4 (Most of the time), to 5 (Almost always/ always).

Substance Use Risk. Personality traits that heighten risk for substance misuse and psychopathology were measured using the Substance Use Risk Profile Scale (SURPS; Woicik et al., 2009). The SURPS has 23 items that are scored on a four-point scale. The SURPS is based on a model of personality risk for substance abuse along four distinct and independent personality dimensions, including: hopelessness, anxiety sensitivity, impulsivity, and sensation seeking. The SURPS subscales have demonstrated adequate to good internal consistency within a large undergraduate sample (α=.61 to α=.86; Woicik et al., 2009). The current study demonstrated an acceptable level of internal consistency for the SURPS total score (α = .711)

with internal consistencies for the SURPS subscales ranging from (α=.686-.906).

Psychosocial Factors. Non-specific psychological distress was measured using the Kessler-6 (Kessler et al., 2002). The Kessler-6 has six items that are scored on a four-point Likert scale. The possible range of the total score is 0 to 24, with higher scores indicating greater psychological distress. The Kessler-6 includes measures of depressed mood, anxiety, motor agitation, fatigue, and worthless guilt. The Kessler-6 has demonstrated excellent internal consistency in terms of its total score (α=.92). The current study demonstrated an excellent level of internal consistency (α = .863).

Academic Behaviours. The ability to organize tasks and structure time to set goals, plan activities, and complete necessary academic activity was assessed using the Organization and Attention to Study subscale of the College Learning Effectiveness Inventory (OAS; Kim et al., 2010). The OAS has seven items in which higher scores indicate a greater likelihood of being able to use effective organizational planning and time management skills to succeed academically, and lower scores indicate a greater likelihood that one will avoid planning strategies and struggle with providing self-direction. According to Newton et al. (2008) construct validity for the OAS was determined by assessing the strength of the relationship between subscales of the validation instrument, the Learning and Study Strategies Inventory (LASSI; Weinstein & Palmer, 2002) and the OAS. Newton et al. (2008) reported strong to moderate correlations for the LASSI Concentration (r=.71) and Self-testing (r=.46) subscales. In a cross-validation study, Yeager (2009) reported that the OAS correlated with the LASSI Time Management (r=.754); Concentration (r=.711) and Self-Testing (r=.431) subscales. The OAS has demonstrated good internal consistency (α=.81; Kim et al., 2010) with the present study demonstrating an excellent level of internal consistency (α = .839).

RESULTS

Data Cleaning

Assumptions for each of the statistical tests ran were checked prior to analyses. The distribution of scores for cannabis use (i.e., CUDIT-R) were moderately positively skewed. Therefore, a log10 transformation (Fox, 2016) was performed on this variable before analyses were conducted, causing it to become normally distributed.

Sample Characteristics

Of the 478 students who had used cannabis in the past six months, the majority were female (60.3% female, $n = 288$; 25.7% male, $n = 123$; 2.5% gender variant/ non-binary, $n = 12$; 0.4% preferred not to disclose, $n = 2$; $n = 53$ did not respond). The average age was 25.02 ($SD = 5.95$; age range of 18-55). Among those who had used cannabis in the last six months, 69% ($n = 330$) were considered non-hazardous users, and 31% ($n = 148$) were considered hazardous users. See Table 1 for descriptive statistics for the demographic information of the current study.

Table 1. *Descriptive Statistics of Demographic Information*

Demographic variable	*n* (%)
Sex (*n* = 425)	
Males	123 (25.7)
Females	288 (60.3)
Gender variant/ Non-Binary	12 (2.5)
Prefer not to disclose	2 (0.4)
Mean age (SD; *n* = 414)	25.02 (5.95)
Academic program (*n* = 420)	
Four-year bachelor degree	263 (55)
After degree program	14 (2.9)
Master's degree	71 (14.9)
Doctoral degree	49 (10.3)

Open studies	1 (0.2)
Extension studies	1 (0.2)
Certificate	8 (1.7)
Other	13 (2.7)
Full-time student (n = 419)	
Yes	389 (81.4)
No	30 (6.3)
Type of user	
Hazardous user	148 (31%)
Non-hazardous user	330 (69%)
Recreational user	268 (56.1%)
Medicinal user	15 (3.1%)
Recreational and Medicinal user	149 (31.2%)

Importance of Associated Outcomes in Predicting Cannabis Use/ Problematic Use

To determine which (if any) of all the variables in this study are most predictive of cannabis use, stepwise multiple linear regressions were computed for the total sample, for males, for females, for hazardous users, and for non-hazardous users. In almost all instances, the CUDIT-R was significantly correlated with the various measures used with the exception of age and the anxiety/sensitivity subscale of the SURPS, see Table 2.

Table 2. *Correlations Between Problematic Cannabis Use and Associated Constructs*

Measure	CUDIT-R
OAS total score	-.12*
Kessler-6 total score	.10*
SURPS total score	.19**
SURPS hopelessness	.16**
SURPS anxiety sensitivity	-.07
SURPS impulsivity	.24**
SURPS sensation seeking	.11*
Age	.06
Age onset of use	-.10*
MMM Social	.09*
MMM Coping	.39**
MMM Enhancement	.39**
MMM Conformity	-.02
MMM Expansion	.32**
Anxiety/ OCD/ PTSD Motive	.28**
Sleep Disorder Motive	.26**
Depression Motive	.34**
Pain Motive	.18**
Stress Motive	.33**
CNS (migraine/ headache) Motive	.13*

Note. CUDIT-R = Cannabis Use Disorder Identification Test- Revised; SURPS = Substance Use Risk Profile Scale; PWI= Personal Wellbeing Index; OAS = Organization and Attention to Study Scale; MMM = Marijuana Motives Measure.
*p < .05. **p < .01.

When analyzing the total sample, 32.1% of the variance was accounted for in the final model, $F(6, 379) = 29.908$, $p < .001$, $R^2 = .321$, with an adjusted R^2 of 31.1%. The MMM enhancement motive, MMM coping motive, MMM expansion motive, SURPS impulsivity subscale, sleep disorder motive, and MMM conformity motive were identified as significant predictors of cannabis use (CUDIT-R; see Table 3). High scores in cannabis use were associated with high scores in the MMM enhancement motive, MMM coping motive, MMM expansion motive, SURPS impulsivity subscale, and the sleep disorder motive, and low scores in the MMM conformity motive. No other variables were identified as significant predictors of cannabis use severity within the total sample, including the OAS, Kessler-6, SURPS total, SURPS hopelessness, anxiety sensitivity, and sensation seeking subscales, age, age onset of use, social, coping, conformity, and expansion MMM motives, anxiety/OCD/PTSD, sleep disorder, depression, pain, stress, and migraine/headache motives.

Table 3. *Multiple Regression Analysis for Variables Predicting Cannabis Use for Total Sample*

Model	Predictor	*B*	*SE B*	*β*	R^2	adj. R^2
1	MMM enhancement motive	.07	.01	.39**	.15**	.148
2	MMM enhancement motive	.06	.01	.31**	.24**	.232
	MMM coping motive	.06	.01	.30**		
3	MMM enhancement motive	.05	.01	.26**	.27**	.266
	MMM coping motive	.05	.01	.28**		
	MMM expansion motive	.04	.01	.20**		
4	MMM enhancement motive	.05	.01	.25**	.30**	.287
	MMM coping motive	.05	.01	.25**		
	MMM expansion motive	.04	.01	.20**		
	SURPS impulsivity subscale	.02	.00	.16**		
5	MMM enhancement motive	.05	.01	.25**	.31**	.299
	MMM coping motive	.04	.01	.21**		
	MMM expansion motive	.04	.01	.19**		
	SURPS impulsivity subscale	.02	.00	.16**		
	Sleep disorder motive	.02	.01	.12**		
6	MMM enhancement motive	.04	.01	.25**	.32**	.311
	MMM coping motive	.04	.01	.23**		
	MMM expansion motive	.04	.01	.20**		
	SURPS impulsivity subscale	.02	.00	.17**		
	Sleep disorder motive	.02	.01	.13**		
	MMM conformity motive	-.07	.02	-.12**		

Note. SURPS = Substance Use Risk Profile Scale; MMM = Marijuana Motives Measure.
*p < .05. **p < .01.

After splitting the sample by gender, the regression revealed some interesting gender differences, see Table 4. For males only, 36.6% of the variance was accounted for in the final model, $F(4, 106) = 15.287$, $p < .001$, $R^2 = .366$ with an adjusted R^2 of 34.2%. The MMM enhancement motive, MMM coping motive, MMM expansion motive, and MMM conformity motives were identified as significant predictors of cannabis use for males, with high scores in cannabis use being associated with high scores in MMM enhancement, coping, and expansion motives, and low scores in the MMM conformity motive. For females, 32.4% of the variance was accounted for in the final model, $F(5, 248) = 23.784$, $p < .001$, $R^2 = .324$ with an adjusted R^2 of 31%. The MMM coping motive, MMM enhancement motive, SURPS impulsivity subscale, depression motive, and MMM expansion motive were identified as significant predictors of cannabis use for females, with high scores in cannabis use being associated with high scores in all variables identified. No other variables were identified as significant predictors of cannabis use severity for males and females.

Table 4. *Multiple Regression Analysis for Variables Predicting Cannabis Use by Gender*

	Model	Predictor	*B*	*SE B*	*β*	R^2	adj. R^2
Males							
	1	MMM enhancement motive	.08	.02	.38**	.14**	.136
	2	MMM enhancement motive	.08	.02	.40**	.29**	.278
		MMM coping motive	.09	.02	.38**		
	3	MMM enhancement motive	.07	.02	.35**	.34**	.322
		MMM coping motive	.08	.02	.35**		
		MMM expansion motive	.04	.02	.23**		
	4	MMM enhancement motive	.07	.02	.35**	.37**	.342
		MMM coping motive	.08	.02	.35**		
		MMM expansion motive	.05	.02	.25**		
		MMM conformity motive	-.09	.04	-.16*		
Females							
	1	MMM coping motive	.07	.01	.42**	.17**	.169
	2	MMM coping motive	.06	.01	.33**	.23**	.225
		MMM enhancement motive	.04	.01	.26**		
	3	MMM coping motive	.05	.01	.28**	.28**	.270
		MMM enhancement motive	.04	.01	.24**		
		SURPS impulsivity motive	.02	.01	.23**		
	4	MMM coping motive	.03	.01	.15*	.31**	.301
		MMM enhancement motive	.04	.01	.25**		
		SURPS impulsivity motive	.02	.01	.22**		
		Depression motive	.04	.01	.23**		
	5	MMM coping motive	.03	.01	.15*	.32**	.310
		MMM enhancement motive	.04	.01	.22**		
		SURPS impulsivity motive	.02	.01	.23**		
		Depression motive	.03	.01	.20**		
		MMM expansion motive	.02	.01	.12*		

Note. SURPS = Substance Use Risk Profile Scale; MMM = Marijuana Motives Measure.
*p < .05. **p < .01.

After splitting the sample by students who endorsed hazardous and non-hazardous cannabis use (i.e., Non-hazardous users = CUDIT-R total scores of 0-8; Hazardous users = CUDIT-R total scores of 9 or greater), the regression revealed some differences, see Table 5. For hazardous users, 20.1% of the variance was accounted for in the final model, $F(6, 267) = 11.202$, $p < .001$, $R^2 = .201$ with an adjusted R^2 of 18.3%. The MMM enhancement motive, depression motive, sleep disorder motive, SURPS total score, Kessler-6 total score, and MMM conformity motive were identified as significant predictors of cannabis use for hazardous users, with high scores in cannabis use being associated with high scores in the MMM enhancement motive, depression motive, sleep disorder motive, and the SURPS total, and low scores in the Kessler-6 total and MMM conformity motive. For non-hazardous users, 19.4% of the variance was accounted for in the final model, $F(4, 101) = 6.075$, $p < .001$, $R^2 = .194$ with an adjusted R^2 of 16.2%. Only the SURPS impulsivity subscale, MMM coping motive, Kessler-6 total, and pain motive were identified as significant predictors of cannabis use for non-hazardous users, with high scores in cannabis use being associated with high scores in the SURPS impulsivity subscale and MMM coping motive, and low scores in the Kessler-6 total and pain motive. No other variables were identified as significant predictors of cannabis use severity for hazardous and non-hazardous users.

Table 5. *Multiple Regression for Variables Predicting Use by Hazardous or Non-Hazardous Users*

	Model	Predictor	*B*	*SE B*	*β*	R^2	adj. R^2
Hazardous users							
	1	MMM enhancement motive	.04	.01	.30**	.09**	.084
	2	MMM enhancement motive	.03	.01	.27**	.15**	.141
		Depression motive	.03	.01	.25**		
	3	MMM enhancement motive	.03	.01	.27**	.16**	.152
		Depression motive	.02	.01	.16*		
		Sleep disorder motive	.02	.01	.14*		
	4	MMM enhancement motive	.03	.01	.27**	.17**	.162
		Depression motive	.02	.01	.14*		
		Sleep disorder motive	.02	.01	.15*		
		SURPS total	.00	.00	.11*		
	5	MMM enhancement motive	.03	.01	.27**	.19**	.172
		Depression motive	.03	.01	.20**		
		Sleep disorder motive	.02	.01	.14*		
		SURPS total	.01	.00	.18*		
		Kessler-6 total	-.01	.00	-.15*		
	6	MMM enhancement motive	.03	.01	.27**	.20**	.183
		Depression motive	.03	.01	.21**		
		Sleep disorder motive	.02	.01	.16*		
		SURPS total	.01	.00	.21**		
		Kessler-6 total	-.01	.00	-.17*		
		MMM conformity motive	-.05	.02	0.12*		

Non-hazardous users							
	1	SURPS impulsivity subscale	.01	.04	.28**	.08**	.067
	2	SURPS impulsivity subscale	.01	.00	.24*	.12**	.104
		MMM coping motive	.02	.01	.22*		
	3	SURPS impulsivity subscale	.01	.00	.32**	.16**	.137
		MMM coping motive	.03	.01	.33**		
		Kessler-6 total	-.01	.00	-.25*		
	4	SURPS impulsivity subscale	.02	.00	.36**	.19**	.162
		MMM coping motive	.03	.01	.36**		
		Kessler-6 total	-.01	.00	-.27*		
		Pain motive	-.02	.01	-.19*		

Note. SURPS = Substance Use Risk Profile Scale; MMM = Marijuana Motives Measure. *p < .05. **p < .01.

A one-way analysis of variance (ANOVA) was conducted to determine if scores of the variables in the study were different between hazardous and non-hazardous cannabis use, see Table 6. Regarding recreational cannabis use motives, using cannabis to be social (MMM social motive score) was significantly different between hazardous and non-hazardous cannabis users, with hazardous users (M = 2.80, SD = 1.17) scoring higher than non-hazardous users (M = 2.5, SD = 1.28), $F(1, 446) = 5.129$, $p = .024$, $\eta^2 = .01$. Using cannabis to cope with negative emotions (MMM coping motive) was significantly different between hazardous and non-hazardous cannabis users, with hazardous users (M = 2.69, SD = 1.38) scoring higher than non-hazardous users (M = 1.80, SD = 1.12), Welch's $F(1, 195.920) = 41.421$, $p < .001$, $\eta^2 = .10$. Using cannabis to enhance experiences and improve mental state (MMM enhancement motive) was significantly different between hazardous and non-hazardous cannabis users, with hazardous users (M = 3.88, SD = 1.09) scoring higher than non-hazardous users (M = 2.98, SD = 1.36), Welch's $F(1, 287.774) = 52.565$, $p < .001$, $\eta^2 = .09$. Lastly, using cannabis to expand awareness/ creativity (MMM expansion motive) was significantly different between hazardous and non-hazardous cannabis users, with hazardous users (M = 2.57, SD = 1.37) scoring higher than non-hazardous users (M = 1.78, SD = 1.15), Welch's $F(1, 203.012) = 32.932$, $p < .001$, $\eta^2 = .08$. There was no significant difference in conformity cannabis use motives between hazardous and non-hazardous users.

Regarding medicinal cannabis use motives, using cannabis to relieve anxiety/OCD/PTSD was significantly different between hazardous and non-hazardous users, with hazardous users (M = 2.79, SD = 1.50) scoring higher than non-hazardous users (M = 2.16, SD = 1.43), $F(1, 425) = 16.146$, $p < .001$, $\eta^2 = .04$. Using cannabis to relieve sleep disorders was also significantly different between hazardous and non-hazardous users, with hazardous users (M = 2.60, SD = 1.42) scoring higher than non-hazardous users (M = 2.06, SD = 1.35), $F(1, 424) = 13.485$, $p < .001$, $\eta^2 = .03$. Further, using cannabis to relieve pain was significantly different between hazardous and non-hazardous users, with hazardous users (M = 2.19, SD = 1.32) scoring higher than non-hazardous users (M = 1.77, SD = 1.28), $F(1, 415) = 8.972$, $p = .003$, $\eta^2 = .02$. Additionally, using cannabis to relieve stress was significantly different between hazardous and non-hazardous users, with hazardous users (M = 3.00, SD = 1.31) scoring higher than non-hazardous users (M = 2.16, SD = 1.33), $F(1, 420) = 34.379$, $p < .001$, $\eta^2 = .08$. Lastly, using cannabis to relieve depression was significantly different between hazardous and non-hazardous users, with hazardous users (M = 2.59, SD = 1.50) scoring higher than non-hazardous users (M = 1.76, SD = 1.21), Welch's $F(1, 184.267) = 29.100$, $p < .001$, $\eta^2 = .08$. There were no significant differences between hazardous and non-hazardous users for CNS/

migraine headache motives. Thus, hazardous users more often used cannabis for social, coping, enhancement, expansion, anxiety/OCD/PTSD, sleep disorder, depression, pain, and stress motives than non-hazardous users. Significant differences between hazardous and non-hazardous users, were also found for the OAS with hazardous users (M = 47.68, SD = 9.86) scoring lower than non-hazardous users (M =50.38, SD = 10.00), $F(1, 413) = 6.06$, $p = .014$, $\eta^2 = .015$. Higher scores on the OAS indicate better a better ability to use effective organizational planning and time management skills to succeed academically.

Table 6. *One-Way ANOVA for Cannabis Use Motives Between Hazardous and Non-Hazardous Users*

Measure		Hazardous		Non-Hazardous		F	p	η^2
		M	*SD*	*M*	*SD*			
Recreational Motives	MMM social	2.80	1.17	2.50	1.28	5.13	.021*	.01
	MMM coping	2.69	1.38	1.80	1.12	41.421	<.001**	.10
	MMM enhancement	3.88	1.09	2.98	1.36	52.57	<.001**	.09
	MMM conformity	1.13	0.44	1.11	0.44	.079	.382	.00
	MMM expansion	2.57	1.37	1.78	1.15	32.93	<.001**	.08
Medicinal Motives	Anxiety/ OCD/ PTSD	2.79	1.50	2.16	1.43	16.146	<.001**	.04
	Sleep disorder	2.60	1.42	2.06	1.35	13.49	<.001**	.03
	Depression	2.59	1.50	1.76	1.21	29.10	<.001**	.08
	Pain	2.19	1.32	1.77	1.28	8.97	.002**	.02
	Stress	3.00	1.31	2.16	1.33	34.38	<.001**	.08
	CNS (Migraine)	1.65	1.12	1.46	.99	2.72	.06	.01
SURPS	Hopelessness	18.55	3.94	19.32	3.07	4.56	.033	.01
	Impulsivity	10.10	2.50	9.15	2.35	13.46	<.001**	.031
	Sensation seeking	14.18	2.86	13.57	2.95	3.71	.055	.009
	Anxiety sensitivity	12.45	2.87	12.86	2.65	14.18	.166	.005
OAS		47.68	9.86	50.38	10.00	6.06	.014*	.015
Kessler-6		13.99	4.74	13.04	4.60	3.36	.067	.008

Note. MMM = Marijuana Motives Measure; SURPS= Substance Use Risk Profile; OAS= Organization and Attention to Study. *p < .05. **p < .01.

DISCUSSION

Of the 920 students that participated in the study, 52% reported using cannabis at least once in the last six months, of which 31% met the criteria for hazardous cannabis use. These findings may suggest that both cannabis use and cannabis use severity are common among university students within a legalized landscape. Though the present study cannot infer any causation due to its correlational nature, it provides some insight into the changing cannabis use trends.

Of all the variables included in this study, using cannabis to enhance one's experiences, cope with negative emotions, expand awareness, be liked, and relieve sleep difficulties, along with a predisposition for impulsive personality traits were identified as important predictors of cannabis use severity among all past six-month users. Among these variables, using cannabis to enhance one's experience because one likes the feeling was identified as the strongest predictor of cannabis use within the total sample and among students who endorsed hazardous cannabis use.

These findings add to the literature by further suggesting that cannabis use motives are important factors to consider when understanding cannabis use severity, as many of the strongest predictors identified were motives for use. The enhancement motive was the strongest predictor of cannabis use among the total sample, hazardous users only, males only, and the second strongest among females only. This suggests that using cannabis to enhance one's experiences may increase the risk for problematic use. Similar findings have been reported in previous research, as it has been found that the enhancement motive was significantly positively associated with cannabis frequency, as well as predicted severe use, and predicted cannabis related impairment beyond gender and frequency of recent use (Bresin & Mekawi, 2019; Gonzalez-Ponce et al., 2022; Mader et al., 2019).

The coping motive was another common predictor, as the current study found that it was the strongest predictor of cannabis use severity for female users, and the second strongest predictor for the total sample, non-hazardous users, and males. The coping motive was not identified as a predictor among hazardous users, implying it may suggest less hazardous yet still increasing problematic use. Previous research has also found links between the coping motive and frequency of use, use severity, cannabis dependency, and higher cannabis consequences in the past month (Gonzalez-Ponce et al., 2022; Mader et al., 2019). The coping motive has been linked to more problem substance use because it is typically a form of avoidance, which has been found to be associated with harmful outcomes (Chao, 2011).

An interesting relationship was demonstrated for the conformity motive. This motive was identified as a predictor for cannabis use severity in the negative direction for the total sample, males only, and hazardous users. Thus, increased cannabis use severity was associated with decreased use of cannabis for conformity purposes. The current findings add to the conflicting research for the conformity motive and cannabis use, as some demonstrate no association, some a negative association, some a positive association, and some a negative association with frequency but a positive association with severity (Bresin & Mekawi, 2019; Mader et al., 2019; Schultz et al., 2019). Conformity may be influenced by the legality of a substance, which may explain why some pre-legalization research has found a positive association between conformity and problem cannabis use (Schultz et al., 2019), while the current study identified a negative association. The last recreational motive identified as an important predictor was the expansion motive. This motive was identified as a predictor in the total sample and for both males and females, and not identified for both hazardous and non-hazardous users. Previous research has found that the expansion motive was significantly positively associated with cannabis use severity (Mader et al., 2019).

Other important predictors identified included risk profile variables. The impulsivity subscale of the SURPS was found as a predictor for the total sample, females only, and as the strongest predictor among non-hazardous users. This suggests that impulsivity may increase cannabis use but not to a hazardous degree. Further, the SURPS total score was found as a predictor only among hazardous users, implicating the SURPS as an identifier of potential hazardous use. These findings coincide with previous research that

found impulsivity was directly related to cannabis related problems as impulsivity has been associated with the inability to effectively use harm reduction strategies, which has been found to be associated with more substance use problems (Gonzalez-Ponce et al., 2022; Simons et al., 2005).

Additionally, some medicinal motives were identified as predictors of cannabis use severity. Using cannabis to alleviate sleep problems was identified as a predictor in the total sample as well as among hazardous users. Past research has found that sleep related motives are common among medicinal users, and that using cannabis to sleep was associated with increased problematic use, as well as worse sleep (Drazdowski et al., 2019). Similar themes have been found for using cannabis to alleviate depression, which was a motive identified in the current study as a predictor of problem use among females and hazardous users. Past research has found that patients with depression who used cannabis were more likely to have poor recovery compared to non-users (Bahorik et al., 2017). However, the current study did not find many medicinal use motives as strong predictors of cannabis use severity, which may be because the majority of the sample used cannabis for recreational purposes only, and the majority of those that used medicinally also used recreationally.

Implications

The findings of this study provide a more nuanced understanding of cannabis consumption among the university student population. Although the consumption, smoking, and growing of cannabis is prohibited on campus, findings suggest that cannabis use and hazardous cannabis use are common among university students. Given this finding, and as there is no safe level for cannabis consumption (Fischer et al., 2022), it is recommended that, in jurisdictions in which legalization has occurred, a campus policy restricting cannabis consumption to off-campus locations be endorsed.

To help address concerns regarding consumption, a harm reduction approach is encouraged. To facilitate harm reduction, lower risk cannabis use guidelines (LRUG) are advocated. Based on the consensus of experts, the LRCUG have been adopted internationally and recently updated with twelve recommendations on how to reduce the adverse effects of cannabis consumption (Fischer et al., 2022). Campus-based prevention and harm reduction initiatives that embrace LRCUG embedded within a harm reduction framework have been shown to be effective when they are used as an education and intervention tool through campus-wide marketing (Centre for Addiction and Mental Health [CAMH], 2019).

Harm reduction, using peer support, has been shown to especially applicable with youth and young adults (Gillespie et al., 2018). As such, post-secondary student support services are well positioned to promote harm reduction through educational/peer support programming. Since it was found that some students use cannabis to self-medicate, safe guidelines and protective strategies for cannabis consumption both in the traditional form and as edibles are required. This indicates there is significant room for continued education about safe guidelines and protective strategies regarding cannabis and its effects. To facilitate this, student support services can coordinate workshops for staff, faculty, and peer student volunteers along with social norming messages on campus plasma TVs and social media postings on student services platforms. It is further advocated that the development of addiction resources and supports in the form of brief interventions and screening tools is desirable not only for those most at risk but also for those who wish to better understand and minimize the risks of cannabis use.

Assessing cannabis use motives can be used to screen students who may be at highest risk for severe use to provide early intervention and prevent further harm. It also may be essential that post-secondary student support service clinicians have increased knowledge about evidence-based medicinal use to educate those students on its potential harms. For example, knowing that there is little evidence to support the use of cannabis in treating depression or sleep issues, and that it may worsen those issues, is important for clinicians to know to guide clients (Bahorik et al., 2017).

Limitations

This study is not without limitations. Because cannabis is now legalized, participants may have

been more likely to report that they use cannabis than pre-legalization. It is also important to note the impact that the COVID-19 pandemic may have had on these findings. University closures and restrictions may have impacted cannabis use frequency, mental health, and academia. Research during the pandemic has found that a large proportion of existing individuals that use cannabis increased their use during the first wave of the pandemic (CAMH, 2021). However, another study that surveyed US adults before and during business closures due to the pandemic found that there was no significant difference in the total amount or frequency of cannabis used before and during COVID-19. Thus, findings may not have been severely impacted by this global event. Future research is required to verify and further clarify these findings. Further, this study used the CUDIT-R total scores as a dependent variable, which may be limiting as the ratio between total scores and severity is unknown (Mader et al., 2019). However, because previous research has demonstrated that items on the CUDIT-R are highly correlated and measure one underlying construct, it is likely that higher scores on the CUDIT-R indicate more severe use (Adamson et al., 2010).

Conclusion

This study sought to describe trends in cannabis use and examine psychosocial outcomes, academic outcomes, risk profile, and motives to use among students at the University of Saskatchewan. Over half of the total sample reported using cannabis in the last six months, with 31% meeting the criteria for hazardous use. Of all the variables in the study, the enhancement motive was identified as one of the strongest predictors of cannabis use severity among the total sample, hazardous users only, males only and females only. Other important predictors included the coping motive, expansion motive, impulsivity, sleep disorder motive, and depression motives.

These findings can better inform campus-based prevention programs, campus rules for safe use, and screening measures to provide early intervention and improve public health education. Findings further implicate the need to provide support for the overall mental health of students and suggest that clinicians may focus on cannabis use motives and risk profile traits to determine risk and tailor interventions. The needs of the student population may be constantly evolving as cannabis products and methods continue to expand and cannabis laws continue to unfold, thus it is important for future research to continue monitoring these changes and their impact on use and outcomes to best mitigate risks going forward.

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