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Examining the Relationship Between Cannabis Use and Mood, Anxiety, and Psychotic Symptoms in Psychiatric Patients with Severe Concurrent Mental Health and Substance Use Disorders Before and After Recreational Cannabis Legalization in Canada

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ABSTRACT

Objective: The relationship between cannabis use and mental health has garnered significant attention in recent decades. However, studies have largely been in general populations or in countries in which recreational cannabis use is illegal. **Method:** The current cross-sectional study examines the relationship between cannabis use, mood disorders, anxiety, and psychosis in an inpatient psychiatric population with severe concurrent mental health and substance use disorders, exploring the potential moderating effect of the legalization of recreational cannabis in Canada. **Results:** Cannabis use compared to non-use was associated with higher self-reported depression, anxiety, and psychotic symptoms but was not associated with diagnosis of a mood, anxiety, or psychotic disorder. Frequency of cannabis use was unrelated to mental health outcomes, but age of first use was negatively associated with self-reported psychoticism symptoms. There were some significant associations between recreational cannabis legalization and mental health, but legalization was largely unrelated to outcomes. There were also some significant differences by demographics. **Conclusions:** While findings are relatively consistent with prior literature, some significant associations differed, suggesting the importance of examining concurrent disorder patients as a unique population when examining relationships between cannabis use and mental health.

Key words: = cannabis; substance use disorders; mood disorders; anxiety; depression; psychosis

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Cannabis use is the second most commonly used recreational substance, following alcohol (Health Canada, 2021). Approximately 50% of Canadians report ever using cannabis and approximately 25% report past-year use (Government of Canada, 2024; Health Canada, 2021). The World Health Organization estimates the global prevalence of cannabis use at approximately 2.5% (World Health Organization, 2024). The landscape of cannabis regulations and use has been changing rapidly across the world. A growing number of regions have decriminalized or legalized either medical or recreational cannabis in the past 20 years. In Canada, medical cannabis use was legalized in 1999 (Controlled Drugs and Substances Act, 1996; Health Canada, 2016), and recreational cannabis use was legalized in 2018 (Cannabis Act, 2018). There has also been an increase in novel consumer products (Spindle et al., 2019), such as cannabis beverages and e-cigarettes ("vapes"; Giroud et al., 2015), and in cannabinoid concentrations in cannabis products (Chandra et al., 2019). With the many changes in cannabis legislation and consumption, there is continued interest in the public health implications of these changes.

The relationship between cannabis and mental health has been widely debated in the scientific community and in the general public. There have been a considerable number of studies, systematic reviews, and meta-analyses examining the relationship between cannabis and mental health in both clinical and general populations. Many people report using cannabis to cope with mental health disorder symptoms and stress (Hyman & Sinha, 2009; Walsh et al., 2013; Yau et al., 2019). Cannabinoids have been proposed by some as a potential therapeutic for a range of psychiatric disorders and related symptoms (Hoch et al., 2019; Lowe et al., 2018; Sarris et al., 2020; Stith et al., 2020). While some evidence is mixed and the potential causal role of cannabis is not established (Lowe et al., 2018), cannabis use–especially early use–is often associated with increased risk for adverse mental health outcomes, including anxiety, depression, and psychosis (Gobbi et al., 2019; Halah et al., 2016; Hall, 2006; Halladay et al., 2020; Leadbeater et al., 2019; Lowe et al., 2018; Van Ours & Williams, 2011; van Ours & Williams, 2012).

Yet, these studies were predominantly conducted in regions in which recreational cannabis was not yet legalized, and/or in which pre- and post-cannabis legalization analyses were not possible. Legalization may impact cannabis use prevalence, potency of products, and psychiatric outcomes (Hall et al., 2023). Furthermore, studies that have examined the potential impacts of legalization have primarily been limited to easily accessible populations. Vulnerable populations, including psychiatric patients with the most severe and comorbid mental health and substance use disorders, are frequently excluded from research due to an emphasis on studying single disorders or pairings of disorders. Individuals suffering from severe concurrent disorders are difficult to recruit and assess. For example, epidemiological studies are often based on household surveys or emergency room data. High rates of homelessness among psychiatric populations limit their inclusion. Findings using standard population-based samples may not be generalizable to psychiatric inpatient populations. A study of psychiatric patients found higher rates of past-month cannabis use compared to general populations (Bahorik et al., 2013). People with psychiatric disorders are also more likely to use high-potency cannabis (Chan et al., 2017), which has become increasingly available post-legalization (Hall et al., 2023). Also, the impact of cannabis in psychiatric populations is often less emphasized in clinical contexts (Wiese et al., 2024), and thus may be under-addressed. Overall, there is a need for cannabis research in inpatient populations at the more severe end of the spectrum (Atakan, 2008) in regions where recreational cannabis has been legalized.

The current study examined the relationship between cannabis use, including use and non-use, frequency of use, age of first use, and mental health outcomes in an inpatient population with severe comorbid mental health and substance use disorders ("concurrent disorders") in British Columbia. We also explore recreational cannabis legalization as a potential moderator of the relationship between cannabis use and mental health. We hypothesized that cannabis use, higher frequency of use, and earlier onset of cannabis use would be associated with increased mental health symptoms and diagnoses. We further hypothesized that cannabis legalization

may moderate this effect, such that this association may decrease post-legalization as commercial access to cannabis became available to non-medical users.

METHODS

Participants and Treatment Facility

Participants at the time of assessment were inpatients at the Red Fish Healing Centre for Mental Health and Addictions (formerly the Burnaby Centre for Mental Health and Addictions) from British Columbia, Canada. The Red Fish Healing Centre is a tertiary integrated treatment centre servicing British Columbia and Yukon Territory for people with concurrent disorders that have exhausted the treatment options available to them in their local health authority (Lee-Cheong et al., 2021; Schütz et al., 2013). The treatment program is designed for a 6- to 9-month stay, but the average length of treatment is approximately 4- to 5- months. Patients receive services including pharmacotherapy, psychotherapy (group therapy), physical therapy, social work services, and recreational activities. For further information on the treatment centre, see Lee-Cheong et al. (2021) and Schütz et al. (2013).

To be eligible for the study, participants had to be in treatment for at least one month, determined stable enough to participate in the study by medical staff at the treatment centre, able to complete the study assessments in English, and consent to the use of medical chart data in the study. While we did not have data on the typical percentage of patients that remain in treatment for at least one month, clinician estimates suggest that at least 90-95% of patients are in treatment for at least 1 month.

Procedure

The study was approved by the Clinical Research Ethics Board at the University of British Columbia and operational approval was obtained from BC Mental Health and Substance Use Services. To recruit participants, patients were informed about the study by research assistants during individual free time and group activities. Posters were also displayed at the treatment center. If patients expressed interest in participating, eligibility was confirmed by treatment centre staff. Written informed consent was obtained from all participants prior to study enrollment. Participants completed a cross-sectional survey, including demographic information, the Maudsley Addiction Profile (Marsden et al., 1998), the Symptom Checklist-90-Revised (SCL-90-R; Derogatis & Unger, 2010), and a clinical cannabis use questionnaire with questions including frequency of use and age of onset of cannabis use. Admission date and diagnoses at admission were collected from medical charts.

Assessments

Mental health symptoms and diagnoses. The SCL-90-R (Derogatis & Unger, 2010) is a standardized and validated 90-item questionnaire used to evaluate a range of mental health disorder symptoms and psychological distress. Depression, anxiety, and psychosis subscales were selected for the present study due to their clinical relevance in the patient population and overlapping symptoms with medical chart diagnosis classifications (mood, anxiety, and psychotic disorders) and the currently available literature examining the relationship between cannabis use and mental health disorders in other populations. The SCL-90-R is an established instrument and has over 1,000 independent studies supporting is reliability and validity. In one validation study in a psychiatric population, the internal consistency coefficient ratings were 0.84, 0.83, and 0.69 for depression, anxiety, and psychoticism, respectively (Kostaras et al., 2020). Medical chart data collected included demographic information, date of admission, medication, DSM-5 diagnoses (American Psychiatric Association, 2013) at admission. Patients' diagnoses are determined by comprehensive assessment by psychiatrists in collaboration with an interdisciplinary clinical care team at the treatment centre. Care providers, including psychiatrists, spend extensive time reviewing patients' medical history, interacting directly with patients, and considering patients', families', and care providers' perspectives. For our analyses, diagnoses were classified according to DSM-5 categories: mood disorders (depressive and bipolar disorders), anxiety disorders (e.g., generalized anxiety disorder), and schizophrenia spectrum disorders. In accordance with the DSM-5, substance-induced psychosis was not included

as a schizophrenia spectrum disorder and post-traumatic stress disorder (PTSD) was not classified as an anxiety disorder.

Cannabis use. Cannabis use was assessed via self-reported data. Recent cannabis use and frequency of cannabis use was evaluated using the MAP (Marsden et al., 1998). The MAP is a standardized and validated questionnaire to assess substance use, physical health and health behaviors, psychological wellbeing, and daily functioning. The MAP average intraclass correlation coefficients for eight substances were 0.94 and 0.81 across health and social domains (Marsden et al., 1998). Patients reported on their typical monthly cannabis use prior to entering treatment. Patients were classified as using cannabis if they reported at least 1 day of use in the MAP cannabis use scale. History of cannabis use, including age of first use, was assessed using a clinically developed questionnaire for assessment at the treatment centre.

Analysis

Linear regressions were computed to assess relationships between cannabis use and SCL-90-R scores. First, we compared if cannabis use compared to non-use predicted SCL-90-R depression, anxiety, and psychosis scores. Next, we examined cannabis use patterns in relation to SCL-90-R scores within cannabis users, assessing for frequency of use and age of first use. Similarly, logistic regressions were computed to examine cannabis use/non-use, and within cannabis users, frequency of cannabis use, and age of first use in relation to mood, anxiety, and psychotic disorder diagnoses at admission. To examine the potential moderating effect of recreational cannabis legalization, the legal status of recreational cannabis at the time of admission was included as an interaction term with our primary predictive variables (cannabis use/non-use and frequency of use). Age and gender differences in mental health disorders are common. Women are more likely to be diagnosed with mild and moderate depression, while men may be more likely to be diagnosed with severe depression (Shi et al., 2021). Younger adults (Askari et al., 2023) are more likely to be diagnosed with a mental health disorder. As such, age and gender were included as potential covariates in all regression models. While the study was not powered to account individually for each other substance use, number of major non-cannabinoid addictive substance classes (alcohol, stimulants, opioids, and sedatives) used were also included as covariates. Box-cox or square root transformations were applied to dependent variables when assumptions of normality were violated. Missing values were addressed via imputation. Analyses were computed in RStudio (Rstudio Team, 2015; Hebbali 2024). We report adjusted models including all regressors of interest and unadjusted models for each regressor of interest in our results.

RESULTS

Demographics

Demographics are summarized in Table 1, and descriptive statistics of SCL-90-R symptom ratings and diagnostic status are summarized in Table 2. A comparison of cannabis users in the sample with national statistics are available in the supplementary materials (Table S1). A total of 211 (65 self-identified female; 146 self-identified male) participants completed the cannabis survey. Of those, 100 (38 female; 62 male) reported no recent cannabis use, and 111 (27 female; 84 male) reported typically using cannabis at least once every 30 days. There was a significantly higher proportion of female to male participants in the non-cannabis group compared to the cannabis group. The mean age of participants was significantly different between groups: 38.6 years in the non-cannabis group, and 34.8 years in the cannabis group. Those that reported using cannabis also reported a higher mean number of non-cannabinoid substances used. As such, these were included as covariates in our regression models. There was no significant difference in proportion of participants that were admitted to the treatment centre pre-cannabis legalization compared to post-legalization. Differences between SCL-90-R ratings and diagnoses by cannabis use status are reported in Table 3 as part of our primary analyses.

Table 1. *Sample Demographics*

Demographics	**Total** N(%) or $\bar{X} \pm SD$	**Non-cannabis users** N(%) or $\bar{X} \pm SD$	**Cannabis users** N(%) or $\bar{X} \pm SD$	**Statistic**	***p*-value**
N	211	100	111		
Gender				**4.00**[1]	**.046**
Male	149 (70.6)	62 (62.0)	84 (75.7)		
Female	65 (30.9)	38 (38.0)	27 (24.3)		
Age ± SD[2]	36.82 ± 11.5	39.8 ± 11.8	34.1 ± 10.5	**3.66**[2]	**.000**
Number of other substance classes used[3]	2.19 ± 0.8	2.0 ± 0.9	2.3 ± 0.7	**-2.92**[2]	**.004**
Cannabis legal status at admission	131 (62.1)	57 (57.0)	74 (66.7)	1.70[1]	.193
Illegal	80 (37.9)	43 (43.0)	37 (33.3)		
Legal	-	-	16.2 ± 11.4		
30-day cannabis use frequency	-	-	14.1 ± 2.58		
Age of first cannabis use	1.2 ± 0.9	1.1 ± 0.9	1.3 ± 0.8		
SCL-90-R Subscale Ratings	0.8 ± 0.7	0.7 ± 0.7	0.9 ± 0.8		
Depression	0.8 ± 0.8	0.7 ± 0.7	0.9 ± 0.9		
Anxiety					
Psychoticism	93 (44.1)	46 (46)	47 (42.3)		
Diagnoses	5 (2.4)	1 (1)	4 (3.6)		
Mood	33 (15.6)	18 (18)	15 (13.5)		
Missing	5 (2.4)	1 (1)	4 (2.4)		
Anxiety	154 (73)	68 (68)	86 (77.5)		
Missing	6 (2.8)	1 (1)	4 (4.5)		
Schizophrenia spectrum					
Missing					

Note. 1. Chi-square; 2. *t*-test; 3. Includes alcohol, opioids, stimulants, and sedatives. *SD* = Standard deviation. Significant between-group differences are indicated in **bold**.

Table 2. *Symptom and Diagnostic Outcome Descriptives*

Symptom/Diagnosis	**Total** N(%) or $\bar{X} \pm SD$	**Non-cannabis users** N(%) or $\bar{X} \pm SD$	**Cannabis users** N(%) or $\bar{X} \pm SD$
SCL-90-R Subscale Ratings			
Depression	1.2 ± 0.9	1.1 ± 0.9	1.3 ± 0.8
Anxiety	0.8 ± 0.7	0.7 ± 0.7	0.9 ± 0.8
Psychoticism	0.8 ± 0.8	0.7 ± 0.7	0.9 ± 0.9
Diagnoses			
Mood	93 (44.1)	46 (46)	47 (42.3)
Missing	*5 (2.4)*	*1 (1)*	*4 (3.6)*
Anxiety	33 (15.6)	18 (18)	15 (13.5)
Missing	5 (2.4)	1 (1)	*4 (2.4)*
Schizophrenia spectrum	154 (73)	68 (68)	86 (77.5)
Missing	*6 (2.8)*	*1 (1)*	*4 (4.5)*

Note. SD = Standard deviation. Differences between SCL-90-R ratings and diagnoses by cannabis use status are reported in Table 3 as part of our primary analyses.

Mental Health Among People Who Use Cannabis Compared to People Who do Not Use Cannabis

Our first set of regressions compared people who use cannabis with people who do not use cannabis, with the legal status of cannabis examined as a potential moderator. SCL-90-R results are detailed in Table 3. Age and gender were not a significant predictor of any SCL-90-R scores. The number of non-cannabinoid substances used was positively associated with SCL-90-R depression scores in both the

unadjusted and adjusted models, while cannabis was not associated with scores in the unadjusted model but was positively associated with scores in the adjusted model. There was no significant impact of cannabis legal status in the unadjusted or adjusted models.

The number of non-cannabis substances used and cannabis use were significantly positively associated with the SCL-90-R anxiety ratings in both the unadjusted and adjusted models. There was also a significant interaction effect between cannabis use and the legal status of cannabis in the unadjusted and adjusted models. Post-hoc pairwise comparisons with Tukey's Honestly Significant Difference (HSD) multiple-comparisons correction revealed significantly higher SCL-90-R anxiety scores for people who used cannabis pre-legalization compared to those who did not (t = -3.45, p = .003) and significantly higher anxiety scores for those who used cannabis post-legalization compared to those who used cannabis pre-legalization (t = 3.23, p = .008).

With regards to the SCL-90-R psychoticism scale, cannabis use significantly predicted higher psychoticism scores in the unadjusted and adjusted models. A higher number of substances used significantly predicted higher psychoticism scores in the unadjusted and adjusted models. Legal status had no significant associations. In summary, the number of non-cannabinoid substances used and cannabis use status were significantly associated with higher SCL-90-R symptom ratings for all three scales, with a moderating effect of cannabis legalization for anxiety scores only.

Table 3. *Regression Models for Self-Reported Mental Health Symptoms by Age, Gender, Cannabis Legal Status at Admission, and Cannabis Use/Non-Use*

	Unadjusted			Adjusted		
	β	95% CI$_β$	*p*	*β*	95% CI$_β$	*p*
SCL-90-R Depression[1]						
Age	0.00	-0.00, 0.01	.272	0.00	0.00, 0.00	.105
Gender	-0.02	-0.15, 0.10	.718	-0.01	-0.14, 0.12	.087
Number of substances used	**0.10**	**0.03, 0.17**	**.005**	**0.09**	**0.01, 0.16**	**.023**
CAN legal status	-0.07	-0.19, 0.05	.257	0.03	-0.14, 0.20	.071
CAN use	0.11	0.00, 0.23	.059	**0.17**	**0.01, 0.32**	**.035**
CAN legal status x CAN use	-0.02	-0.44, 0.04	.098	-0.16	-0.40, 0.08	.183
SCL-90-R Anxiety[1]						
Age	0.01	0.00, 0.01	.617	0.00	0.00, 0.01	.364
Gender	-0.06	-0.19, 0.06	.307	-0.06	-0.18, 0.06	.339
Number of substances used	**0.13**	**0.06, 0.20**	**.000**	**0.11**	**0.04, 0.18**	**.001**
CAN legal status	-0.09	-0.20, 0.03	.130	0.10	-0.05, 0.26	.193
CAN use	**0.11**	**0.01, 0.23**	**.039**	**0.20**	**0.06, 0.35**	**.006**
CAN legal status x CAN use	**-0.37**	**-0.59, -0.14**	**.002**	**-0.32**	**-0.55, -0.10**	**.005**
SCL-90-R Psychoticism[2]						
Age	0.00	0.00, 0.01	.642	0.00	0.00, 0.01	.328
Gender	-0.03	-0.18, 0.12	.700	-0.02	-0.17, 0.13	.792
Number of substances used	**0.14**	**0.05, 0.22**	**.002**	**0.11**	**0.03, 0.20**	**.011**
CAN legal status	-0.11	-0.25, 0.04	.143	0.04	-0.16, 0.24	.701
CAN use	**0.13**	**0.00, 0.27**	**.050**	**0.19**	**0.01, 0.37**	**.035**
CAN legal status x CAN use	-0.27	-0.55, 0.01	.059	0.22	-0.51, 0.05	.112

Note. 1. Box-cox transformed outcome variable. 2. Square-root transformed outcome variable. CAN = cannabis; CI = Confidence interval. SE = Standard error. Gender: reference level = male. Cannabis legal status: reference level = pre-legalization. Unadjusted model statistics are reported for each regressor, in addition to statistics for the adjusted multivariate models. Significant findings are indicated in **bold.**

Diagnosis results are detailed in Table 3. For mood disorder diagnoses, males were more likely to be diagnosed but there were no other significant predictors. There were no significant predictors of anxiety disorder diagnosis. While cannabis use and illegal cannabis status individually predicted a schizophrenia spectrum disorder in unadjusted models, these relationships were no longer significant in our adjusted models. There were no

other significant predictors of a schizophrenia spectrum disorder.

Table 4. *Regression Models for Diagnosis at Admission by Age, Gender, Cannabis Legal Status at Admission, and Cannabis Use/Non-Use*

	Unadjusted				Adjusted			
	β	OR	95% CI_{OR}	*p*	*β*	OR	95% CI_{OR}	*p*
Mood Disorder								
Age	0.02	1.02	1.00, 1.05	.096	0.02	1.02	0.99, 1.04	.130
Gender	**-0.74**	**0.47**	**0.25, 0.87**	**.018**	**-0.77**	**0.46**	**0.24, 0.87**	**.019**
Number of substances used	-0.01	0.99	0.70, 1.39	.945	0.07	1.32	0.74, 1.55	.428
CAN legal status	-0.19	0.83	0.47, 1.46	.523	-0.34	0.72	0.31, 1.63	.524
CAN use	-0.10	0.90	0.52, 1.56	.714	-0.24	0.78	0.37, 1.66	.718
CAN legal status x CAN use	0.11	1.12	0.36, 3.51	.845	0.28	1.31	0.41, 1.55	.645
Anxiety Disorder								
Age	0.00	1.00	0.97, 1.03	.979	0.00	1.00	0.96, 1.03	.830
Gender	0.12	1.13	0.50, 2.46	.759	0.06	1.06	0.45, 2.40	.888
Number of substances used	0.12	1.13	0.71, 1.80	.603	0.13	1.14	0.70, 1.84	.595
CAN legal status	-0.08	0.93	0.42, 1.98	.846	0.40	1.49	0.52, 4.24	.451
CAN use	-0.31	0.73	0.34, 1.55	.417	0.02	1.02	0.37, 2.83	.962
CAN legal status x CAN use	-1.18	0.31	0.05, 1.55	.169	-1.17	1.13	0.05, 1.59	.177
Psychotic Disorder								
Age	-0.01	0.99	0.96, 1.01	.308	-0.01	0.99	0.97, 1.03	.738
Gender	-0.04	0.96	0.49, 1.94	.909	0.20	1.23	0.60, 2.60	.586
Number of substances used	-0.13	0.88	0.59, 1.31	.531	-0.31	0.73	0.48, 1.12	.153
CAN legal status	**-0.74**	**0.48**	**0.25, 0.91**	**.024**	-0.56	0.57	0.24, 1.37	.212
CAN use	**0.67**	**1.96**	**1.03, 3.78**	**.041**	0.92	2.51	0.99, 6.61	.055
CAN legal status x CAN use	-0.35	0.71	0.19, 2.63	.603	-0.44	0.64	0.17, 2.43	.512

Note. CI = Confidence interval. OR = Odds ratio. Gender: negative β indicates higher score for male participants. Cannabis legal status: negative β indicates higher odds pre-legalization compared to post-legalization. Unadjusted model statistics are reported for each regressor, in addition to statistics for the adjusted multivariate models. Significant findings are indicated in **bold.**

Frequency of Cannabis Use, Age of First Use, and Mental Health

Our next set of analyses was within people who used cannabis, with legal status of cannabis explored as a potential moderator. SCL-90-R results are detailed in Table 4. Within people who reported cannabis use, there were no significant predictors of SCL-90-R depression scores. Both SCL-90-R anxiety and psychoticism scores were significantly positively associated with number of substances used and were lower post-legalization compared to pre-legalization in our unadjusted models but these relationships became non-significant in our adjusted models. They were not significantly associated with any other variables.

Results regarding diagnoses are detailed in Table 4. Age at admission was positively associated with mood disorder diagnoses. There were no other significant predictors of mood disorder diagnoses. Anxiety disorders were significantly associated with a later age of first cannabis use. Schizophrenia spectrum disorders were significantly negatively associated with the legal status of cannabis.

Table 5. *Regression Models for Self-Reported Mental Health Symptoms by Age, Gender, Cannabis Legal Status at Admission, Frequency of Use, and Age of First Use Among Cannabis Use (N = 111)*

	Unadjusted			Adjusted		
	β	95% $CI_{β}$	*p*	*β*	95% $CI_{β}$	*p*
SCL-90-R Depression						
Age	0.01	-0.01, 0.02	.237	0.01	-0.01, 0.02	.311

Gender	-0.08	-0.45, 0.30	.683	0.00	-0.38, 0.38	.982
Number of substances used	0.13	-0.10, 0.35	.269	0.10	-0.14, 0.33	.413
Age of first CAN use	0.06	0.00, 0.12	.060	0.05	-0.02, 0.11	.168
CAN legal status	-0.28	-0.62, 0.06	.102	-0.01	-0.62, 0.59	.963
Frequency of CAN use	-0.01	-0.02, 0.01	.477	0.00	-0.02, 0.02	.886
CAN legal status x CAN frequency of use	-0.02	-0.05, 0.01	.287	-0.01	-0.04, 0.02	.458
SCL-90-R Anxiety[1]						
Age	0.00	-0.01, 0.01	.758	0.00	-0.01, 0.01	.948
Gender	-0.10	-0.30, 0.10	.310	-0.05	-0.24, 0.14	.618
Number of substances used	**0.14**	**0.03, 0.25**	**.017**	**0.12**	**0.00, 0.23**	**.047**
Age of first CAN use	0.03	0.00, 0.06	.054	0.02	-0.01, 0.06	.158
CAN legal status	**-0.29**	**-0.47, -0.12**	**.001**	-0.12	-0.42, 0.19	.441
Frequency of CAN use	0.00	-0.01, 0.01	.822	0.01	0.00, 0.01	.204
CAN legal status x CAN frequency of use	-0.01	-0.02, 0.01	.275	-0.01	-0.02, 0.01	.358
SCL-90-R Psychoticism[1]						
Age	0.00	0.01, 0.01	.945	0.00	-0.01, 0.01	.985
Gender	0.03	-0.20, 0.25	.811	0.05	-0.17, 0.28	.630
Number of substances used	**0.13**	**0.00, 0.27**	**.045**	0.10	-0.04, 0.24	.151
Age of first CAN use	0.02	-0.01, 0.06	.228	0.02	-0.56, 0.16	.281
CAN legal status	**-0.23**	**-0.43, -0.03**	**.026**	-0.20	-0.56, 0.16	.384
Frequency of CAN use	-0.01	-0.01, 0.00	.146	0.00	-0.02, 0.01	.397
CAN legal status x CAN frequency of use	0.00	**-0.01, 0.02**	.936	0.00	-0.02, 0.02	.880

Note. CI = Confidence interval. SE = Standard error. Gender: negative ß indicates higher score for male participants. Cannabis legal status: negative ß indicates higher score pre-legalization compared to post-legalization. Unadjusted model statistics are reported for each regressor, in addition to statistics for the adjusted multivariate models. Significant findings are indicated in **bold.**

Table 6. *Frequency of Cannabis Use per 30 Days and Age of First Use with Mental Health Diagnoses (N = 111)*

	Unadjusted				Adjusted			
	ß	OR	95% CI_{OR}	*p*	*ß*	OR	95% CI_{OR}	*p*
Mood Disorder								
Age	**0.05**	**1.05**	**1.01, 1.09**	**.016**	**0.05**	**1.05**	**1.01, 1.10**	**.013**
Gender	-0.51	0.60	0.23, 1.47	.274	-0.46	0.63	0.23, 1.65	.357
Number of substances used	-0.14	0.87	0.50, 1.49	.612	-0.15	0.86	0.48, 1.53	.615
Age of first CAN use	0.09	1.09	0.94, 1.30	.255	0.08	1.08	0.92, 1.31	.363
CAN legal status	-0.14	0.87	0.38, 1.95	.738	-0.92	0.40	0.08, 1.80	.241
Frequency of CAN use	0.00	1.00	0.97, 1.04	.790	-0.02	0.98	0.94, 1.03	.486
CAN legal status x CAN frequency of use	0.02	1.03	0.95, 1.10	.496	0.05	1.05	0.97, 1.14	.206
Anxiety Disorder								
Age	0.01	1.01	0.96, 1.07	.597	0.01	1.01	0.96, 1.07	.658
Gender	-0.83	0.44	0.07, 1.73	.297	-0.35	0.70	0.10, 3.19	.674
Number of substances used	0.15	1.17	0.54, 2.53	.693	0.21	1.23	0.52, 2.99	.641
Age of first CAN use	**0.35**	**1.42**	**1.13, 1.88**	**.008**	**0.35**	**1.42**	**1.11, 1.96**	**.016**
CAN legal status	-0.81	0.45	0.10, 1.53	.237	-1.00	0.37	0.02, 3.53	.423
Frequency of CAN use	-0.01	0.99	0.94, 1.04	.671	-0.01	0.99	0.92, 1.05	.657

CAN legal status x CAN frequency of use	0.00	1.00	0.88, 1.12	.964	0.03	1.03	0.90, 1.17	.652
Psychotic Disorder								
Age	-0.01	0.99	0.95, 1.04	.800	0.00	1.00	0.95, 1.05	.945
Gender	0.26	0.77	0.42, 4.89	.676	0.75	2.11	0.58, 10.02	.294
Number of substances used	0.45	1.29	0.38, 1.53	.448	-0.41	0.66	0.30, 1.42	.296
Age of first CAN use	0.16	1.17	0.95, 1.50	.184	0.25	1.28	0.99, 1.73	.078
CAN legal status	-0.89	0.41	0.14, 1.11	.078	**-2.41**	**0.09**	**0.01, 0.53**	**.010**
Frequency of CAN use	0.02	1.02	0.98, 1.07	.289	-0.01	0.99	0.93, 1.06	.866
CAN legal status x CAN frequency of use	0.08	1.08	0.98, 1.19	.111	0.10	1.10	1.00, 1.23	.595

Note. CI = Confidence interval. OR = Odds ratio. Gender: negative β indicates a higher score for male participants. Cannabis legal status: negative β indicates higher odds pre-legalization compared to post-legalization. Unadjusted model statistics are reported for each regressor, in addition to statistics for the adjusted multivariate models. Significant findings are indicated in **bold.**

DISCUSSION

Compared to those who did not report using cannabis, the cannabis-using group had a higher proportion of males, tended to be younger, and used more variety of substances, suggesting that this is a group with unique demographic characteristics. Legalization did not impact the proportion of people who used cannabis compared to those who did not. It is possible that legalization does not impact cannabis use status in a population that already uses illicit substances often.

Our findings suggest some similarities and some differences across self-reported symptoms and medical chart diagnoses. The significant associations of both cannabis use and number of substances used with self-reported depression, anxiety, and psychotic symptoms was as expected. In contrast to self-reported symptoms, cannabis use status did not significantly predict diagnoses except for schizophrenia spectrum disorders. The positive associations we found with mental health symptoms are relatively consistent with prior literature in other populations in which cannabis use has often been associated with worsened mental health (although some evidence is mixed; Halah et al., 2016; Halladay et al., 2020; Hasan et al., 2020; Lev-Ran et al., 2013; Lowe et al., 2018; Van Ours & Williams, 2011). There are several epistemological theories as to why cannabis may be related to mental health: it may be due to shared risk factors for mental illness and cannabis use, the self-medication theory in which individuals use cannabis to cope with mental illness, negative causal effects of cannabis on mental health, or a combination of these (Mueser et al., 1998). Our findings indicate that this association is true even in individuals with severe concurrent substance use disorders and severe mental disorders.

Interestingly, cannabis use status was not associated with mood, anxiety, and schizophrenia spectrum disorder diagnoses in our study, despite it being associated with self-reported symptoms. It is possible that the assessments used are not valid, but the SCL-90-R has been validated in more than 1000 studies, including studies with similar substance-using and psychiatric populations (e.g., Benjamin et al., 2006; Kostaras et al., 2020; Grande et al., 2014), and clinician diagnoses are determined after extensive assessments. The discrepancy between findings for diagnoses and self-reported symptoms may be due to the binary nature of diagnoses compared to the continuous nature of a symptom score. Also, symptoms may be subthreshold or captured under another diagnosis due to the transdiagnostic nature of many mental health symptoms. It is important to note that the SCL-90-R is not intended as a diagnostic assessment, but rather to capture general distress as manifested by a range of symptoms (e.g., Carrozzino et al., 2023; Derogatis & Unger, 2010). While differential diagnoses may not be determinable from the SCL-90-R, psychiatrists may be able to make more nuanced clinical judgments through more comprehensive assessment. Alternatively, some of these symptoms may be determined by psychiatrists as attributable to substance (including cannabis) withdrawal or drug craving, in which case they would not qualify for a psychiatric diagnosis. Anxiety and depressive symptoms are known effects of withdrawal from many substances. In Wang et al. (2023), SCL-90-R scores including depression, anxiety, and

psychoticism scores were positively associated with drug craving and negatively correlated with abstinent time in patients in treatment for drug withdrawal. In contrast, Wetterling and Junghanns (2020) found no significant relationships between SCL-90-R scores and alcohol withdrawal symptoms. Further research may be needed to elucidate how psychiatric symptoms are attributed to substance-related factors or to DSM-5 diagnosis.

Unlike some previous studies (Patton et al., 2002; Rup et al., 2021; Van der Pol et al., 2013), frequency of cannabis use was unrelated to outcomes. This may be due to a ceiling effect. The cannabis group in our sample used cannabis frequently compared to the general population. According to a national survey, most cannabis users use cannabis a maximum of three times in a typical month (Government of Canada, 2022), although past-30-day users report 14.2 days in the past month. In our sample, most of the cannabis use group used cannabis at least one day per week, with the average frequency of use being more than half of the days per month. Also, while we expected earlier age of first use to be associated with higher self-reported mental health symptoms and with diagnostic status among people who used cannabis, this was not the case. Surprisingly, later onset of cannabis use was associated with a higher likelihood of an anxiety disorder diagnosis, yet there is substantial literature that has found that early cannabis use increases the risk for adverse mental health outcomes. Our differential findings may be due to the unique nature of our population. For example, in our sample, most participants' age of onset of cannabis use was approximately 11 to 17 years old, with a mean of 14.1 years old, compared to the national average of 20.5 years (Government of Canada, 2022). This suggests that most of our participants would be considered early-onset users. One study of young adults found that cannabis use was only associated with poorer mental health in those who reported using cannabis to cope with distress (Brodbeck et al., 2007), and another study (Haug et al., 2017) found that young people are more likely to use cannabis to relieve boredom, while older adults are more likely to use cannabis for coping.

There were a few contexts in which cannabis legal status impacted outcomes. People who used cannabis pre-legalization reported higher SCL-90-R anxiety scores compared to those who did not use cannabis pre-legalization. This was pre-recreational cannabis legalization; medical cannabis was already legalized at this time. Those who used cannabis pre-legalization may have been accessing medical cannabis to cope with anxiety-related symptoms, while those who did not have as severe anxiety symptoms were less likely to access medical cannabis. Also, people who used cannabis post-legalization reported higher anxiety scores compared to those who used cannabis pre-legalization. The legalization of cannabis was associated with a decreased likelihood of a schizophrenia spectrum disorder diagnosis among people who used cannabis. This result was quite surprising. While we were unable to find specific data regarding the age of onset, changes in the availability of other drugs such as fentanyl and crystal meth may have replaced cannabis use in the often street-entrenched population served at Red Fish Healing Centre. This is speculative, as we were unable to find data to verify or dismiss this hypothesis. Furthermore, results may have been confounded by other temporally related factors, such as the COVID-19 pandemic (e.g., anxiety increased nationally during the pandemic; Dozois & Mental Health Research Canada, 2021).

Cannabis legalization was otherwise unrelated to mental health outcomes. This could be explained by the overall limited changes in the prevalence of cannabis use in our sample. The legal status of a substance may not make a substantial impact on substance use in our sample, given that many of them have multiple substance use disorders, and that most substances used in our sample are controlled or illicit substances. Also, medical cannabis, including for mental health symptoms, was widely available prior to the legalization of recreational cannabis, and the prevalence of cannabis use was already quite high in Canada (Rotermann, 2020). Our sample may have already been accessing medical cannabis prior to recreational cannabis legalization. Furthermore, a recent systematic review found mixed evidence for the relationship between cannabis legalization and mental health (Walker et al., 2023).

Our findings regarding demographics further highlight the complexities of the relationships between substance use and mental health in individuals with concurrent disorders. In our

study in a concurrent disorder population, men were more likely to be diagnosed with a mood disorder, despite other literature reporting that the prevalence of mood disorder diagnoses are at least equal, if not greater, in women (Dell'Osso et al., 2021; Moreno-Agostino et al., 2021). However, mood disorders are often underdiagnosed in men (Whitley, 2021), and men tend to report more severe depression compared to women (Shi et al., 2021). In a structured inpatient treatment centre that includes comprehensive mental health assessment at intake, it is possible that a mood disorder is more likely to be identified in men compared to other settings and that severe depression (which is more common in men) is more prevalent.

Patient age was not a significant predictor of diagnosis or self-reported symptoms in the whole sample, but older age predicted a mood disorder diagnosis within people who use cannabis. Treatment options for mood disorders, especially depressive disorders, are relatively accessible compared to treatments for other disorders. Because the treatment facility is tertiary, patients must have exhausted all other treatment options in the service region. It is possible that younger people with depression are first referred to other services, while older people with depression are more likely to have exhausted their treatment options and qualify for tertiary treatment. Alternatively, clinicians generally may consider mood disorders to be less severe compared to some other disorders and may only refer patients with persistent, long-term depression to tertiary care, resulting in an older patient group with depression. People who use cannabis that are older may also be more likely to use cannabis for coping motives (Haug et al., 2017), and thus their use may be more linked to mental health outcomes compared to younger adults (Brodbeck et al., 2007).

Overall, the differential findings in this study may be due to the unique and complex nature of this population. People with severe concurrent disorders are frequently excluded from research. The vast majority of patients at the treatment centre are often homeless or in temporary housing without a permanent address, excluding them from population-based studies that use telephone or mail-based surveys. Additionally, this sample draws from a psychiatric population with high comorbidity of mental health and substance use disorders (Lee-Cheong et al., 2021; Schütz et al., 2013). While some studies sample from non-institutionalized populations, studies involving psychiatric populations often focus on a single disorder or the relationship between two disorders, excluding those with additional comorbidities. This present sample represents an understudied population, and thus findings from previous studies may not reflect unique patterns of substance use and mental health in populations with severe concurrent disorders.

Limitations and Future Directions

This study has some limitations. First, it is a cross-sectional study, and causality of the relationships cannot be established. Retrospective data may be susceptible to recall bias. There were significant demographic differences between the cannabis use and non-use groups; however, all variables included in our regression models met the assumption of independence of observations. Additionally, motives for use were not examined but may be a relevant mediator in the relationship between cannabis use patterns and mental health (Brodbeck et al., 2007; Glodosky & Cuttler, 2020). Further, there is vast heterogeneity of cannabis use behaviors (e.g., route of administration, dose, cannabinoids) that may have differential, or even interacting, effects, with potential individual differences that can modulate cannabis effects (Atakan, 2012). Lastly, cannabis legalization may be confounded by other temporally related factors, such as the COVID-19 pandemic.

Longitudinal studies are needed to better elucidate directionality of these findings. Other areas to examine further include cannabis use motives and differential use patterns that may mediate relationships between mental health and cannabis use. Direct comparisons between inpatient populations and appropriate controls in the general population may be warranted to better understand divergent findings. Lastly, multivariate analyses to examine interactions between cannabis use and more specific mental health and substance use outcomes may provide insight into relevant subgroups and interactions, including interactions between cannabis and other individual substances.

Conclusions

Cannabis has been proposed both as a therapeutic agent and a potential risk factor for mental health and substance use disorders. This study explored the associations between cannabis use and mental health outcomes in individuals with severe concurrent mental health and substance use disorders, a population often excluded from research. Our results indicate that cannabis use in this group correlates with poorer self-reported mental health, though variations may exist depending on the age of onset of use and legal status. Additionally, distinct demographic differences emerged in our analysis.

These findings provide critical insights into the role of cannabis in mental health among a highly vulnerable population, particularly through direct comparisons of cannabis use before and after legalization. While some conclusions from broader population studies may be applicable to this subgroup, they are not universally generalizable, as evidenced by our results. Individuals with severe concurrent disorders have unique risk profiles that warrant dedicated investigation, as substance use and its mental health impacts may differ from those in other populations. Although cannabis is often considered of lower clinical concern compared to higher-risk substances, our study highlights its relevance to mental health discussions within substance-using populations. Further research is essential to clarify differences between general and clinical populations and to better understand how cannabis use intersects with mental health in the context of severe concurrent disorders.

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