



MAJOR ARTICLE

## Differences in internalizing symptoms between those with and without Cannabis Use Disorder among HBCU undergraduate students

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### ABSTRACT

**Objective:** To determine the differences in internalizing symptoms between those who met criteria for Cannabis Use Disorder (CUD) and those who did not in young adults attending a Historically Black College or University (HBCU).

**Participants:** The sample included 619 undergraduate students, with 110 (18%) who met criteria for CUD.

**Methods:** Participants completed an online survey, which included demographic, anxious and depressive symptomatology, and substance use assessment.

**Results:** Those who met CUD criteria reported more depressive symptoms ( $M=22.83 \pm 10.74$ ) and anxiety symptoms ( $M=45.70 \pm 12.82$ ) than their non-CUD counterparts ( $M=19.17 \pm 10.58$ ;  $M=40.57 \pm 14.11$ , respectively).

**Conclusion:** Differences between those who met criteria for CUD and those who did not are consistent with previous literature and may aid in characterizing internalizing behaviors in HBCU students with CUD. Future research should examine the subgroups that may cycle through withdrawal symptoms, despite not having severe CUD. This subgroup may be at higher risk for psychopathology than their severe counterparts.

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## Introduction

Cannabis is among the most abused and trafficked illicit substances worldwide.<sup>1</sup> However, laws and attitudes toward the use of cannabis are changing in the United States, with 33 states legalizing cannabis for medical use, and 11 of those including legalization for recreational use.<sup>2</sup> Given these changes in legislation, fewer Americans view cannabis use as risky and some view cannabis as harmless and have positive social perceptions of the substance.<sup>3,4</sup> However, increases in recreational cannabis use may be due to established cannabis use patterns and not legislative changes.<sup>5</sup> Cannabis users may be more inclined to report their use, with legalization efforts and the social climate surrounding cannabis shifting.

Previous research suggests that approximately 30% of Freshmen reported currently using cannabis.<sup>6</sup> Examining substance use contrasts between African Americans/Blacks (Blacks) and other ethnicities at predominantly White institutions suggests Blacks are less likely to use substances than their White counterparts.<sup>7,8</sup> Further, students attending Historically Black Colleges or Universities (HBCUs) are less likely to use substances than their counterparts at predominantly White institutions.<sup>9,10</sup> Specifically, students attending a HBCU are less likely to use alcohol and other substances,<sup>11,12</sup>

including cannabis.<sup>13</sup> However, few substance use findings have been replicated in HBCU samples.<sup>14</sup> Those vulnerable to using cannabis are more likely to have close friends that use cannabis.<sup>15</sup> However, in more recent literature, Blacks are more likely to use cannabis than their White counterparts.<sup>16</sup> This literature is still in its infancy, with very few studies examining cannabis use at HBCUs. To date, no study has examined Cannabis Use Disorder (CUD), a Diagnostic and Statistical Manual of Psychological Disorders 5th Edition (DSM-5) diagnosis given for the problematic use of cannabis in the past 12 months,<sup>17</sup> among HBCU students.

Previous research indicates that young adults experiment with cannabis, utilizing it for enjoyment or to socially conform. Additionally, some young adults may also use cannabis to relax and manage their stress.<sup>18,19</sup> Further, Blacks that perceive their parents to be accepting of cannabis use are at higher risk for cannabis-related problems compared to their White counterparts.<sup>20</sup> Cannabis use is associated with an increased risk of detrimental outcomes, including psychiatric symptoms.<sup>21,22</sup> Frequent cannabis use is associated with psychological disorders, suggesting cannabis use chronicity increases the likelihood of psychopathology.<sup>23</sup> Individuals who use cannabis chronically may develop CUD,<sup>24</sup> which has shown strong comorbidity with other mental disorders, including major depressive disorder and

generalized anxiety disorder.<sup>3</sup> Studies demonstrate that males, young adults, and those with low incomes are more likely to have CUD than their counterparts.<sup>4</sup> Specifically, Hasin and colleagues<sup>3</sup> reported that Blacks were more likely to have CUD in comparison to their White counterparts in the last 12 months in a population level study. Therefore, a critical intersection may exist between the emerging adulthood developmental stage, internalizing symptomatology and disordered cannabis use.<sup>25</sup>

Previous findings on the relationship between cannabis use and depression have been mixed. However, meta-analyses indicate that individuals who use cannabis have a higher risk of developing major depressive disorder when compared to individuals who do not use cannabis. Further, individuals who use cannabis heavily have an even higher risk.<sup>26</sup> Evidence of this relationship is that cannabis use has been phenotypically associated with depression,<sup>27</sup> as there is an almost fivefold increase in depressive symptoms when someone uses cannabis.<sup>28</sup> Research also suggests a relationship between negative internalizing disorders and CUD. Increases in depressive symptoms are associated with CUD,<sup>29,30</sup> including increases in suicidality in college-aged individuals.<sup>31</sup> These findings align with previous research that suggests CUD is associated motivations to use cannabis during times of emotional pain.<sup>32</sup> Ultimately, young adults may use cannabis to cope with life stressors or negative emotions that may lead to or exacerbate depressive disorders.<sup>33</sup>

Cannabis use and CUD are also associated with anxiety symptoms and disorders (e.g., social anxiety disorder, panic disorder, and generalized anxiety disorder).<sup>3,34,35</sup> In addition to these associations, consuming large cannabis quantities may cause acute temporary anxiety episodes that resemble panic attacks.<sup>36</sup> Additionally, individuals with high anxiety levels may self-medicate with substances like cannabis.<sup>34,37</sup> This notion is supported by the fact that most undergraduate individuals who use cannabis associate the use of cannabis with relaxation, coping with stress, and anxiety reduction.<sup>34,38</sup> Although it is unclear if cannabis use increases the risk of developing long-lasting anxiety disorders, cannabis use reduction is associated with a decrease in anxiety symptoms.<sup>39</sup>

It is well established that depression and anxiety disorders overlap in symptomatology.<sup>40-42</sup> With depression and anxiety diagnosis rates increasing among individuals aged 18 to 25 years over the last decade, cannabis use may exacerbate the symptom development and clinical disorder severity.<sup>43</sup> For example, increases in depressive symptoms may come with corollary problems or symptoms, especially when there is significant overlap with anxiety symptoms. Identifying this intersection between CUD and internalizing symptomatology may aid in developing treatment plans and programs for undergraduate young adults experiencing symptoms from these comorbid disorders.

The literature posits an association between CUD and internalizing symptoms; however, the majority of these studies have been performed in clinical samples, determining associations between CUD and depression or anxiety disorders. Very little research has examined negative affective symptomatology differences in undergraduates who meet the criteria for CUD and those who do not. Given the scant

literature in the assessment of substance use and internalizing symptoms in HBCUs, this study provides the unique opportunity to examine findings from a predominantly Black undergraduate student sample. The purpose of the current study was to examine differences in depression and Anxiety symptoms among individuals who met the criteria for CUD and those who did not meet the criteria for CUD within an undergraduate sample. We hypothesized that undergraduate students who meet criteria for CUD will endorse more depression and anxiety symptoms in comparison to their counterparts who do not meet criteria for CUD.

## Method

### Participants

The current data was collected from the Spring 2015 through Spring 2019 as a part of the parent study entitled, “*The Checkpoint Survey Study*”.<sup>44-46</sup> This study recruited undergraduate students through flyers and professor referrals at a HBCU in central Virginia. The current HBCU has a population of approximately 5,000 students with Blacks representing nearly 82% of the population, followed by 10% for Whites, 6% Hispanic Nonwhite, and others accounting for nearly 2%. Individuals must have been between the ages of 18-25 and a student at the university to be included in the study. The current study included 619 participants, with 458 women and 161 men. *The Checkpoint Survey Study* has received annual approval from the institution’s Institutional Review Board (IRB).

### Procedure

Participants who signed up or who contacted the study were emailed a Qualtrics<sup>47</sup> Web link that contained an informed consent page. Once the participant digitally signed the informed consent page, the participant completed the online survey. The survey took approximately thirty minutes to complete. The online survey included measures assessing demographic information, lifetime substance use, depression symptoms, and Anxiety symptoms. After completion of the online survey, participants’ names were collected and recorded so that they may receive extra credit in their respective courses.

## Measures

### Anxiety symptoms

The Mind Over Mood Anxiety Scale (MOM-A) is a brief self-report scale used to measure anxiety symptoms over the past week.<sup>48</sup> The MOM-A consists of 24 items looking at three anxiety dimensions, which are: anxious feelings, anxious thoughts, and physical symptoms. The items were rated on a four-point scale ranging from 0 to 3 representing “not at all” to “most of the time”. Total scores are calculated by summing up the response ratings. The possible range of scores is 0 to 72, with the higher scores indicating the presence of more anxiety-based symptomatology. Items

include: "How much have you experienced muscle tension, muscle aches, muscle soreness over the past week?" and "How much have you experienced avoiding places where I might be anxious over the past week?" This measure has shown validity and internal consistency in college samples.<sup>49</sup> The measure yielded a Cronbach's alpha coefficient of 0.95 within the current sample.

### **Depressive symptoms**

The Center for Epidemiologic Studies Depression Scale (CES-D) is a brief self-report scale used to measure depressive symptoms in the general population.<sup>50</sup> The items on the CES-D were designed to see if depression symptoms are present the past seven days.<sup>50</sup> The scale is composed of twenty items on a four-point likert scale ranging from 0 to 3, representing "rarely or none of the time (less than a day)" to "most or all of the time (5-7 days)". Total scores are calculated by summing up the responses. The possible range of scores is 0 to 60, with the higher scores indicating the presence of more depressive symptomatology. Items include: "I was bothered by things that usually don't bother me." and "I had trouble keeping my mind on what I was doing." This measure has been used to assess depressive symptomatology in Black college students.<sup>51</sup> The measure yielded a Cronbach's alpha coefficient of 0.91 within the current sample.

### **Cannabis Use Disorder assessment**

The DSM-5 identification of CUD includes a problematic pattern of cannabis use that leads to clinically significant impairment or distress.<sup>17</sup> Individuals experiencing two or more of nine specified criteria in a 12-month period meet the criteria for CUD diagnosis. The current study derived questions from the DSM-5 criteria for CUD for use in non-clinical undergraduate samples. Instructions for the CUD assessment section of the *Checkpoint Survey Study* asks the participants "Over the last 12 months..." and are followed by the nine CUD items. Questions included "Have you had cravings or a strong desire or urge to use cannabis"; "Has recurrent cannabis use resulted in a failure to fulfill major role obligations at work, school, or home". The responses choices are "Yes" and "No". In accordance with the DSM-5, participants who endorsed two or more items were designated as meeting criteria for cannabis use disorder. See Table 1 for items and endorsement frequencies.

### **Covariates**

Demographic information was collected through the online survey demographic form, which was developed to collect general information about the participant. The demographic form allowed participants to self-report information such as age and sex. The form consists of a mix of open-ended and multiple-choice questions such as, "What is your age?", "What is your sex?". For analytic purposes categorical variables were dummy coded, for example sex was coded by using "0" for female and "1" for male.

The Youth Risk Behavior Surveillance Survey (YRBSS) was used to measure covariates concerning substance use.

**Table 1.** Cannabis use disorder criterion endorsement percentage.

N=619	Frequency	Endorsement %
<b>Over the past 12 months:</b>		
<b>1. Have you consumed cannabis in large amounts or over a longer period of than intended?</b>	87	14%
<b>2. Have you had a persistent desire or unsuccessful effort to cut down or control cannabis use?</b>	86	14%
<b>3. Do you spend a great deal of time engaging in activities necessary to obtain the cannabis, use cannabis, or recover from its effects?</b>	57	9%
<b>4. Have you had cravings, or a strong desire or urge to use cannabis?</b>	83	13%
<b>5. Has recurrent cannabis use resulted in a failure to fulfill major role obligations at work, school, or home?</b>	51	8%
<b>6. Have you had continued cannabis use despite having persistent or recurrent social or interpersonal problems caused by or exacerbated by the effects of cannabis?</b>	53	8%
<b>7. Have you had to give up or reduce social, occupational or recreational activities because of cannabis use?</b>	64	10%
<b>8. Have you had recurrent cannabis use in situations in which it is physically hazardous?</b>	60	10%
<b>9. Have you had continued cannabis use despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the substance?</b>	134	21%

The YRBSS is a measure derived from the Center for Disease Control and Prevention's national Youth Risk Behavior Surveillance System designed to be utilized in research studies to monitor six categories of health-risk behaviors among youth and young adults, including tobacco, alcohol, and illicit substance use.<sup>52</sup> The substance use subsection of the YRBSS consists of questions with responses that vary from "Yes" or "No" regarding lifetime use of substance, to likert scaled responses regarding the number of days/times a substance was used. For example, "Have you ever tried cigarette smoking, even one or two puffs?". Based on the increased likelihood of individuals who meet the criteria for CUD using other substances in their lifetime,<sup>53</sup> the substance use covariates for this study are derived from lifetime substance use data as reported on the YRBSS.

### **Data analysis**

Data were analyzed using the Statistical Package for Social Sciences, version 24.<sup>54</sup> Any cases with missing data were excluded from the current study analyses. Continuous variables were checked for skewness and are presented as "means (standard deviation)". Frequencies and percentages for categorical variables are reported as the "n" of the subsample and the within group percentage. Based on the low prevalence of cocaine (2%), heroin (<1%), methamphetamines

(1%), MDMA (2%), and hallucinogens (3%) usage in the current sample, these variables were converted to a variable “Other Illicit Substance” for analyses. Analysis of Variance and Chi-square tests were employed to compare differences and associations between cannabis use frequency groups for continuous and categorical variables, respectively. Multiple Analysis of Covariance (MANCOVA) were performed to examine the differences in depressive symptoms and anxiety symptoms scores between individuals who meet criteria for CUD and those who do not while controlling for demographic and substance use covariates. In order to adjust for multiple predictors in the MANCOVA, we employed Wilk’s Lambda F statistics<sup>55</sup> to understand CUD’s unique variance in the presence of statistically significant demographic and lifetime substance use covariates. Lastly, we employed Bonferroni adjustment for multiple comparisons<sup>56</sup> in the MANCOVA model. This adjusted the alpha value from  $p=0.05$  to  $p=0.0125$ .

## Results

### Sample characteristics

The mean age of the current sample was 19.77 ( $SD = 1.66$ ), with approximately 74% of the sample self-reporting as female. The majority of the sample worked part time (46%) and the vast majority of the sample self identified as Black (82%). There were 110 individuals who met the criteria for CUD, including 38 reporting mild symptoms, 21 reporting moderate symptoms, and 51 reporting severe symptoms. The mean CESD score was 19.82 ( $SD = 10.69$ ). These and other results can be seen in Table 2.

### Cannabis Use Disorder and lifetime substance use

Approximately 59% of participants reported using cannabis in their lifetime, and almost 72% reported trying alcohol

in their lifetime. Approximately 6% reported using illicit substances such as cocaine, heroin, ecstasy, or hallucinogens. Nearly 18% met the criteria for CUD, based on the DSM-5 adapted items. As seen in Table 1, “Have you continued cannabis use despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the substance?” (21%), “Have you consumed cannabis in large amounts or over a longer period than intended?” (14%) and Have you had a persistent desire or unsuccessful efforts to cut down or control cannabis use?” (14%) led item endorsements. Additionally, meeting CUD criteria was associated with lifetime use of cigarettes ( $X^2 [DF= 1, n= 619] = 21.02, p = 0.01$ ), alcohol ( $X^2 [DF= 6, n= 622] = 53.08, p = 0.01$ ), prescription drug misuse ( $X^2 [DF= 5, n= 619] = 29.19, p = 0.01$ ), and other illicit substance use ( $X^2 [DF= 1, n= 619] = 5.24, p = 0.02$ ) these associations are reported in Table 3.

### Depressive and anxiety symptoms compared across Cannabis Use Disorder criteria groups

In unadjusted analyses, the group that met criteria for CUD reported higher CESD scores (22.83,  $SD = 10.74$ ) and MOMA scores ( $M = 45.70, SD = 12.82$ ) in comparison to their non-CUD criteria counterparts ( $M = 19.17, SD = 10.57$ ;  $M = 40.57, SD = 14.12$ , respectively). Based on the Wilk’s Lambda Criterion when employing MANCOVA, the dependent variables (depressive and anxiety symptoms) significantly differed based on sex ( $F [2, 609] = 10.51, p = 0.01$ ; partial  $\eta^2 = 0.03$ ), employment ( $F [2, 609] = 6.23, p = 0.01; \eta^2 = 0.02$ ), ( $F [2, 609] = 3.10, p = 0.05; \eta^2 = 0.01$ ), and CUD ( $F [2, 609] = 9.73, p = 0.01; \eta^2 = 0.03$ ). The MANCOVA between subjects effect for CUD suggests a significant difference between the two CUD criteria groups for both depressive ( $F [1, 610] = 15.01, p = 0.01; \eta^2 = 0.02$ ) and anxiety symptoms ( $F [1, 610] = 15.10, p = 0.01; \eta^2 = 0.02$ ). Employing the Bonferroni adjustment for multiple comparisons,

**Table 2.** Demographic, mood, and behavioral characteristics for the sample.

	Total (n=619)	Met Criteria for Cannabis Use Disorder (n=110)		Did not meet Criteria for Cannabis Use Disorder (n=509)		
		M (SD)/F (%)	M (SD)/F (%)	M (SD)/F (%)	t-statistic/ X2 Statistic	p-value
Age	19.77 (1.66)	19.94 (1.62)	19.71 (1.67)	-1.47	0.06	
Sex				4.04	<b>0.04</b>	
Male	161 (26%)	37 (34%)	124 (24%)			
Female	458 (74%)	73 (66%)	385 (76%)			
Employment				7.70	0.05	
Full Time	147 (24%)	26 (24%)	121 (24%)			
Part Time	284 (46%)	40 (36%)	244 (48%)			
Unemployed	186 (30%)	43 (39%)	143 (28%)			
Retired	2 (0.3%)	1 (0.9%)	1 (0.2%)			
Ethnicity				3.20	0.78	
Black/AA	506 (82%)	90 (82%)	416 (82%)			
Mixed	45 (7%)	8 (7%)	37 (7%)			
White	36 (6%)	5 (5%)	31 (6%)			
Hispanic	7 (1%)	1 (1%)	6 (1%)			
Asian	6 (1%)	1 (1%)	5 (1%)			
American Indian	1 (0.2%)	0 (0%)	1 (0.2%)			
Other	18 (3%)	5 (5%)	13 (3%)			
CESD	19.82 (10.69)	22.83 (10.74)	19.17 (10.57)	-3.28	<b>0.01</b>	
MOMA	41.48 (14.02)	45.70 (12.82)	40.57 (14.12)	-3.24	<b>0.01</b>	

Note: Black/AA=Black or African American; CESD=Center for Epidemiological Studies Depression Scale; MOMA=Mind Over Mood Inventory.

**Table 3.** Association between meeting criteria for cannabis use disorder and lifetime substance use prevalence.

	Total (n=619)	Met Criteria for Cannabis Use Disorder (n=110)	Did not meet Criteria for Cannabis Use Disorder (n=509)	X <sup>2</sup> Statistic	p-value
Cigarettes				21.02	<b>0.01</b>
Yes	181 (29%)	52 (47%)	129 (25%)		
No	438 (71%)	58 (53%)	380 (75%)		
Alcohol				53.08	<b>0.01</b>
0 Days	175 (28%)	9 (8%)	166 (33%)		
1-2 Days	77 (12%)	7 (6%)	70 (14%)		
3-9 Days	90 (15%)	15 (14%)	75 (15%)		
10-19 Days	75 (12%)	14 (13%)	61 (12%)		
20-39 Days	73 (12%)	21 (19%)	52 (10%)		
40-99 Days	65 (11%)	21 (19%)	44 (9%)		
100+ Days	64 (10%)	23 (21%)	41 (8%)		
Marijuana				177. 44	<b>0.01</b>
0 Times	252 (41%)	0 (0.0%)	252 (50%)		
1-2 Times	70 (11%)	14 (13%)	56 (11%)		
3-9 Times	74 (12%)	10 (9%)	64 (13%)		
10-19 Times	31 (5%)	4 (4%)	27 (5%)		
20-39 Times	52 (8%)	15 (14%)	37 (7 %)		
40-99 Times	74 (12%)	23 (21%)	51 (10%)		
100 + Times	66 (11%)	44 (40%)	22 (4%)		
Prescription Drug				29.19	<b>0.01</b>
0 Times	532 (86%)	78 (71%)	454 (89%)		
1-2 Times	51 (8%)	22 (20%)	29 (6%)		
3-9 Times	19 (3%)	5 (5%)	14 (3%)		
10-19 times	7 (1%)	2 (2%)	5 (1%)		
20-39 Times	2 (0.3%)	1 (1%)	1 (0.2%)		
40+ Times	8 (1%)	2 (2%)	6 (1.2%)	5.24	<b>0.02</b>
Other Illicit Substance					
Yes	34 (6%)	11 (10%)	23 (5%)		
No	585 (94%)	99 (90%)	486 (95%)		

Note: Cigarettes = Ever tried cigarettes; Alcohol = Days in a lifetime of any alcohol consumption; Other Illicit Substance = Substances that did not achieve 5% prevalence, which includes Cocaine, Heroin, methamphetamine, MDMA, and Hallucinogens.

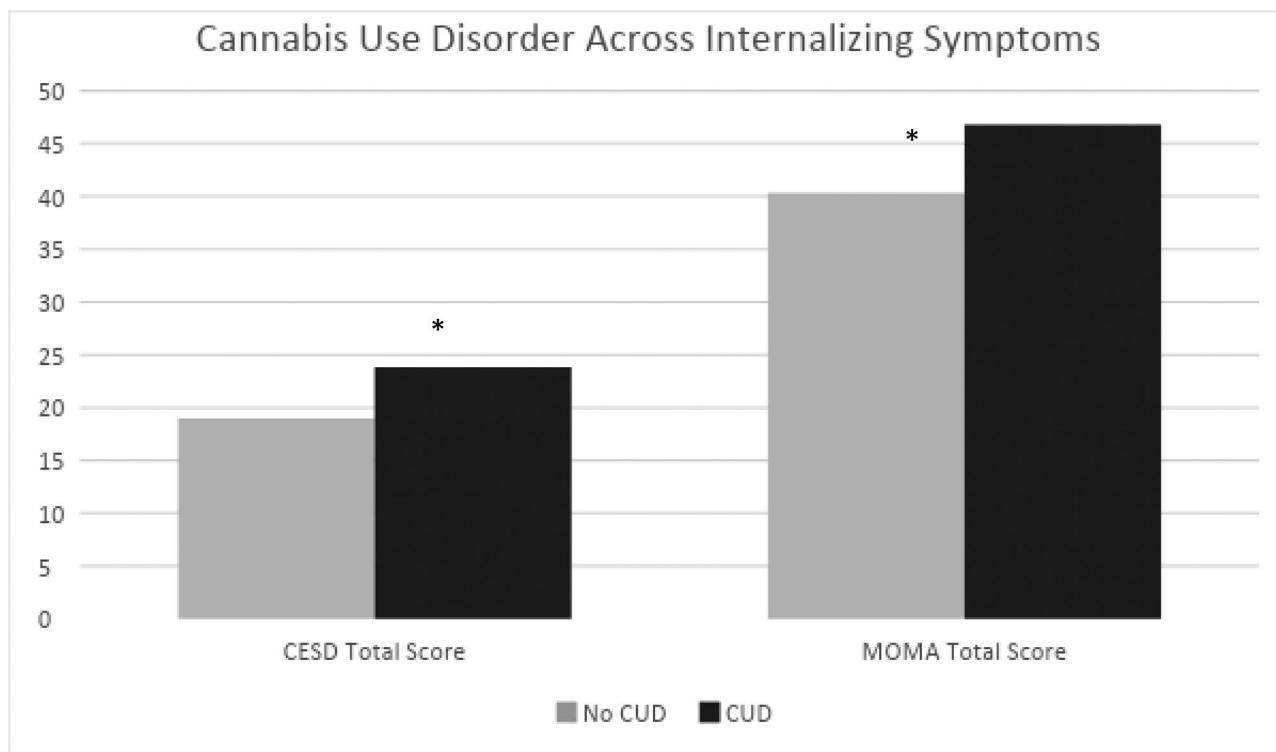
groups that met CUD criteria had higher depressive ( $M = 22.83$ ,  $SE = 1.12$ ) and anxiety symptoms ( $M = 46.79$ ,  $SE = 1.47$ ) in comparison to the non-CUD criteria groups ( $M = 19.00$ ,  $SE = 0.47$ ;  $M = 40.33$ ,  $SE = 0.62$ , respectively). These results are depicted in Figure 1.

## Discussion

In a study of predominantly Black HBCU undergraduate students, we sought to determine if there were any differences in internalizing symptomatology between undergraduate students who met criteria for CUD and those who did not. With approximately 18% meeting the criteria for CUD, unadjusted analyses suggested differences in depressive and anxiety symptoms between groups. After adjusting for demographic and lifetime substance use covariates, Multiple Analyses of Covariance yielded statistically significant differences between the two groups. Specifically, those who met the criteria for CUD reported higher depressive and anxiety symptoms than their non-CUD counterparts. These findings were consistent with previous research, suggesting a link between cannabis use and anxiety<sup>57</sup> or depression symptomatology.<sup>32</sup> Additionally, these findings support previous literature, which posit that CUD at any point in an individual's lifetime is associated with lifetime major depressive disorder.<sup>58</sup> The results from the current study extend the

literature by identifying these differences in a predominately Black sample and by including the lifetime assessments of substance use that may influence current internalizing symptoms.

The statistical adjustment for substance use covariates was a critical component of the analyses, as previous research suggests that other substances may attenuate the relationship between CUD and internalizing behaviors.<sup>59</sup> Previous studies that examined CUD, depression symptoms, and anxiety symptoms reported reductions in cannabis use led to reductions in the aforementioned psychiatric symptoms.<sup>39</sup> However, other studies have reported associations between cannabis use and these internalizing behaviors were lost after controlling for demographic factors and other substance use.<sup>29,59–61</sup> Consistent with previous literature, meeting CUD criteria was associated with the use of other substances in this sample, however, the association with depression and Anxiety symptomatology remained when we adjusted for lifetime substance use covariates. Given the bidirectional pathway between cannabis use and internalizing behaviors posited by the literature, it is critical to elucidate the role of other substances. Our findings indicate that while there is statistically significant influence, the use of other substances does not attenuate the relationship between CUD and depression and Anxiety symptoms. Though it needs to be further explored, this suggests that the use of other substances may have parallel pathways to CUD in university undergraduates.



**Figure 1.** Multiple analyses of covariance determined if those with Cannabis Use Disorder reported significantly higher depressive symptoms, and anxiety symptoms ratings than their counterparts without Cannabis Use Disorder. This analysis was performed in the presence of demographic and lifetime substance use covariates.

As cannabis use becomes more common and CUD rates increase, individuals without depressive or anxiety disorders may develop, or have increases in internalizing symptomatology. The majority of research posits that individuals use cannabis and other substances to cope with or manage existing disorders.<sup>30</sup> However, previous research also suggests that it is plausible for CUD to predispose individuals for depressive or anxiety disorders.<sup>62</sup> There is potential for cannabis use to be utilized as a coping mechanism in Black students, as they are disproportionately affected by a higher likelihood of discrimination, trauma, and other internal factors based in race/ethnicity. As college adjustment may induce stress, it is plausible that Black students using cannabis may develop CUD. Taken together, our findings and previous research suggests that if used chronically, as with CUD, cannabis users may exacerbate residual levels of depressive and/or anxiety-based symptoms.

The present study had limitations that should be noted. First, these findings only include students from a single university, and may not be generalizable to all other institutions. Though this study aids in filling a gap of limited CUD findings in diverse undergraduate populations, the generalizability of the results needs to be demonstrated with future studies focusing on Black students in other institutions. Second, we used self-reported data collection procedures, which is often associated with potential social desirability in responses. When cross-referencing cannabis use frequency with CUD status, some reported only using cannabis once or twice. Though it is improbable, we could not prudently exclude

these participants from the CUD group. Additionally, some of the substance use responses may be subject to recall bias, given participants were asked about lifetime use. The YRBSS did not assess substance use in the past year, only past 30 days and lifetime usage. There was also a large disparity in the frequency between men and women in the current study. This typical occurrence at HBCUs, as HBCUs have larger women populations in comparison to men and this disparity may be represented in our findings. In spite of these limitations, there are a number of strengths that should also be reported. The sample includes a relatively large sample of predominately Black young adults from a HBCU, and the analyses adjusted for important covariates (e.g., age, sex, and lifetime substance use). Additionally, the items utilized to assess criteria for CUD were derived from the latest version of the American Psychiatric Association's DSM-5.

### Implications

Emerging adulthood, spanning ages 18-29 years, is an integral developmental and transitional period. Various college experiences may induce stress and subsequent depression or anxiety symptoms. These experiences and internalizing symptoms may be exacerbated by CUD, leading to potentially deleterious decisions during this developmental stage. Future research in Blacks in predominately White institutions or at HBCU's should incorporate ethnicity-based covariates, including internal factors associated with discrimination and racism. Further, it remains unclear if the higher anxiety symptoms reported



by those who met the criteria for CUD resulted from withdrawal, or if chronic cannabis use was a coping strategy for individuals with higher anxiety symptoms. An a priori study design elucidating why undergraduate students use cannabis chronically is needed.

### Conflict of interest disclosure

The authors have no conflicts of interest to report. The authors confirm that the research presented in this article met the ethical guidelines, including adherence to the legal requirements, of the United States of America and received approval from the Virginia State University Institutional Review Board.

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