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Why Use Cannabis? Examining Motives for Cannabis Use in Individuals with Anxiety Disorders

Mélise J. Ouellette[1,2] (iD), Karen Rowa[1,2,3*] (iD), Duncan H. Cameron[1], Ashleigh Elcock[1], Noam Soreni[1,3], Elizabeth J. Pawluk[1,3] and Randi E. McCabe[1,2,3]

[1]Anxiety Treatment and Research Clinic, St. Joseph's Healthcare Hamilton, Hamilton, Ontario, Canada, [2]Department of Psychology, Neuroscience & Behaviour, McMaster University, Hamilton, Ontario, Canada and [3]Department of Psychiatry and Behavioural Neurosciences, McMaster University, Hamilton, Ontario, Canada
*Corresponding author: Karen Rowa, Anxiety Treatment and Research Clinic, St. Joseph's Healthcare, 100 West 5th St., Hamilton, ON, Canada L8N 3K7. E-mail: krowa@stjoes.ca

Abstract

This study examined cannabis use motives in individuals with anxiety disorders and compared motives between infrequent and frequent cannabis users. It was hypothesised that coping motives would be endorsed at a significantly higher rate than other motives, and that frequent cannabis users would endorse coping motives significantly more than infrequent users. Participants were 144 adults seeking clinical services for anxiety disorders who reported using cannabis. Cannabis use was categorized by infrequent ($n = 54$) and frequent ($n = 90$) use. Anxiety symptoms were assessed and deemed clinically significant. Participants completed measures of cannabis use motives, cannabis use patterns, and cannabis use disorder symptoms, cross-sectionally. Cannabis use motives were examined for the entire sample and compared between frequent and infrequent users. In general, cannabis users endorsed coping (i.e., use for managing distress) and enhancement (i.e., use for fun, pleasant feeling, or the high) motives at equal rates ($p = .265$) and more than other motives ($p < .001$). Frequent users reported using cannabis for coping and expansion motives (i.e., use to change one's thinking) significantly more than infrequent users. These results indicate that individuals with anxiety disorders use cannabis for various reasons, some of which may not be directly related to their mental health symptoms. Future research is needed to compare motives for cannabis use in those with anxiety disorders, other mental health populations, and the general population, as well as examine motives for cannabis use within specific anxiety disorders.

Keywords: cannabis; marijuana; coping; motives; anxiety disorders

Introduction

Individuals with anxiety disorders use cannabis at an elevated rate and are at higher risk of cannabis use disorder (CUD) compared to those with low anxiety (Kedzior & Laeber, 2014; Ouellette, Puccinelli, Rowa, Elcock, & McCabe, 2019). Three models of substance use have been used to explain the association between cannabis use and anxiety: the tension-reduction model, the motivational model, and the mutual maintenance model. The tension-reduction model characterizes substance use as a means to reduce tension, which is rewarding and perpetuates substance use (Conger, 1956; Greeley & Oei, 1999). The motivational model (originally applied to alcohol use) is similar in that it describes substance use to manage distressing emotions; however, it also suggests that substances are used to enhance positive emotions (Cox & Klinger, 1988). The mutual maintenance model suggests that comorbid anxiety and substance use disorders (SUDs) maintain and exacerbate each

other, where anxiety may lead to self-medication with substances and SUDs may exacerbate anxiety symptoms (Stewart & Conrod, 2008).

Identifying specific motives for cannabis use in those with clinically significant anxiety symptoms will help improve our understanding of the cannabis–anxiety relationship within the context of these models. Specific motives may be differentially associated with cannabis use patterns and therefore fit some models better than others. For example, if individuals are exclusively using cannabis to manage their anxiety, this may be best represented by the tension-reduction model. However, if individuals use cannabis to cope with their anxiety and to enhance positive emotions, this may be best represented by the motivational model. Treatment planning depends on the motives for use and the associated patterns of cannabis use. For example, if cannabis is used to manage anxiety leading to mutual maintenance of CUD and anxiety, integrated treatment for both conditions is needed to minimise relapse risk (Buckner et al., 2019b). However, if cannabis is used to manage anxiety (i.e., tension reduction) but has not led to a mutually maintaining relationship between cannabis use and anxiety, then cognitive behavioural therapy (CBT) for anxiety may be sufficient to replace cannabis use with alternative CBT coping strategies (Kadden, 1995). The current study aims to identify specific motives for use that may be contextualised within these various models.

Five motives for cannabis use have been identified in the literature: coping (i.e., to manage distress), enhancement (i.e., use for fun, pleasant feeling, or the high), expansion (i.e., to change one's thinking), social (i.e., for social gatherings), and conformity (i.e., due to peer pressure; Simons, Correia, Carey, & Borsari, 1998). Initial research suggests that coping motives play a particularly important role in individuals who experience high levels of anxiety, consistent with the idea of using cannabis to manage negative emotions described by all three models (Boden, Babson, Vujanovic, Short, & Bonn-Miller, 2013; Buckner, Crosby, Wonderlich, & Schmidt, 2012b). Coping motives have been associated with symptoms of post-traumatic stress disorder (PTSD) as well as social anxiety and obsessive-compulsive symptoms (Boden et al., 2013; Buckner et al., 2012b; Buckner, Heimberg, Matthews, & Silgado, 2012c; Spradlin, Mauzay, & Cuttler, 2017). For example, in Veterans with PTSD, using cannabis to cope with sleep disturbances mediated the relationship between PTSD and cannabis use frequency (Metrik et al., 2016). Veterans with PTSD have also been significantly more likely to report using cannabis to cope compared to those without PTSD (Boden et al., 2013). PTSD symptom severity was also positively associated with cannabis coping motives (Boden et al., 2013). It has also been suggested that cannabis is used to cope with social anxiety symptoms in an undergraduate population, as individuals with social anxiety are more likely to use cannabis when those around them are using compared to individuals with lower social anxiety (Buckner et al., 2012b). Coping motives have further been shown to mediate the relationship between cannabis misuse and obsessive-compulsive symptom severity in undergraduates (Spradlin et al., 2017).

Additionally, anxiety symptoms associated with craving and withdrawal due to frequent use have been associated with later cannabis use, supporting the mutual maintenance model (Buckner, Crosby, Silgado, Wonderlich, & Schmidt, 2012a; Cornelius, Chung, Martin, Wood, & Clark, 2008). Individuals who use for coping motives tend to experience problematic cannabis use (e.g., CUD, frequent and chronic use; Benschop et al., 2015; Bujarski, Norberg, & Copeland, 2012; Hyman & Sinha, 2009; Moitra, Christopher, Anderson, & Stein, 2015; Sofis, Budney, Stanger, Knapp, & Borodovsky, 2020) and 50–95% of heavy cannabis users experience withdrawal symptoms (Hasin et al., 2013). Taken together, frequent cannabis users may endorse more coping motives with both anxiety symptoms and CUD-related symptoms (e.g., withdrawal and craving) than infrequent users. More generally, previous research has also shown that cannabis use motives have been differentially associated with the frequency of use, with coping motives being significantly positively associated with cannabis use frequency (Bresin & Mekawi, 2019).

In summary, coping motives have been consistently reported as the most common motive for cannabis use in individuals with high anxiety; however, previous research has mainly focused on subclinical anxiety samples (e.g., undergraduates) or specific clinical diagnoses (i.e., PTSD). There is a need for research examining motives for cannabis use in other anxiety disorder samples to provide a broad

overview of the motives for cannabis use in individuals seeking services for clinical anxiety disorders and provide a foundation for future research into subsamples of the broader anxiety disorder population. Ultimately, it is important to understand motives for cannabis use in those with clinical anxiety to inform the optimisation of clinical interventions for those seeking anxiety disorder treatment and determining treatment targets. The current study examined cannabis use motives in a well-defined, mixed anxiety disorder population, recruited from a specialized anxiety disorders clinic, to provide a broad overview of cannabis use motives in this population. Furthermore, given that previous research has shown cannabis use motives to be differentially associated with the frequency of use (Bresin & Mekawi, 2019), that frequent users have been shown to consume more cannabis than infrequent users (Caulkins, Pardo, & Kilmer, 2020), and that cannabis-related distress (e.g., withdrawal) is common among heavy cannabis users (Hasin et al., 2013), it is possible that cannabis motives differ between frequent and infrequent users, warranting investigation (e.g., frequent users being more likely to use for coping motives than infrequent users). It is important for clinicians to be aware of any differences in cannabis use motives between frequent and infrequent users to ensure they screen for them and develop appropriate treatment plans. Additionally, examining cannabis use motives across a range of cannabis use severity (i.e., frequency of use), rather than solely examining motives between subclinical and clinical CUD, provides a naturalistic representation of cannabis use motives in individuals with anxiety disorders, where the majority of individuals' symptoms do not meet criteria for CUD (Ouellette et al., 2019) and where cannabis use may be clinically relevant despite not meeting CUD criteria (e.g., using cannabis as a subtle avoidance strategy; Salkovskis, Clark, Hackmann, Wells, & Gelder, 1999). As such, the current study also compared motives between frequent and infrequent cannabis users. It was hypothesised that coping motives would be endorsed more often than other motives and that frequent cannabis users would report coping motives at a higher rate than infrequent users, as individuals who use at higher rates are at greater risk of using to manage cannabis use-related symptoms (Buckner et al., 2012a; Cornelius et al., 2008).

Methods

Participants

One-hundred and forty-four adults seeking services at a specialized anxiety disorders clinic participated in the current study, which used a cross-sectional design. Participants were referred to a symptom-specific CBT group at the clinic following a diagnostic assessment. Although diagnostic data were only available for 68.75% ($n = 99$) of the total sample of participants, all participants referred to CBT groups had clinically significant symptoms consistent with their assigned group, as per the clinic's policy. To confirm this, participants completed a symptom-specific questionnaire matching their symptom-specific CBT group, on which they had to score equal to or above the cut-off score indicating clinically significant symptoms to be included in the study.

Cannabis use was categorized into two groups: infrequent users ($n = 54$) and frequent users ($n = 90$). Participants who answered the Cannabis Use Disorder Identification Test-Revised question 'How often do you use cannabis?' with 'Monthly or less' or '2–4 times a month' were considered infrequent users and those who answered '2–3 times a week' or '4 or more times a week' were considered frequent users. Frequent and infrequent user categories were chosen to be similar to other studies' categorisations (e.g., Buckner & Schmidt, 2008; Henry, Kaye, Bryan, Hutchison, & Ito, 2014). There is also evidence to suggest that frequent cannabis users also consume more cannabis (Caulkins et al., 2020) and therefore may differ in motives for use compared to infrequent users as hypothesised above.

Procedure

Participants were referred to a specialized anxiety disorders clinic in an academic hospital by healthcare professionals and received a diagnostic assessment. The Diagnostic Assessment Research Tool (DART; a semi-structured modular interview based on DSM-5 criteria; see McCabe et al., 2017;

Schneider et al., 2022) was used to assess 65.28% of participants, 22.92% of participants received a psychiatric consult, and 4.86% received an assessment with a mental health nurse, depending on how participants were referred to the clinic. Based on their assessment results, participants were referred to symptom-specific CBT groups for social anxiety disorder (SAD), generalized anxiety disorder (GAD), panic disorder (PD) and/or agoraphobia, obsessive-compulsive disorder (OCD), or PTSD. Prior to the beginning group, participants completed measures of cannabis use patterns, CUD symptoms, motives for cannabis use, and symptom measures matching their respective CBT group. This study was approved by the institution's research ethics board and participants provided written and informed consent.

Measures

Demographic data form

Demographic data form included items asking about participants' personal characteristics, including age, gender identity, relationship status, education level, and ethnicity. Participants selected a descriptor option for each item, except for the age item where they provided their age.

The Marijuana History Questionnaire (MHQ)

The Marijuana History Questionnaire (MHQ) is a 32-item data collection tool, measuring self-reported cannabis use history (Metrik et al., 2009). The current study only used the following items, which ask about marijuana used in the past 3 months: 'On a typical **day** you use marijuana, how much do you personally use? [grams]' and 'In a typical **week** you use marijuana, how much marijuana do you personally use? [grams]' to characterize the sample's cannabis use.

The Cannabis Use Disorder Identification Test-Revised (CUDIT-R)

The Cannabis Use Disorder Identification Test-Revised (CUDIT-R) screens for past 6-month CUD symptoms (Adamson et al., 2010). Scores of 13 or above indicate likely CUD (Adamson et al., 2010). The Cronbach's alpha value on the CUDIT-R was .80 for the current sample, demonstrating good internal consistency.

The Marijuana Motives Measure (MMM)

The Marijuana Motives Measure (MMM) assesses motives for cannabis use based on five subscales: coping (four items; e.g., 'I use marijuana to forget my worries', 'I use marijuana to forget about my problems'), social (five items; e.g., 'I use marijuana because it helps me enjoy a party'), enhancement (five items; e.g., 'I use marijuana because it's fun'), conformity (five items; e.g., 'I use marijuana so that I won't feel left out'), and expansion (five items; e.g., 'I use marijuana to understand things differently'; Simons et al., 1998). The response options were rated on a 1–5 Likert scale, representing the following, respectively: 'Almost never/Never', 'Some of the time', 'Half of the time', 'Most of the time', and 'Almost always/Always'. Higher scores on each item represent more frequent use for that particular reason and vice versa for lower scores. The MMM has shown good discriminant validity and MMM subscales have shown strong internal consistency with Cronbach's alpha values of .84–.94 (Simons et al., 1998). Cronbach's alpha values for the present study ranged from .88 (social) to .94 (expansion), except for the conformity subscale which was .68.

The Social Phobia Inventory (SPIN)

The Social Phobia Inventory (SPIN) measures SAD symptoms (Connor et al., 2000). For the purpose of this study, only those who scored 31 and above were included in the study, a cut-off score indicating moderate severity of symptoms (Connor et al., 2000). The SPIN has demonstrated sound psychometric properties, with good divergent and convergent validity (Connor et al., 2000). The Cronbach's alpha value for the current study was .81.

The Penn State Worry Questionnaire (PSWQ)

The Penn State Worry Questionnaire (PSWQ) screens for excessive worry seen in GAD with a cut-off score of 45 and above (Fresco, Mennin, Heimberg, & Turk, 2003; Meyer, Miller, Metzger, & Borkovec, 1990). The PSWQ has shown good internal consistency and discriminant validity (Meyer et al., 1990). The current study's Cronbach's alpha value was .86.

The Panic Disorder Severity Scale (PDSS)

The Panic Disorder Severity Scale (PDSS) screens for PD with a cut-off score of 8 and above (Behar, Alcaine, Zuellig, & Borkovec, 2003; Furukawa et al., 2009; Shear et al., 1997). The PDSS has shown good convergent and discriminant validity (Shear et al., 1997). The current study's Cronbach's alpha value was .80.

The Obsessive-Compulsive Inventory-Revised (OCI-R)

The Obsessive-Compulsive Inventory-Revised (OCI-R) screens for OCD with a cut-off score of 21 and above (Foa et al., 2002). The OCI-R has demonstrated good internal consistency and convergent validity in previous studies (Foa et al., 2002). The current study's Cronbach's alpha value was .56, which is poor but may be due to the small sample size of individuals with OCD ($n = 10$).

The PTSD Checklist for DSM-5 (PCL-5)

The PTSD Checklist for DSM-5 (PCL-5) screens for PTSD, with total scores between 31 and 33 and above indicating likely PTSD (Bovin et al., 2016; Weathers et al., 2013). The current study used the conservative cut-off score of 33. The PCL-5 has sound psychometric properties with good internal consistency ($\alpha = .94$), and convergent and discriminant validity (Blevins, Weathers, Davis, Witte, & Domino, 2015). The current study's Cronbach's alpha value was .92.

Data Analysis

The cut-off score for statistical significance used to interpret analyses was .05. Of the total sample, 37.50% were considered infrequent users, while 62.50% were considered frequent users. Demographics were reported for the entire sample with a mean, standard deviation, and range for age, and proportions for categorical variables (e.g., education, ethnicity, and relationship status). Diagnostics were reported using proportions and the number of additional diagnoses was represented by a mean, standard deviation, and range. The symptom-specific measure total score means and standard deviations were calculated. The amount of cannabis use and the severity of cannabis use were reported with means, standard deviations, and ranges.

Demographics were compared across sample subgroups (infrequent and frequent users). Age was compared using the Mann–Whitney U test because the assumption of normality required for a t-test was violated. Chi-squared was used to compare categorical variables between infrequent and frequent users. The number of additional diagnoses was compared using a t-test and interpreted with equal variances not assumed due to Levene's test of homogeneity having been violated. Proportions were calculated to characterize sample diagnostics, frequency of cannabis use, and likely CUD as per the CUDIT-R. A Mann–Whitney U test was applied to the raw total scores of the CUDIT-R to compare scores between frequent and infrequent users. A Mann–Whitney U test was applied to compare the amount of cannabis used per day and per week between infrequent and frequent users. Pearson correlation between CUDIT-R scores and the amount of cannabis use per day and per week was conducted to explore whether there may be an association between CUD symptom severity and the amount of cannabis used.

Given the violations of normality and the highly ordinal nature of the data involved, non-parametric statistics were employed for primary outcome analyses. A Kruskall–Wallis test with post-hoc pairwise comparisons between MMM subscales was applied to determine if any motives for cannabis use were reported significantly more frequently than others. A Bonferroni correction was applied

to correct for multiple comparisons. To investigate differences in motives between infrequent and frequent cannabis users, a series of Mann–Whitney *U* tests with Bonferroni corrections were used to assess differences between MMM subscale medians. The Mann–Whitney *U* test with Bonferroni corrections was also used to explore motives for use between individuals who scored at or above the CUDIT-R cut-off which suggested likely CUD and those below the cut-off score. Analyses were conducted using IBM® Statistical Package for the Social Sciences (SPSS) versions 27 and 28.

Results

Participant Characteristics

Demographic information is summarised for the overall sample (Table 1) and subgroups (infrequent and frequent cannabis users) in Table 2. There were no differences in demographic variables across subgroups except for age, with frequent users being older than infrequent users. The means of symptom-specific measure total scores for each treatment group were well above clinical cut-off scores, indicating clinically significant anxiety disorder symptoms. Most participants had a principal diagnosis of anxiety disorder. No participants had a principal diagnosis of CUD.

Patterns of Cannabis Use

The frequency of cannabis use is reported in Table 2. The amount of cannabis used and CUD symptom severity as per the CUDIT-R are represented for the entire sample in Table 1. These variables are compared between infrequent and frequent users in Table 2, demonstrating that frequent users used significantly more cannabis and had more severe CUD symptoms than infrequent users. Additionally, there were positive Pearson correlations between CUDIT-R scores and the amount of cannabis use per day, $r(141) = .43$, $p < .001$, and per week, $r(141) = .42$, $p < .001$, suggesting that individuals with more severe CUD symptoms may use more cannabis. Furthermore, only 1.85% of infrequent users scored 13 or above on the CUDIT-R, indicating likely CUD, compared to 36.67% of frequent users.

Motives for Cannabis Use

Motives for cannabis use were compared across the cannabis user groups. The omnibus Kruskall–Wallis test comparing MMM subscale medians was statistically significant, $H(4) = 163.46$, $p < .001$. Coping and enhancement motives were the most frequently endorsed by cannabis users. Pairwise comparisons of MMM subscales showed several significant differences between motives endorsed ($p < .005$). All pairwise comparisons are presented in Table 3. When comparing motives for cannabis use between infrequent and frequent users, the Mann–Whitney *U* test showed that coping ($p < .001$) and expansion ($p = .001$) were significantly more commonly reported by frequent users than infrequent users (Table 4). Additionally, coping, expansion, and enhancement motives were significantly more common in those who scored at or above the CUDIT-R cut-off score for likely CUD than those who scored below the cut-off score (Table 5).

Discussion

The current study explored motives for cannabis use in a sample of individuals with anxiety disorders. As hypothesised, coping motives were often endorsed in the sample, especially in frequent users compared to infrequent users. Although the tension-reduction model was not explicitly tested, these findings are consistent with this model and previous findings where cannabis has been used to manage anxiety symptoms when individuals have expectancies that it will help reduce their symptoms (Conger, 1956; de Dios et al., 2010; Walukevich-Dienst, Crapanzano, Lewis, & Buckner, 2019). Individuals with anxiety disorders who use cannabis to cope likely do so in part due to feeling unable to cope with their symptoms otherwise. Research has shown that lower perceived distress tolerance has

Table 1 General Sample Characteristics

Demographics	Cannabis users ($N = 144$)
Age (years)	
Mean (*SD*)	33.74 (10.50)
Range	17–69
Gender (%)	
Man	27.78
Woman	69.44
Transgender	2.78
Relationship status (%)	
Single	47.92
In a relationship	49.31
Education (%)	
Some or completed high school	17.36
Some or completed post-secondary education	70.14
Some or completed graduate school	7.64
Ethnicity (%)	
White	86.11
Indigenous	2.78
Black/Afro-Caribbean/African	0.69
Hispanic/Latin American	0.69
Asian	0.69
Biracial/multiracial	1.39
Other	0.69
Diagnostics	
Principal (%)	
Generalized Anxiety Disorder	18.75
Social Anxiety Disorder	17.36
Post-traumatic Stress Disorder	15.97
Panic Disorder/Agoraphobia	6.94
Other (e.g., anxiety disorders, mood disorders, and personality disorders)	9.72
Additional (%)	
Major Depressive Disorder	25.00
Persistent Depressive Disorder	18.06
Generalized Anxiety Disorder	15.97
Social Anxiety Disorder	19.44
Panic Disorder/Agoraphobia	16.67
Cannabis Use Disorder	9.72
Other (e.g., anxiety disorders, mood disorders, and personality disorders)	36.11

(*Continued*)

Table 1 (*Continued.*)

Demographics	Cannabis users (*N* = 144)
Number of additional diagnoses, mean (SD)	2.33 (1.47)
Range	1–6
Symptom-specific measure, mean (SD)	
Total scores	
OCI-R	33.60 (8.34)
PCL-5	56.28 (12.62)
PDSS	14.73 (3.98)
PSWQ	67.93 (8.50)
SPIN	46.08 (8.79)
Amount and severity of cannabis use	
Grams used per day	
Mean (*SD*)	0.85 (1.99)
Range	0–20
Grams used per week	
Mean (*SD*)	4.60 (10.54)
Range	0–100
CUDIT-R scores	
Mean (*SD*)	8.69 (6.17)
Range	1–27

Note. Principal diagnosis = a mental health condition that is the patient's most pressing concern; additional diagnosis = mental health conditions secondary to the principal diagnosis. Diagnostic data for principal diagnoses were available for 68.75% (*n* = 99) of individuals.

been associated with increased cannabis coping motives to manage negative affect (Farris, Metrik, Bonn-Miller, Kahler, & Zvolensky, 2016) and individuals with anxiety disorders tend to have poor distress tolerance (Keough, Riccardi, Timpano, Mitchell, & Schmidt, 2010). Moreover, coping motives were more frequently reported in frequent users than infrequent users, as hypothesised, potentially because individuals with higher psychological distress use cannabis more frequently than those with lower distress (Ouellette et al., 2019; Weinberger et al., 2019).

Higher endorsement of coping motives may also be consistent with the mutual maintenance model, although this was not explicitly tested in the current study. Specifically, elevated distress associated with severe anxiety symptoms may lead to heavier cannabis use, increasing the likelihood of CUD which may exacerbate anxiety further (Cornelius et al., 2008; Kedzior & Laeber, 2014; Stewart & Conrod, 2008). For example, high levels of cannabis use may lead to use for coping with anxiety related to cannabis withdrawal (Cornelius et al., 2008). In the current study, significant positive associations were found between CUD symptom severity and the amount of cannabis used, and coping motives were more common in those with likely CUD as per the CUDIT-R compared to those likely without CUD, which may provide some support for this idea. Taken together, the mutual maintenance model may be particularly relevant in this population when cannabis use presentations are more severe; however, further research is needed to examine this explicitly.

Enhancement motives were also frequently endorsed among cannabis users in our study. This is consistent with previous studies that have found elevated rates of enhancement motives compared to other motives in cannabis user samples, and positive associations between enhancement motives

Table 2 Sample Characteristics by Infrequent and Infrequent Users

	Infrequent user ($n = 54$)	Frequent user ($n = 90$)	Statistical comparisons	
Demographics			Mann–Whitney U	*p*-value
Age (years)			1814.50	.039
Raw, mean (*SD*)	31.92 (11.79)	34.78 (9.61)		
Mean ranks	61.58	76.34		
Range	18–69	17–59		
			Chi-squared comparison	*p*-value
Gender (%)			$\chi^2(2) = .96$	.619
Man	24.07	30.00		
Woman	74.07	66.67		
Transgender	1.85	3.33		
Relationship status (%)			$\chi^2(1) = .56$	.453
Single	42.59	51.11		
In a relationship	51.85	47.78		
Education (%)			$\chi^2(2) = 5.16$	.076
Some or completed high school	11.11	21.11		
Some or completed post-secondary education	70.37	70.00		
Some or completed graduate school	12.96	4.44		
Ethnicity (%)			$\chi^2(6) = 4.59$	.597
White	88.89	84.44		
Indigenous	3.70	2.22		
Black/ Afro-Caribbean/African	N/A	1.11		
Hispanic/Latin American	N/A	1.11		
Asian	1.85	N/A		
Biracial/Multiracial	1.85	1.11		
Other	N/A	1.11		
Diagnostics				
Principal (%)				
Generalized Anxiety Disorder	18.52	18.89		
Social Anxiety Disorder	12.96	20.00		
Post-traumatic Stress Disorder	18.52	14.44		
	9.26	5.56		

(*Continued*)

Table 2 (*Continued.*)

	Infrequent user (*n* = 54)	Frequent user (*n* = 90)	Statistical comparisons	
Panic Disorder/ Agoraphobia				
Other (e.g., anxiety disorders, mood disorders, and personality disorders)	7.41	11.11		
Additional (%)				
Major Depressive Disorder	18.52	28.89		
Persistent Depressive Disorder	12.96	21.11		
Generalized Anxiety Disorder	14.82	16.67		
Social Anxiety Disorder	22.22	17.78		
Panic Disorder/ Agoraphobia	11.11	20.00		
Cannabis Use Disorder	5.56	12.22		
Other (e.g., anxiety disorders, mood disorders, and personality disorders)	31.48	38.89		
Number of additional diagnoses			*t*-test	*p*
Mean (*SD*)	2.03 (1.14)	2.50 (1.61)	*t*(79.70) = −1.58	.119
Range	1–5	1–6		
Symptom-specific measure, mean (SD)				
Total score				
OCI-R	31.75 (7.27) *n* = 4	34.83 (9.43) *n* = 6		
PCL-5	51.90 (17.27) *n* = 10	58.58 (9.07) *n* = 19		
PDSS	15.00 (3.65) *n* = 7	14.25 (5.06) *n* = 4		
PSWQ	68.00 (8.20) *n* = 20	67.89 (8.77) *n* = 38		
SPIN	44.69 (10.02) *n* = 13	46.87 (8.15) *n* = 23		
Frequency of cannabis use				
Monthly or less	89.63% *n* = 43			
2–4 times per month	20.37% *n* = 11			
2–3 times per week				

(*Continued*)

Table 2 (*Continued.*)

	Infrequent user (*n* = 54)	Frequent user (*n* = 90)	Statistical comparisons	
		25.56% *n* = 23		
4 or more times per week		74.44% *n* = 67		
Amount and severity of cannabis use			Mann–Whitney *U*	*p*
Grams used per day			744.50	<.001
Raw, mean (*SD*)	0.23 (0.71)	1.21 (2.37)		
Mean ranks	41.05	90.23		
Range	0–5	0–20		
Grams used per week			289.00	<.001
Raw, mean (*SD*)	0.85 (4.79)	6.80 (12.27)		
Mean ranks	32.45	95.29		
Range	0–35	0–100		
CUDIT-R scores			468.00	<.001
Raw, mean (*SD*)	3.82 (3.12)	11.61 (5.69)		
Mean ranks	36.17	94.3		
Range	1–14	3–27		

Note. Principal diagnosis = a mental health condition that is the patient's most pressing concern; additional diagnosis = mental health conditions secondary to the principal diagnosis. Diagnostic data for principal diagnoses were available for 68.75 (*n* = 99) of individuals.

and cannabis use (Buckner et al., 2015, 2019a). Together, these findings suggest that enhancement motives may be common among multiple populations including those with anxiety disorders. This provides indirect support for the motivational model, suggesting that individuals with anxiety disorders not only use it for coping motives but also to enhance positive emotions. The current study is one of the first to find elevated enhancement motives in a sample of individuals with anxiety disorders specifically.

Expansion motives were reported at a higher rate in frequent users than in infrequent users. This is in line with research that shows a positive association between cannabis use frequency and expansion motives (Bresin & Mekawi, 2019). Furthermore, recent studies have found an association between expansion motives and anxiety. For example, Glodosky and Cuttler (2020) found that expansion motives interacted with stress to predict anxiety in a sample of undergraduate students, most of whom had used cannabis in the past year or month. Additionally, Chowdhury, Kevorkian, Sheerin, Zvolensky, and Berenz (2016) found that neuroticism was positively associated with expansion motives (as well as coping motives) in a sample of young adults, most of whom reported experiencing mental health disorders and subclinical panic attacks. These studies suggest that expansion motives may not only be associated with heightened cannabis use (independent of anxiety) but may also be indirectly associated with anxiety symptoms. Given that expansion motive items on the MMM include using cannabis to expand awareness, to increase openness to experiences, for creativity, to understand things differently, and to better know oneself, it may be that individuals with anxiety use cannabis as a means to think differently about stressors, problem-solving, or gain more self-understanding (Bravo, Pearson, & Baumgardner, 2020). Expansion motives may fit best with the motivational model, where cannabis

Table 3 Pairwise Comparisons of Motives

Comparison	Test statistic	Standard test statistic	p-values
Conformity < expansion	−120.99	−5.41	<.001
Conformity < social	142.39	6.37	<.001
Conformity < coping	230.07	10.29	<.001
Conformity < enhancement	254.98	11.41	<.001
Expansion = social	21.40	.957	.338
Expansion < coping	109.08	4.88	<.001
Expansion < enhancement	134.00	6.00	<.001
Social < coping	87.68	3.92	<.001
Social < enhancement	−112.60	−5.04	<.001
Coping = enhancement	−24.92	−1.12	.265

Note. The mean subscale ranks: conformity = 210.82; expansion = 331.80; social = 353.20; coping = 440.88; enhancement = 465.8. Bonferroni correction adjusted for multiple comparisons was .05/10 = .005.

Table 4 Comparing Motives Between Non-Frequent and Frequent Users

Motives	Mean ranks of median MMM subscales		Mann–Whitney U	p-values (Bonferroni correction: .05/5 = .001)	Comparisons
	Infrequent users	Frequent users			
Coping	47.73	87.36	1092.50	<.001*	Infrequent < frequent users
Social	70.44	73.74	2318.50	.612	Infrequent = frequent users
Enhancement	64.61	77.23	2004.00	.070	Infrequent = frequent users
Conformity	74.36	71.38	2329.50	.266	Infrequent = frequent users
Expansion	59.76	80.14	1742.00	.001*	Infrequent < frequent users

may be used to enhance positive emotions or manage negative emotions. Further research is needed to replicate these findings and examine more specifically if expansion motives relate to anxiety symptoms via attempts to solve or understand these symptoms.

Additionally, when cannabis use motives were compared between individuals who scored at or above the CUDIT-R cut-off for likely CUD compared to those below the cut-off score, individuals at or above the cut-off reported significantly more coping, enhancement, and expansion motives. Although this finding is limited by the relatively small group of individuals at or above the cut-off (i.e., $n = 34$), they converge with the ideas described above where coping and expansion appear to be associated with more severe cannabis use presentations. Furthermore, the findings that enhancement motives were elevated in those with likely CUD and in the sample in general (i.e., not more common in frequent than infrequent users) suggest that there may be various factors associated with enhancement motives, which warrant further research.

Additionally, the current study examined cannabis use patterns and CUD symptoms in those with anxiety disorders. Frequent cannabis users reported using significantly larger quantities of cannabis

Table 5 Comparing Motives Between Individuals Equal/Above and Below the CUDIT-R Cut-Off Score Suggesting CUD

Motives	Mean ranks of median MMM subscales		Mann–Whitney U	*p*-values (Bonferroni correction: .05/5 = .001)	Comparisons
	Equal/above cut-off (*n* = 34)	Below cut-off (*n* = 110)			
Coping	113.28	59.90	483.50	<.001*	Equal/above > below
Social	87.69	67.80	1353.50	.007	Equal/above = below
Enhancement	97.44	64.79	1022.00	<.001*	Equal/above > below
Conformity	69.00	73.58	1751.00	.133	Equal/above = below
Expansion	101.38	63.57	888.00	<.001*	Equal/above > below

per day and per week compared to infrequent users and reported significantly more CUD symptoms. Twenty-four percent of cannabis users (infrequent and frequent users) scored above the cut-off for possible CUD on the CUDIT-R, and 5.56% of infrequent users and 12.22% of frequent users had a confirmed additional diagnosis of CUD based on diagnostic assessment. This is in contrast to the 12-month prevalence rate of CUD in the general population, which is approximately 2–4% (Kerridge, Pickering, Chou, Saha, & Hasin, 2018). These findings are consistent with previous research, which show that individuals with anxiety disorders are at increased risk of CUD compared to those with low anxiety (Kedzior & Laeber, 2014); however, CUD rates are not necessarily uniquely elevated in anxiety disorders compared to other mental health concerns (Ferland & Hurd, 2020). In summary, the current findings add to the growing literature demonstrating the elevated rate of cannabis use and related problems in this population. Furthermore, there is a notable difference between the proportion of individuals who likely met criteria for CUD as per the CUDIT-R cut-off score and those with a formal diagnosis, especially in frequent users — 36.67% of which surpassed the CUDIT-R cut-off score, while only 12.22% had a formal CUD diagnosis. It is unclear why this is the case; however, it is possible that due to the perceived stigma associated with cannabis use, individuals were not comfortable reporting the extent of their cannabis use directly to a clinician during a diagnostic assessment. Perceived devaluation (i.e., when substance users think others believe negative stereotypes about them; Ahern, Stuber, & Galea, 2007; Link, Struening, Rahav, Phelan, & Nuttbrock, 1997) is one of the more common dimensions of stigma (Skliamis, Benschop, & Korf, 2020). It is plausible that this stigma would be perceived by anxious individuals seeking mental health services from a clinician and therefore minimised difficulties associated with their cannabis use with clinicians compared to their self-reported cannabis use on the CUDIT-R. Furthermore, it is also possible that the CUDIT-R could be overly sensitive in this population, leading to a high false positive rate; however, future research would need to examine this hypothesis.

Additionally, frequent users were found to be significantly older than infrequent users. Given that frequent users were also found to use more cannabis than infrequent users, one possible explanation for the age difference between groups is that individuals may increase their cannabis use over time due to increased tolerance (Mason et al., 2021). Future research is needed to test this hypothesis.

These results have important clinical implications. The elevated rate of cannabis use and diverse motives reported in the current study highlights the importance of screening for cannabis use and motives in those seeking services for anxiety disorders. Motives for cannabis use in those seeking

treatment for anxiety disorders are important to understand the association between cannabis use and anxiety symptoms, as well as to inform effective interventions. For example, if cannabis is used to cope with anxiety symptoms specifically, providing psychological treatment with alternative skills to manage their anxiety may be needed, or for those with anxiety and more severe cannabis use or comorbid CUD, integrated treatment for both conditions may be necessary to address their mutual maintenance (Buckner et al., 2016, 2019b). For those who use for reasons likely unrelated or indirectly related to their anxiety concerns such as enhancement and expansion motives, it may be important to address mediating factors (e.g., stress), include psychoeducation on the effects of cannabis on anxiety (e.g., withdrawal), and/or provide CUD treatment prior to treating anxiety symptoms. It may also be that some motives for use are unrelated to problematic cannabis use or negative impacts on mental health, which may not need to be addressed. However, further research is needed as the literature reports conflicting findings (Lee, Neighbors, & Woods, 2007; Moitra et al., 2015).

The current study has important limitations to be considered. First, unlike alcohol, there are no standardized recommended consumption guidelines to identify a concerning amount of cannabis use; therefore, defining cannabis user groups is inconsistent across studies. The current study used the frequency of cannabis use to define groups but also reported the amount used (daily and weekly), so that studies can be compared on multiple indicators of use. A long-standing challenge in cannabis research, which was faced in the current study, is the lack of measures to accurately capture the various forms of cannabis consumption, products, and cannabinoid concentrations (Freeman & Winstock, 2015). There is a need for measures that capture these variables and for studies that control for these variables to better represent nuances in cannabis use patterns. Furthermore, the sample was ethnically homogenous and therefore not representative of motives for use across diverse ethnicities. Some studies have shown differences in motives for cannabis use across ethnic groups, and therefore, future research should closely examine differences in motives endorsed across various ethnic groups as well as moderating factors (e.g., minority stress and cultural social norms) to inform inclusive screening and treatment protocols (Davis, Prince, Swaim, & Stanley, 2020). Furthermore, although most self-report measures used have been previously validated, self-report measures in general run the risk of biased reporting (e.g., under- or over-reporting cannabis use or anxiety symptoms). Notably, to our knowledge, the MHQ has not been formally validated and therefore may run a higher risk of biased reporting, although it has been used in other published studies (e.g., Lopez-Vergara, Jackson, Meshesha, & Metrik, 2019; Ouellette et al., 2019). Relatedly, the current findings are limited by the cross-sectional design used and are likely at higher risk of being impacted by biased reporting (e.g., recency effect; Krosnick, 1999), as compared to using a longitudinal design to measure cannabis use motives such as experience sampling (Shiffman, 2016). Additionally, the current study lacked the power to compare cannabis use motives, as well as other variables of interest such as CUD rates and the amount of cannabis used between specific anxiety disorders. This is an important area of future research as there may be unique patterns of and motives for cannabis use associated with specific anxiety disorders, which may help further guide assessment and intervention. Moreover, research is needed to compare cannabis use motives between anxiety disorder populations, other mental health populations, and the general population as some motives may not be uniquely elevated in anxiety disorders (e.g., enhancement motives may be common to all cannabis users). These comparisons may help clinicians better understand when cannabis use and associated motives are likely to be an important treatment target and when it is likely not clinically relevant.

In summary, the current findings suggest that coping and enhancement motives for cannabis use are most frequently endorsed compared to other motives by those with anxiety disorders. Furthermore, coping and expansion motives were more frequently endorsed by frequent users than infrequent users. These findings suggest that individuals with anxiety disorders use it for various reasons, some of which may be unrelated to their mental health concerns. Future research is needed to examine the associations between various cannabis use motives, patterns of cannabis use, and anxiety disorder symptoms specifically.

Declaration of interest. None declared.

Ethical standards. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

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