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Original Paper

Are Younger Medical Cannabis Users at Risk? Comparing Patterns of Use and Mental Health in Younger and Older Medical Cannabis Dispensary Users

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Running title: *Cannabis abuse characteristics*

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Abstract

While there has been a considerable amount of research on recreational cannabis use in youth to date, much less is known about patterns of medical cannabis use in youth. Adult medical versus recreational cannabis users may differ in how they use the product on important factors such as dose, frequency and route of ingestion, and so it is important to understand whether adolescents and young adults differ in how they use medical cannabis compared to adults, and if this increases risk of impaired mental health. In the present study, one hundred members of a community cannabis dispensary who endorsed cannabis use for medical purposes were assessed for major psychiatric disorders, and completed questionnaires related to stress, depression, sleep and somatic symptoms. Detailed information about

cannabis use was collected. In the sample, 35% were aged 19-24 years old, and 24% were aged 25-30 (categorized as youth/young adults). In comparison to the older medical cannabis users, there were unexpectedly few differences, both in mental health status as well as pattern of medical cannabis use. These findings contrast with those of recreational cannabis users, and indicate that medical cannabis in youth may be as effective and well-tolerated as in older adults.

Keywords

cannabis, dispensary, mental health, teenagers, youth

1. Introduction

Young people often perceive cannabis as harmless (Pacek et al., 2015). This may be even more true for individuals using cannabis for medical purposes. However, there is a growing body of research associating younger age of cannabis use with a host of issues including worsening anxiety, depression, psychosis, social dysfunction, and increased risk of substance misuse (Crean et al., 2011; Gicas et al., 2020; Gobbi et al., 2019; Jacobson et al., 2019; Nocon et al., 2006; Urbanoski et al., 2005). Although much of the literature focuses on adolescents under the age of 19, the world health organization categorizes young people as individuals between the ages of 10 and 24 (World Health Organization, 2011). This encompasses a notable period of young adulthood between the ages of 19 to 24 years of age. Accordingly, brain development has been shown to continue until at least 25 years of age (Johnson et al., 2009). While a great deal of attention has been given to investigating the impacts of cannabis use in adolescents, the literature for young adults is less comprehensive. Furthermore, the majority of evidence comes from studies where cannabis was used recreationally, whose subjects tend to have different goals and patterns of use from medical cannabis users (Eadie et al., 2021; Lo, MacCallum, Yau, & Barr, 2022; Turna et al., 2020). As such, it is not yet clear if cannabis-related risks identified in adolescents specifically using medical cannabis persist into young adulthood, or if these risks are even present in medical users.

The endocannabinoid system is an important substrate of brain development (Goldstein Ferber et al., 2021; Schonhofen et al., 2018). It has been shown to regulate the activity of local neurons and larger brain pathways, such as corticolimbic circuitry, impacting the regulation of stress, anxiety and depression (Hill et al., 2007; Meyer et al., 2018). Although most neurodevelopment occurs before the age of 18, the fine-tuning of neural pathways continues into the mid-'20s (Hurd, 2020). This is especially pronounced in the prefrontal cortex (PFC), a brain region crucial for higher cognitive function and emotional regulation (Jones & Graff-Radford, 2021). This has led to concerns about the impact cannabis may have on mental health. Though the directionality of associations has not yet been established, some evidence links earlier cannabis use with anxiety, depression, and bipolar disorder (Degenhardt et al., 2003; Gobbi et al., 2019; Lo, MacCallum, Yau, Panenka, et al., 2022; Lowe et al., 2019; Moore et al., 2007). The strongest evidence regarding risk has been associated with early age of

initiation and frequent use of high Δ9-tetrahydrocannabinol (THC) products (Gobbi et al., 2019; Murray et al., 2017). The recent rise in popularity medical cannabis, coupled with societal views that it is a “safe” alternative, may lead to an underestimated risk of potential harms. Therefore, there is a pressing need to evaluate both patterns of use and mental health status in young people using cannabis for medical purposes. Furthermore, there is a need to evaluate if patterns of use and associated risks differ from older aged groups to inform policy, healthcare practices and possible areas of intervention.

The aim of this study was therefore to investigate cannabis use patterns and associated mental health in young people (aged 19-24) using cannabis with medical intent. The primary research question is whether younger cannabis users are at a greater risk for adverse mental health outcomes compared to older users. Secondary investigations aimed to assess if cannabis use patterns differ between age groups, as these may help explain any potential differences in mental health outcomes. This information could be used to help evaluate risks associated with medical cannabis use in young people and provide details on where, or if, potential interventions are needed.

2. Method

2.1 Study Population

Study ethics were approved by the Behavioural Research Ethics Board of the institutional review board (protocol H16-01830). A sample of participants (n = 100) was recruited in 2018 from Evergreen Cannabis Society compassion club, a cannabis dispensary in Vancouver, Canada. Participants had a membership to the cannabis dispensary and reported using cannabis for medical purposes, however, most were not under the direct care of a healthcare provider. Participants were 19 years or older and able to give informed consent. The study took approximately four hours to complete per subject and consisted of self-report questionnaires and the Mini-International Neuropsychiatric Interview (MINI) version 6, conducted by a trained research associate as previously (Alexander et al., 2019; Barr et al., 2011; Zhou et al., 2019). Participants were provided an honorarium for their time. No subjects were excluded, and none withdrew.

2.2 Measures

Demographic information was collected including age, gender, ethnicity, and education level. Self-reported information on cannabis use patterns were collected, such as preference in chemovar (strain), route of consumption, frequency of use, amount of use, and negative experiences of any severity associated with cannabis use. Individuals were able to select multiple preferences for each measure. Validated self-report questionnaires were used to collect information on well-being and mental health. The Perceived Stress Scale 10 (PSS10) was used to rate perceived stress by collecting information on life unpredictability, lack of control, and stress overload as rated by participants (Cohen et al., 1983). Depressive symptoms and attitudes within the last two weeks were captured using the Beck Depression Inventory-II (BDI-II) (Beck et al., 1961). The Patient Health Questionnaire 15

(PHQ-15) was used to assess the severity of somatic symptoms (Kroenke et al., 2002). Finally, the Patient Reported Outcomes Measurement Information System (PROMIS) sleep disturbance scale was used to assess sleep disturbance within the last seven days (Buysse et al., 2010). To determine whether participants met criteria for the psychiatric diagnoses of major depressive disorder (MDD), general anxiety disorder (GAD), or bipolar disorder (BD, either type I, II, or Not Otherwise Specified (NOS)), the MINI version 6 was administered. The MINI is a structured clinical interview for psychiatric diagnoses based on the Diagnostic and Statistical Manual of Mental Disorders 4th edition (DSM-IV) and the International Classification of Diseases, 10th edition (ICD-10) (Sheehan et al., 1998).

2.3 Data Analysis

All analyses were completed using the Statistical Package for the Social Sciences (SPSS) software version 27 (SPSS Inc., Armonk, USA). The Shapiro-Wilk test of normality was used to check if continuous variables were normally distributed. Continuous measures were compared using an Analysis of Variance (ANOVA) or Kruskal-Wallace test, if non-parametric. Associations between categorical variables were assessed using the Chi-square test of independence or Fisher-Freeman-Halton Exact Test, if cell count assumptions were violated.

3. Result

3.1 Demographics

The sample consisted of the following age groups; 19-24 (n = 35), 25-30 (n = 24), 31-40 (n = 19), and 41+ (n = 22). “Young people” were represented in the 19-24 age group, while “young adults” encompassed the 19-24 and 25-30 age groups. Fifty nine percent of the sample was under the age of 30. The majority of the participants were Caucasian / white (66%) and had at least a college degree (51%).

3.2 Mental Health Scales

There were relatively few differences between mental health status among age groups (Table 1). Young people (19-24) did not significantly differ from any of the other age groups for PSS-10 scores ($F(3, 95) = .883$, $p = .453$), BDI-II scores ($H(3) = 4.818$, $p = .186$), or PHQ-15 scores ($H(3) = 3.813$, $p = .282$). Overall, most participants endorsed “moderate” or greater levels of perceived stress via the PSS10 (62%). The PHQ-15 scale showed 74% of the sample ranked as having minimal or low somatic symptoms. Only 17% of the sample had depressive symptomatology ranked worse than “normal” on the BDI. Thirty four percent of the sample had a standardized PROMIS sleep disturbance score over 50, indicating above-average sleep disturbance.

Table 1. Associations between Age Group and Mental Health Outcomes

	Age group, *n* (%)				**P-value**
	19-24 (n=35)	25-30 (n=24)	31-40 (n=19)	41+ (n=22)	
PSS-10					.453
Mean	16.77 (SD 5.8)	16.63 (SD 5.7)	13.89 (SD 7)	16.09 (SD 7.8)	
Median	17.00 (IQR = 12.00 – 21.00)	15.00 (IQR = 13.00 – 22.25)	12.50 (IQR = 9.50 – 18.50)	15.50 (IQR = 9.75 – 21.25)	
BDI-II					.186
Mean	7.4 (SD 6.7)	8.83 (SD 7)	5.32 (SD 6.4)	8.77 (SD 7.6)	
Median	6.00 (IQR = 2.00 – 9.00)	6.00 (2.00 – 9.00)	3.00 (0 – 9.00)	4.00 (IQR = 3.00 – 8.00)	
PHQ-15					.282
Mean	6.29 (SD 3.8)	5.71 (SD 3.9)	5.11 (SD 3.5)	7.9 (SD 5.2)	
Median	6.00 (IQR = 3.00 – 9.00)	4.50 (IQR = 3.00 – 7.75)	4.00 (IQR = 3.00 – 8.00)	7.00 (IQR = 3.00 – 11.25)	
PROMIS Sleep Disturbance					.490
Mean	46.08 (SD 7.21)	45.84 (SD 9.18)	45.49 (SD 8.09)	46.60 (8.546)	
Median	45.50 (IQR = 41.40 – 51.20)	42.90 (IQR = 39.80 – 54.75)	45.50 (IQR = 39.80 – 53.30)	50.10 (IQR = 42.52 – 54.80)	
Psychiatric diagnoses					
Cannabis dependence or abuse	9 (25.7)	11 (45.8)	6 (31.6)	4 (18.2)	.203
Alcohol dependence or abuse	10 (28.6)	5 (20.8)	5 (26.3)	5 (22.7)	.910
GAD current	6 (17.1)	6 (25.0)	2 (10.5)	2 (9.1)	.443
MDD current	3 (8.6)	0 (0)	0 (0)	0 (0)	.286
MDD past	16 (45.7)	5 (20.8)	6 (31.6)	6 (27.3)	.211
BD current	0 (0)	1 (4.2)	0 (0)	1 (4.5)	.420
BD past	17 (48.6)	10 (41.7)	2 (10.5)	5 (22.7)	.020

Abbreviations: PSS-10 = Perceived Stress Scale 10, BDI-II = Beck Depression Inventory-II, PHQ-15 = Patient Health Questionnaire 15, PROMIS sleep = Patient Reported Outcomes Measurement Information System sleep disturbance scale, GAD = Generalized anxiety disorder, MDD = Major depressive disorder, BD = Bipolar disorder

Age group and psychiatric diagnoses were not significantly associated with any of the investigated conditions, except for meeting criteria for a prior diagnosis of bipolar disorder (type I, II, or NOS), X^2 (3, N=100) = 9.852, p = .02. The age groups under 30 had a significantly higher incidence of a lifetime diagnosis compared to the over 30 age groups.

3.3 Patterns of Use

Several differences were found between age groups and conditions used for, but general patterns of cannabis use remained similar across age groups (Table 2). There was a significant relationship between age and use for depression (X^2 (3, N=100) = 3.427, p = .036), with the under 30 age groups reporting most frequent use (19-24 = 54.5%, 25-30 = 62.5%). Young people also reported significantly more use for sleep issues (71.4%) than any other age group, X^2 (3, N=100) = 9.221, p = .026. The proportion of subjects who reported use for anxiety did not significantly differ between age groups X^2 (3, N=100) = 3.427, p = .330, but was the highest reported condition for cannabis use among all age groups.

The 19-24 age group was not found to significantly differ in preference for almost all other use pattern variables. The two exceptions were having less preference for tinctures (Fisher- Freeman-Halton Exact Test, p = .035), compared to the over 30 age groups, and more preference for high CBD low THC chemovars compared to the 31-40 age group (X^2 (3, N=100) = 7.330, p = .033). Young people were not more likely to prefer high or pure THC chemovars than other age groups (X^2 (3, N=100) = 1.961, p = .581).

Table 2. Cannabis Use Patterns across Age Groups

	Age group, *n* (%)				**P-value**
	19-24 (n=35)	25-30 (n=24)	31-40 (n=19)	41+ (n=22)	
Condition using for					
Anxiety/ Stress	28 (80)	21(87.5)	13 (68.4)	15 (68.2)	.330
Depression	19 (54.3)	15 (62.5)	4 (21.1)	9 (40.9)	.036
Sleep Issues	25 (71.4)	13 (54.2)	7 (13.3)	8 (15.1)	.026
Amount					.958
1g or less	13 (37.1)	7 (29.2)	6 (31.6)	6 (27.3)	
3.5g	14 (40.0)	11 (45.8)	6 (31.6)	8 (36.4)	
7g or more	8 (22.9)	6 (25.0)	7 (36.9)	8 (36.4)	
Frequency of use					.533
Non-daily	10 (28.6)	9 (37.5)	5 (26.3)	6 (27.3)	
1x/day	11 (31.4)	5 (20.8)	2 (10.5)	7 (31.8)	
≥ 2x/day	14 (40.0)	10 (41.7)	12 (63.2)	9 (40.9)	

Preferred Consumption forms					
Smoking	27 (77.1)	19 (79.2)	13 (68.4)	12 (54.5)	.224
Vaporization	13 (37.1)	9 (37.5)	9 (47.4)	11 (50.0)	.719
Edibles	8 (22.9)	5 (20.8)	2 (10.5)	5 (22.7)	.753
Tinctures	3 (8.6)	1 (4.2)	4 (21.1)	7 (31.8)	.035
Capsules	6 (17.1)	2 (8.3)	5 (26.3)	4 (18.2)	.476
Only prefer smoking	14 (40)	10 (41.7)	6 (31.6)	4 (18.2)	.297
Preferred Chemovar					
Pure THC	9 (25.7)	2 (8.3)	4 (21.1)	5 (22.7)	.385
High THC low CBD	12 (34.3)	9 (37.5)	8 (42.1)	7 (31.8)	.913
Equal THC and CBD	10 (28.6)	7 (29.2)	9 (47.4)	9 (40.9)	.468
Pure CBD	8 (22.9)	3 (12.5)	2 (10.5)	5 (27.8)	.598
High CBD low THC	10 (28.6)	7 (29.2)	0 (0)	4 (18.2)	.033
Prefer pure or high THC only	10 (28.6)	8 (33.3)	9 (47.4)	8 (36.4)	.581
Prefer pure or high CBD only	7 (20)	3 (12.5)	1 (5.3)	2 (9.1)	.494
Negative adverse events					
Experienced negative adverse events	22 (62.9)	15 (62.5)	9 (47.4)	8 (38.1)	.233

4. Discussion

Currently, there is a lack of literature available on the patterns of medical cannabis use in young adulthood, compared to adolescents. The current study aimed to assess mental health status and patterns of use in young people using medical cannabis, and to compare these findings to older age groups. The conditions medical cannabis was reported as being used for differed between age groups, with the young adult age groups reporting greater use for depression and sleep issues. Interestingly, however, young people did not appear to have worse scores on validated scales or a greater occurrence of psychiatric diagnoses (Table 1). The one exception to this was a greater amount of past BD diagnoses in the under 30 age groups. Further, young people had use patterns similar to older age groups (Table 2). In all, there were relatively few differences between age groups for most measures of mental health and patterns of use.

The lack of difference between age groups on indicators of mental health and psychiatric diagnoses is a reassuring, but a somewhat unexpected finding. The literature from recreational studies has shown that frequent cannabis use, as would be seen in this sample, may be associated with increased risk of depression (Degenhardt et al., 2003; Moore et al., 2007). Further, earlier age of regular use has been associated with elevated risk for poor mental health outcomes and substance dependence (Degenhardt et al., 2003; Eadie et al., 2021; Gicas et al., 2020; Gobbi et al., 2019; MacCallum, Eadie, et al., 2021; McGee et al., 2000). Sleep disturbance has also been found to moderate a relationship between

depressive symptoms and problematic cannabis use, in addition to being associated with stress and higher levels of anxiety in young adults (Babson et al., 2017; Manzar et al., 2021). Some evidence suggests there may also be an association between earlier cannabis use and worsening BD symptoms (Bally et al., 2014). Even though a greater proportion of young people self-reported using cannabis for depression and sleep issues, outcomes from the validated scales and assessment measures showed no significant differences. As such, it appears younger individuals were not at a greater risk for adverse mental health outcomes. Most of the sample had Beck Depression Inventory and PROMIS sleep disturbance scale scores within normal ranges. Furthermore, there was low incidence of current MDD and BD, including in young people. This is a promising finding, as it suggests that young people over the age of 19 may not face the same risks that were found for adolescent users below the age of 19. Additionally, this may also reflect a difference in intent of use, compared to recreational-use populations, such that use patterns are unlikely to invoke adverse mental health outcomes. One related finding of interest was that, although there were very low rates of current BD, there was a significantly higher proportion of past BD diagnoses in the under 30 age groups. This may indicate that young people are seeking out medical cannabis to help control symptoms. A similar trend was seen for MDD, although it was consistent across age groups. While these findings should not be inferred as causal, this may indicate that medical cannabis was helpful in improving symptoms. Overall, our findings suggest that young people using medical cannabis (age 19-24) are not at a greater risk of adverse mental health outcomes compared to older adults.

The similarity of cannabis use patterns across age groups was also an unexpected finding. Older adults have been reported to perceive cannabis as having a greater risk of harm compared to young people (Okaneku et al., 2015; Pacek et al., 2015). Accordingly, we expected there to be differences in how cannabis was being used between the younger and older age groups. The similarity observed may partly explain why there were minimal differences for mental health outcomes. Many cannabis-related harms are THC dose dependent (MacCallum, Lo, et al., 2021). As such, differences in factors, such as chemovar and frequency, impact risk of harm. Hence, those with similar patterns of use may have similar risks. In contrast to our study, (Haug et al., 2017) found that younger users reported a higher quantity of use, and older users reported more preference for oral formulations. Differences may be due to different age groupings, as (Haug et al., 2017) used categories of 18-30, 31-50, and 51-74. Their larger sample size (n = 217) also contained more individuals in older age categories, which may have increased statistical power to detect subtle differences. Despite these contrasting findings, one notable similarity was the common preference for smoked cannabis. Smoking cannabis is a known respiratory harm (Hoffmann & Weber, 2010; National Academies of Sciences et al., 2017; Tashkin, 2014). This is a particular concern for young people and young adults who may continue to smoke throughout their lifetime. Our findings support the need for a greater emphasis on education and diversion away from smoking cannabis.

Finally, although not significantly different across age groups, this sample showed high rates of current problematic cannabis (30%) and alcohol (25%) use. This is particularly concerning for the younger age groups. It should be noted that currently available measures for cannabis misuse have not been validated for medical cannabis populations. Nevertheless, consideration is still warranted. This finding is consistent with previous studies suggesting an elevated risk for co-use of cannabis and alcohol (Metrik et al., 2018; Yurasek et al., 2017). This also may imply that increased vigilance for problematic cannabis use and co-use with alcohol is needed. One important distinction within this sample, however, is that although participants reported use for medical purposes, most were not government-authorized medical cannabis users. As such, findings from this study are more relevant to self-guided medical cannabis users, obtaining cannabis from a dispensary, than authorized cannabis users under the care of a healthcare professional.

5. Limitations

Generalization to broader populations may be limited as the sample was obtained from an affluent neighbourhood and generally had higher levels of education. Additionally, although sample participants reported use for medical purposes, few had guidance from a healthcare professional as authorized medical cannabis patients do. Therefore, generalizations between this population and government authorized medical cannabis patients under the care of a healthcare professional should be made with caution. Finally, the present assessments, while comprehensive, did not address all areas of mental health—such as pain, where both preclinical and clinical evidence for benefits of cannabis have been reported (Duarte et al., 2021; Legare et al., 2022; MacCallum, Eadie et al., 2021; Rouhollahi et al., 2020; Ware et al., 2015).

6. Conclusion

This investigation of patterns of use and mental health outcomes in a sample of cannabis dispensary users revealed that young people and adults did not have significantly different patterns of use. More importantly, it does not appear that young people had an elevated incidence of adverse mental health outcomes. This serves as a starting point to better evaluate differences in use and risk factors between younger and older medical cannabis users. Further, it illustrates potential differences between those using with a recreational vs. medical intent. Despite this, more research is needed to provide stronger evidence and guidance for potential risk factors for adverse mental health outcomes, particularly in younger age groups. In the future, larger sample sizes would better help clarify associations between age groups, use patterns, and mental health outcomes. Additionally, comparisons between self-medicating cannabis users and medical cannabis patients authorized by a licensed healthcare professional should be investigated.

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