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College Student Mental Health: An Evaluation of the DSM-5 Self-rated Level 1 Cross-Cutting Symptom Measure

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Abstract

The DSM-5 Self-rated Level 1 Cross-Cutting Symptom Measure was developed to aid in clinical decision-making for clients seeking psychiatric services and to facilitate empirical investigation of the dimensional nature of mental health issues. Preliminary evidence supports its utility with clinical samples. However, the brief, yet comprehensive structure of the DSM-5 Level 1 measure may benefit a high-risk population that is less likely to seek treatment. College students have high rates of hazardous substance use and co-occurring mental health symptoms, yet rarely seek treatment. Therefore, the current study evaluated the psychometric properties (i.e., construct and criterion-related validity) of the DSM-5 Level 1 measure with a large, diverse sample of non-treatment-seeking college/university students. Data from 7,217 college students recruited from ten universities in ten different states across the U.S. evidenced psychometric validation of the DSM-5 Level 1 measure. Specifically, we found acceptable internal consistency across multi-item DSM-5 domains and moderate to strong correlations among domains (internal validity). Further, several DSM-5 domains were positively associated with longer, validated measures of same mental health construct and had similar strengths of associations with substance use outcomes compared to longer measures of the same construct (convergent validity). Finally, all DSM-5 domains were negatively associated with self-esteem and positively associated with other theoretically relevant constructs, such as posttraumatic stress (criterion-related validity). Taken together, the DSM-5 Level 1 measure appears to be a viable tool for evaluating psychopathology in college students.

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Author Note:

The manuscript is original, has not been published previously (or posted on any website), or submitted for review elsewhere, and reports on IRB-approved research. The manuscript consists of original data and is not one of several papers derived from the same dataset. We do not have any conflict of interest that could inappropriately influence, or be perceived to influence, our work.

Several opportunities for clinical application and empirical investigation of the DSM-5 Level 1 measure are discussed.

Keywords

mental health; college students; substance use; psychometrics

Introduction

A primary goal for the recent edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*; American Psychiatric Association [APA], 2013a) was to address the high comorbidity and overlapping symptoms across mental health disorders (Clark & Kuhl, 2014). The DSM-5 Self-rated Level 1 Cross-Cutting Symptom Measure (hereinafter referred to as DSM-5 level 1 measure; APA, 2013b) was developed in an effort to facilitate additional empirical investigation of the dimensional nature of mental health issues. Broadly, the DSM-5 level 1 measure is a brief, yet comprehensive assessment of mental health symptoms that are commonly endorsed among clients seeking treatment, regardless of their primary presenting concern (Narrow & Kuhl, 2011). Specifically, the DSM-5 level 1 measure comprises 23 self-rated symptoms that capture 13 mental health domains: depression, anger, mania, anxiety, somatic distress, suicidal ideation, psychosis, sleep disturbance, memory, repetitive thoughts and behaviors, dissociation, personality functioning, and substance use. Respondents indicate how much (or how often) they have been bothered by each symptom in the prior two weeks using a five-point response scale (*none, not at all to severe, nearly every day*). A score of 2 or higher in most domains, except substance use (score of 1 or higher) is suggestive of clinically-relevant mental health problems (Narrow et al., 2013).

Preliminary evidence for the psychometric properties of the DSM-5 level 1 measure is encouraging but insufficient. During the DSM-5 field trials, test-retest reliability estimates ranged from good to excellent for all mental health domains, except mania among clients recruited from seven treatment facilities across the United States (Narrow et al., 2013). However, Bastiaens and Galus (2017) found high rates of false positives among a sample of clients residing in a correctional community center, resulting in poor sensitivity and poor positive predictive power. Though, sensitivity of the anxiety and psychosis domains and negative predictive power (i.e., a negative screen) of the mania, anxiety, and psychosis domains were good when they used the lowest domain thresholds. The researchers concluded that the DSM-5 level 1 measure would benefit as a screener to rule out but not necessarily identify mental health issues. Although these findings are notable, the psychometric analyses are limited and restricted to only clinical samples (i.e., no prior research has evaluated the psychometric properties of the DSM-5 level 1 measure in a nonclinical sample). Additional psychometric validation in nonclinical samples is needed to determine its wider applicability.

The DSM-5 level 1 measure may be particularly useful for the college/university student population given the high prevalence of substance abuse, and increasing rates of mental health issues. More specifically, 66.7% of college students in the U.S. endorse past-month

alcohol use, 20.0% endorse past-month marijuana use, and roughly 30% endorse being diagnosed or treated by a professional for a mental health disorder (predominately depression and anxiety) within the past 12 months (American College Health Association, 2017). Similar to clinical populations, college students tend to endorse symptoms that span several mental health disorders. Therefore, and in line with the purpose of the DSM-5 level 1 measure, examining the breadth of potential mental health issues can facilitate the development of at-risk student profiles, and inform how best to address and tailor treatment interventions.

The goal of the present study was to evaluate the psychometric properties (i.e., construct and criterion-related validity) of the DSM-5 level 1 measure in a large, diverse sample of non-treatment-seeking college/university students at 4-year institutions from ten U.S. states (Alaska, Colorado, Idaho, Mississippi, Missouri, Nebraska, New Mexico, Virginia, Washington, and Wyoming). First, we assessed internal validity of the DSM-5 level 1 measure by examining the reliability of multiple-item mental health domains and intercorrelations of mental health domains. Second, we assessed convergent validity by examining the relation between mental health domains and longer, validated measures of the same mental health construct. Next, we assessed criterion-related validity by evaluating the association between mental health domains and theoretically-related measures of psychopathology. Finally, we also compared correlations between the domains and past 30-day substance use outcomes to correlations between established measures of the same construct and past 30-day substance use outcomes in order determine if the DSM-5 level 1 measure can be a viable brief measure used to assess relationships between mental health and substance use among college students.

Method

Participants and Procedures

Participants were college students recruited to participate in an online survey from Psychology Department Participant Pools at ten universities across ten U.S. states. To ensure that data collection was standardized at each site, all data were collected using the same software (i.e., Qualtrics). To minimize burden on participants, we utilized a planned missing data design, also known as matrix sampling (Graham, Taylor, Olchowski, & Cumsille, 2006). Specifically, each participant received and completed a battery of core measures that focused on substance use (i.e., alcohol and marijuana) and the DSM-5 level 1 measure. After completing the core measures, each participant received a random sample of 10 measures from a larger pool (19 total measures) that assessed mental health (e.g., depression, anxiety, stress, self-esteem, suicide, posttraumatic stress), physical health (i.e. sleep quality, sexual experiences, eating habits), and personality (i.e., impulsivity-like traits, Big Five personality traits, antisocial behavior, and temperament) constructs. Although 7,307 students were recruited across sites, only data from students that completed the DSM-5 level 1 measure ($n = 7,217$) were included in the final analyses. The majority of the analytic sample was White (73.80%), female (70.54%), and reported a mean age of 20.85 ($Median = 19.00$; $SD = 4.74$) years. Specific demographic information on our full sample as well as each data collection site is shown in Supplemental Table 1. Participants received research participation credit for

completing the study. This protocol was approved by the institutional review boards at each participating university.

Non-DSM Level 1 Measures

Based on our missing-data-by-design procedure, at least 3,746 (51.91%) of participants completed each randomized measure unless otherwise noted.

Depression, anxiety, and stress.—Past week depression, anxiety, and stress were assessed using the 21-item Depression Anxiety Stress Scales (DASS-21; Lovibond & Lovibond, 1995) measured on a 4-point response scale (0 = *did not apply to me at all* to 3 = *applied to me very much, or most of the time*). We summed items to create a total score for the three domains covered by the measure: depression (7 items; $M = 3.42$; $SD = 4.48$; $\alpha = .92$), anxiety (7 items; $M = 3.15$; $SD = 3.86$; $\alpha = .86$), and stress (7 items; $M = 4.18$; $SD = 4.24$; $\alpha = .88$).

Fear of Negative Evaluation.—Fear of negative evaluation was assessed using the 12-item Brief Fear of Negative Evaluation Scale (BFNES; Leary, 1983), measured on a 5-point response scale (1 = *not at all characteristic of me* to 5 = *extremely characteristic of me*). Items were summed ($M = 33.88$; $SD = 9.92$; $\alpha = .89$).

Social Interaction Anxiety.—Social interaction anxiety was assessed using the 20-item Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998), measured on a 5-point response scale (0 = *not at all characteristic or true of me* to 4 = *extremely characteristic or true of me*). Items were summed ($M = 26.24$; $SD = 15.81$; $\alpha = .94$).

Posttraumatic stress disorder.—Past month posttraumatic stress disorder (PTSD) symptoms was assessed using the 20-item PTSD Checklist for DSM-5 (PCL-5; Blevins, Weathers, Davis, Witte, & Domino, 2015), measured on a 5-point response scale (0 = *not at all* to 4 = *extremely*). Items were summed ($M = 16.00$; $SD = 16.67$; $\alpha = .96$).

Insomnia.—Past 2-week insomnia problems was assessed using the 7-item Insomnia Severity Index (ISI; Bastien, Vallières, & Morin, 2001), measured on a 5-point response scale (0 = *not at all* to 4 = *extremely*). The seven items assess severity of difficulties falling asleep, staying asleep, sleep quality and its impact on daily functioning. We summed items to create a total score of insomnia ($M = 7.86$; $SD = 5.75$; $\alpha = .88$).

Suicidality.—Suicidality was assessed with three independent questions adapted from the World Mental Health Composite International Diagnostic Interview (CIDI; Kessler & Üstün, 2004). The three questions focused on suicidal thought (“Did you think about killing yourself?”), planning a suicide (“Did you make a plan to kill yourself?”), and suicide attempts (“Did you make a suicide attempt or try to kill yourself?”). Participants reported whether they did or did not (0 = *no*, 1 = *yes*) experience suicidal thoughts (16.01% endorsed yes), plan to kill themselves (3.85% endorsed yes), and attempt suicide (1.89% endorsed yes) in the past 12 months.

Self-esteem.—Self-esteem was assessed using the 10-item Rosenberg Self-Esteem Scale (Rosenberg, 1965), measured on a 5-point response scale (0 = *strongly agree* to 4 = *strongly disagree*). We reverse-coded and summed items to create a total score with higher scores indicating higher positive self-esteem ($M = 20.27$; $SD = 5.86$; $\alpha = .90$).

Alcohol use.—Alcohol use was broken down into several indicators: an indicator of past 30-day frequency of alcohol use, an indicator of typical quantity, and an indicator of binge drinking frequency (i.e., past 30-day frequency of drinking 4+/5+ standard drinks in for women/men in a period of two hours or less). Typical quantity was measured with a modified version of the Daily Drinking Questionnaire (Collins, Parks, & Marlatt, 1985). Participants indicated how much they drink during a typical week in the past 30 days using a 7-day grid from Monday to Sunday. We summed number of standard drinks consumed on each day of the typical drinking week (i.e., “weekly drinks”). Only participants that reported at least one alcohol use day in the previous month ($n = 5,001$) completed the binge drinking frequency and typical quantity questions.

Alcohol-related problems.—Past 30-day alcohol-related problems were assessed using the 24-item Brief-Young Adult Alcohol Consequences Questionnaire (Kahler, Strong, & Read, 2005). Each item was scored dichotomously (0 = *no*, 1 = *yes*) and we summed all items to create an alcohol-related problem composite score reflective of the number of distinct problems experienced in the past 30 days ($\alpha = .91$). Only participants that reported at least one alcohol use day in the previous month ($n = 5,001$) completed the measure.

Alcohol misuse.—Alcohol misuse was assessed using a modified version of the 10-item Alcohol Use Disorder Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). The difference between the AUDIT and the modified version is that the response options for items 1–3 were modified and the wording for item 3 reflects the U.S. gender-specific definition of heavy episodic drinking (i.e., frequency of drinking 4+/5+ standard drinks in for women/men in a drinking period). We summed items to create a total score for the two primary domains covered by the measure: alcohol consumption (3 items; $M = 5.71$; $SD = 3.60$; $\alpha = .82$) and alcohol-related problems (7 items; $M = 2.42$; $SD = 3.55$; $\alpha = .78$). Only participants that reported consuming alcohol at least once in their lifetime ($n = 6,366$) completed the measure.

Marijuana use.—Marijuana use was broken down into several indicators: an indicator of past 30-day marijuana use, an indicator of typical frequency of use, and an indicator of typical quantity. Typical marijuana use frequency and quantity was assessed using the Marijuana Use Grid (Author et al., 2018). Specifically, each day of the week was broken down into 6 4-hour blocks of time (12a-4a, 4a-8a, 8a-12p, etc.), and participants were asked to report at which times they used marijuana during a “typical week” in the past 30 days as well as the quantity of grams consumed during that time block. We calculated typical frequency of marijuana use by summing the total number of time blocks for which they reported using during the typical week (ranges: 0–42). We calculated typical quantity of marijuana use by summing the total number of grams consumed across time blocks during

the typical week. Only participants that reported at least one marijuana use day in the previous month ($n = 2,175$) completed the marijuana use frequency and quantity questions.

Marijuana-related problems.—Past 30-day marijuana-related problems were assessed using the 21-item Brief Marijuana Consequences Questionnaire (Simons, Dvorak, Merrill, & Read, 2012). Each item was scored dichotomously ($0 = no$, $1 = yes$) and we summed all items to create a marijuana-related problems composite score reflective of the number of distinct problems experienced in the past 30 days ($\alpha = .89$). Only participants that reported at least one marijuana use day in the previous month ($n = 2,175$) completed the measure.

Marijuana misuse.—Marijuana misuse was assessed using the 8-item Cannabis Use Disorders Identification Test-Revised (CUDIT-R; Adamson et al., 2010). We summed items to create a total score with higher scores indicating higher marijuana misuse ($M = 5.57$; $SD = 5.82$; $\alpha = .84$). Only participants that reported consuming marijuana at least once in their lifetime ($n = 4,018$) completed the measure.

Statistical Analyses

To test for internal validity, we examined the reliability of test scores from domains that had multiple items and correlations between domains. To test for convergent validity (i.e., evidence of a relationship between the test scores and other scores from measures of the same or similar construct), we examined the correlations between five specific domains and other measures purported to assess the same (or similar) construct: 1) the depression domain with the DASS-21 depression subscale; 2) the anxiety domain with the DASS-21 anxiety subscale and two forms of social anxiety (fear of negative evaluation and social interaction anxiety); 3) the suicidal ideation domain and three forms of suicidality (i.e., thoughts, planning, and attempt); 4) the sleep disturbance domain with insomnia, and 5) the substance use domain with reports on the AUDIT, CUDIT-R, and past 30-day alcohol and marijuana use/problems. To test for criterion-related validity (i.e., the relationship between the test's scores with other theoretically relevant constructs), we examined the correlations between the 13 domains and all mental health constructs mentioned in the measures section that were not the exact same construct (e.g., correlation between depression and PTSD symptoms).

Furthermore, we compared correlations between these domains and past 30-day substance use outcomes to correlations between established measures of the same construct and past 30-day substance use outcomes in order determine if the DSM-5 level 1 measure can be a viable brief measure used to assess relationships between mental health and substance use. Since we utilized a missing-data-by-design procedure, missing data are considered missing completely at random or MCAR (Enders, 2010), which allows us to use Full Information Maximum Likelihood in *Mplus* 7.4 to handle missing data (i.e., allows us to use all available information in determining parameter estimates) (Muthén & Muthén, 1998–2017). Given our large sample size (i.e., statistical power), significant associations were determined by a 99% bias-corrected standardized bootstrapped confidence interval (based on 10,000 bootstrapped samples) that does not contain zero and we place emphasis on the strength of the associations.

Results

Internal Validity and Descriptive Statistics

Of the 13 domains assessed by the DSM-5 level 1 measure, eight had multiple items and each of these domains had acceptable to good internal consistency (Loewenthal, 2001) within this college student population: depression (2 items; $M = 2.00$; $SD = 2.01$; $\alpha = .82$), anger (1 item; $M = .99$; $SD = 1.05$), mania (2 items; $M = 1.52$; $SD = 1.74$; $\alpha = .63$), anxiety (3 items; $M = 2.90$; $SD = 2.96$; $\alpha = .84$), somatic distress (2 items; $M = 1.21$; $SD = 1.76$; $\alpha = .70$), suicidal ideation (1 item; $M = 0.28$; $SD = 0.74$), psychosis (2 items; $M = 0.29$; $SD = .96$; $\alpha = .80$), sleep disturbance (1 item; $M = .89$; $SD = 1.18$), memory (1 item; $M = .46$; $SD = .87$), repetitive thoughts and behaviors (2 items; $M = .79$; $SD = 1.52$; $\alpha = .75$), dissociation (1 item; $M = .44$; $SD = .89$), personality functioning (2 items; $M = 1.48$; $SD = 1.98$; $\alpha = .81$), and substance use (3 items; $M = 1.06$; $SD = 1.81$; $\alpha = .61$). As expected, all domains were significantly positively associated with each other and the majority of these magnitudes were in the moderate ($.30 < rs < .50$) to strong range ($r > .50$).

Beyond examining mean rates and correlations among domains, we also calculated prevalence rates (i.e., percentages) of participants who met the threshold for psychopathology symptom criteria. Within the total sample and averaged across items, the prevalence of potential symptom presentation for the domains are as follows: anxiety (27.89%), depression (27.87%), anger (27.54%), sleep disturbance (25.47%), mania (21.91%), personality functioning (20.07%), somatic distress (17.11%), memory (12.09%), dissociation (11.70%), repetitive thoughts and behaviors (10.95%), suicidal ideation (7.46%), and psychosis (4.00%). For substance use, we present the rates by specific substance: alcohol use (32.06%), tobacco (15.53%), and other drug use (14.68%). Specific percentage rates for each item in our full sample (and across data collection sites) is shown in Supplemental Table 2. Specific percentage rates for each item across racial/ethnic identities are shown in Supplemental Table 3. We also compared our sample to a community sample obtained by Hurst and Kavanagh (2017). By and large, our sample demonstrated lower rates on most mental health domains except for slightly higher prevalence of tobacco use and prescription drug misuse (see Supplemental Table 2).

Convergent and Criterion-related Validity

Correlations between domains of the DSM-5 level 1 measure and mental health constructs are summarized in Table 1. Across all domain specific correlations, all correlations were significantly positive and the majority of these magnitudes were in the moderate to strong range: 1) depression domain with the DASS-21 depression subscale ($r = .67$); 2) sleep disturbance domain with insomnia ($r = .66$); 3) anxiety domain with fear of negative evaluation ($r = .42$), social interaction anxiety ($r = .48$), and the DASS-21 anxiety subscale ($r = .58$); 4) suicidal ideation domain with past year suicidality thoughts ($r = .48$), planning ($r = .39$), and attempt ($r = .23$); 5) substance use domain with reports on the AUDIT (consumption, $r = .45$; problems, $r = .45$), CUDIT-R ($r = .37$), and past 30-day alcohol/marijuana use indicators and related problems ($rs = .19-.41$). With regards to criterion-related validity, all domains of the DSM-5 level 1 measure were significantly positively associated with each poor mental health construct (only exception was alcohol consumption

assessed by the AUDIT; only four significant associations). The majority of these magnitudes ranged from moderate-to-strong (see Table 1).

Correlations between health constructs and past 30-day substance use outcomes are summarized in Table 2. Excluding the substance use domain of the DSM-5 level 1 measure, there were relatively few significant associations between mental health constructs and both alcohol and marijuana use indicators and all significant correlations were weak. In contrast, almost all correlations between mental health constructs and alcohol/marijuana-related problems were significant and had modest associations (correlations ranged from .15 to .31). In comparing the associations between the five specific domains and other measures assessing the same (or similar) construct on substance use outcomes, the correlations were largely similar in strength (e.g., the correlation between the depression domain and marijuana-related problems was .21 and the correlation between DASS-21 depression and marijuana-related problems was .21). Other correlation comparisons were similar in strength (i.e., .10 or less in magnitude difference).

Discussion

Broadly, the present study sought to test the utility of the DSM-5 level 1 measure in assessing psychopathology among college students through a systematic testing of internal, convergent, and criterion-related validity. Overall, the measure performed admirably. All multi-item subscales of the DSM-5 level 1 measure demonstrated at least acceptable internal consistency estimates and were moderately-to-strongly correlated with each other (internal validity). Further, several domains were strongly, positively associated longer measures of the same (or similar) constructs and the associations between mental health symptoms and substance use outcomes were remarkably similar across the brief DSM-5 level 1 measure mental health domains and the longer, more validated measures assessing these constructs (convergent validity). Not only were the 13 domain measures negatively associated with self-esteem, but they tended to correlate strongly with other theoretically-relevant constructs such as posttraumatic stress (criterion-related validity). Taken together, our findings further support the utility of this measure in non-clinical samples (Hurst & Kavanagh, 2017).

Specific to the present study, our findings provide evidence that the DSM-5 level 1 measure could have incredible value as a brief, comprehensive measure of mental health among college students. Given its brevity, we anticipate that a growing number of researchers will strategically use the DSM-5 level 1 measure in college student populations. As the first study using this measure in this population, we have provided detailed information about prevalence rates in our total sample and both site-specific and racial/ethnic subsamples to facilitate comparisons in future studies. Although the present study relied on convenience sampling, which limits our contributions from an epidemiological perspective, we provide a strong reference point to which other studies using the DSM-5 level 1 measure can be compared. Moreover, and with particular attention to the high rates of substance use among college students, brief motivational interventions may also benefit from using the DSM-5 level 1 measure to gain a fuller picture of the mental health issues associated with college student substance use. In fact, incorporating the DSM-5 level 1 measure into such

interventions can help guide conversations surrounding the facilitative and detrimental effects of substance use.

Limitations and Future Directions

Despite the importance of these findings, our study was not without its limitations. The cross-sectional study design prevents the examination and demonstration of temporal precedence. Furthermore, the present study did not collect clinical diagnosis data to determine if the proposed cutoffs by Narrow and colleagues (2013) are valid for the college population. Additional work is needed to examine the sensitivity and specificity of the DSM-5 level 1 to inform its utility as a mental health screener among college students. Moreover, further validation of the DSM-5 level 1 measure will increase confidence in current findings, as well as facilitate epidemiological research on the prevalence, incidence, and impact of psychopathology among college students and aid in developing profiles for at-risk student.

Although we had multiple mental health measures resulting in our ability to compare the DSM-5 level 1 measure estimates of specific psychopathology to more comprehensive measures of overlapping constructs, we did not compare the measure to larger, comprehensive measures of overall psychopathology (e.g., Counseling Center Assessment of Psychological Symptoms-62; Locke et al., 2011). These comparisons are needed to determine whether researchers can use the measure to evaluate the myriad of psychiatric issues commonly experienced by college students without placing undue burden on them through extensive psychological evaluation. Finally, the DSM-5 Level 1 measure currently does not have normative data and has not been evaluated according to the Standards for Educational and Psychological Testing which is needed to provide greater empirical validation of the measure (see Al-Dajani, Gralnick, & Bagby, 2015 for an example of testing a DSM-5 measure using these standards).

Conclusions

The current study provides psychometric validation of the DSM-5 Self-Rated Level 1 Cross-Cutting Symptoms Measure with a large, diverse sample of non-treatment-seeking college students. The high prevalence of hazardous substance use and increasing rates of mental health issues among college students points to the DSM-5 level 1 measure as a viable tool to identify and address the needs of this population. Further, the tool may prove useful for empirical investigations of the profiles of at-risk students while minimizing relative participant burden. Although additional validation of the DSM-5 level 1 measure with the college student population is needed, we foresee opportunities to augment epidemiological research, theoretical conceptualizations, and clinical applications using the DSM-5 level 1 measure with the college student population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Public Significance Statement:

Empirical investigations surrounding the etiology and pathophysiology of mental health issues in college students may benefit from a brief, yet comprehensive measure of mental health issues. This study supports the notion that the DSM-5 Self-rated Level 1 Cross-Cutting Symptom Measure is a viable tool for identifying and addressing the needs of this population.

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Table 1

Correlations between domains of the DSM-5 level 1 measure and health outcomes.

	Depression	Anger	Mania	Anxiety	Somatic Distress	Suicidal Ideation	Psychosis	Sleep Disturbance	Memory	Repetitive Thoughts	Dissociation	Personality Functioning	Substance Use
Depression	---												
Anger	.70	---											
Mania	.42	.45	---										
Anxiety	.68	.60	.44	---									
Somatic Distress	.56	.53	.41	.61	---								
Suicidal Ideation	.51	.40	.30	.46	.47	---							
Psychosis	.27	.26	.32	.30	.38	.50	---						
Sleep Disturbance	.53	.46	.42	.54	.52	.37	.26	---					
Memory	.44	.40	.33	.45	.47	.37	.40	.47	---				
Repetitive Thoughts	.53	.46	.40	.57	.52	.60	.52	.47	.52	---			
Dissociation	.55	.44	.34	.54	.52	.54	.44	.46	.50	.65	---		
Personality Functioning	.68	.53	.36	.60	.52	.51	.34	.50	.46	.59	.62	---	
Substance Use	.22	.20	.22	.21	.24	.31	.41	.21	.26	.31	.30	.27	---
DASS: Depression	.67	.50	.29	.57	.49	.53	.31	.46	.42	.56	.57	.66	.25
DASS: Stress	.56	.55	.34	.61	.51	.40	.28	.48	.42	.51	.49	.54	.23
DASS: Anxiety	.49	.41	.32	.58	.51	.43	.33	.42	.41	.50	.50	.50	.27
FNE	.35	.28	.11	.42	.24	.21	.05	.24	.20	.26	.23	.36	.04
Social Interaction Anxiety	.42	.32	.16	.48	.32	.29	.17	.29	.25	.32	.31	.44	.06
PTSD	.59	.50	.36	.60	.52	.49	.32	.51	.46	.57	.55	.59	.23
AUDIT: Consumption	-.02	-.03	.02	-.04	-.03	.03	.06	-.02	.01	.01	.03	.01	.45
AUDIT: Problems	.17	.15	.20	.17	.18	.22	.29	.15	.20	.24	.21	.19	.45
CUDIT	.16	.09	.16	.13	.13	.17	.23	.09	.21	.20	.18	.18	.37
Insomnia	.48	.42	.36	.46	.44	.28	.15	.66	.38	.36	.37	.41	.15
Suicide Thought	.40	.28	.11	.33	.25	.48	.12	.26	.23	.33	.32	.40	.11
Suicide Plan	.23	.16	.08	.18	.17	.39	.13	.15	.13	.26	.23	.25	.10
Suicide Attempt	.13	.11	.07	.10	.12	.23	.10	.07	.10	.16	.15	.13	.06
Self-Esteem	-.54	-.40	-.20	-.49	-.37	-.42	-.20	-.34	-.31	-.41	-.40	-.53	-.15
Sex (0=male, 1=female)	.04	.08	-.04	.09	.07	-.01	-.09	.06	.02	-.06	.02	.01	-.13

Note. DASS=Depression Anxiety Stress Scales; FNE=Fear of Negative Evaluation; PTSD=posttraumatic stress disorder; AUDIT=Alcohol Use Disorder Identification Test; CUDIT=Cannabis Use Disorders Identification Test. *Ns* range from 4,018 (among CUDIT associations assessed among lifetime marijuana users), 6,366 (among AUDIT associations assessed among lifetime alcohol users), to 7,217 (total sample). Significant associations are in bold typeface for emphasis and were determined by a 99% bias-corrected standardized bootstrapped confidence interval (based on 10,000 bootstrapped samples) that does not contain zero. Correlations among non-DSM level 1 cross-cutting symptoms domains are available upon request from the authors.

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Table 2

Correlations between past 30-day alcohol/marijuana use indicators/problems with composite scores of study variables.

	Substance Use				Substance Use Problems			
	Last 30-Day Alcohol use 5.63(5.01)	Weekly Drinks 6.39(7.18)	Binge Drinking Frequency 2.39(3.51)	Last 30-Day Marijuana use 10.87(10.56)	Marijuana Use Frequency 6.63(8.57)	Marijuana Use Quantity 7.42(14.02)	Alcohol-related Problems 5.61 (5.32)	Marijuana-related Problems 3.47(4.17)
Substance Use	.33	.39	.41	.27	.27	.19	.38	.28
<i>Mental Health Comparisons</i>								
CC: Depression	.03	.01	.03	.03	.07	.05	.15	.22
DASS: Depression	.06	.05	.08	.08	.07	.05	.22	.22
CC: Anxiety	.02	-.02	.01	.04	.09	.03	.15	.21
DASS: Anxiety	.06	.07	.10	.09	.10	.08	.24	.21
Fear of Negative Evaluation	-.02	-.05	-.03	-.07	-.04	-.07	.06	.09
Social Interaction Anxiety	-.06	-.08	-.06	-.03	-.02	-.01	.07	.12
CC: Suicidal Ideation	.03	.03	.06	.04	.06	.07	.16	.15
Suicide Thought	-.02	-.02	-.01	.05	.05	.01	.06	.13
Suicide Plan	-.02	.00	.02	.01	.02	.03	.07	.05
Suicide Attempt	.00	.01	.04	.00	-.01	.02	.07	.05
CC: Sleep Disturbance	.02	.00	.02	.03	.05	.04	.12	.17
Insomnia	.04	.02	.02	-.01	.02	.02	.15	.13
<i>Other Mental Health</i>								
CC: Anger	.02	-.01	.01	-.01	.06	.04	.15	.18
CC: Mania	.06	.07	.09	.03	.08	.10	.20	.21
CC: Somatic Distress	.01	.02	.03	.05	.07	.08	.17	.19
CC: Psychosis	.04	.10	.11	.09	.12	.14	.23	.19
CC: Memory	.04	.05	.06	.12	.13	.11	.20	.31
CC: Repetitive Thoughts	.04	.05	.08	.07	.09	.07	.20	.24
CC: Dissociation	.05	.05	.08	.06	.08	.09	.18	.22
CC: Personality Functioning	.04	.03	.06	.02	.06	.05	.18	.23
DASS: Stress	.04	.02	.04	.08	.09	.06	.21	.20
PTSD	.03	.04	.06	.05	.04	.02	.25	.19
Self-Esteem	-.03	-.02	-.04	-.01	-.01	.01	-.20	-.15

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	Substance Use				Substance Use Problems	
	Last 30-Day Alcohol use	Weekly Drinks	Binge Drinking Frequency	Last 30-Day Marijuana use	Marijuana Use Frequency	Marijuana Use Quantity
Gender	-07	-20	-14	-15	-17	-14
					Alcohol-related Problems	Marijuana-related Problems
					-04	-14

Note. CC = Cross-Cutting DSM-5 level 1 measure. DASS=Depression Anxiety Stress Scales; PTSD=posttraumatic stress disorder; Ns range from 2,175 (among marijuana outcomes associations assessed among past 30-day marijuana users) to 5,001 (among alcohol outcomes associations assessed among past 30-day alcohol users). Gender was coded 0=male, 1=female. Significant associations are in bold typeface for emphasis and were determined by a 99% bias-corrected standardized bootstrapped confidence interval (based on 10,000 bootstrapped samples) that does not contain zero.