

12-2021

Substance Use and Psychological Distress Correlates of Sleep Quality Among College Students

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Substance Use and Psychological Distress Correlates of Sleep Quality Among College Students

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science in Community Health Promotion

by

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University of Arkansas
Bachelor of Arts in Psychology, 2019

December 2021
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This thesis is approved for recommendation to the Graduate Council.

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Abstract

Poor sleep quality in college students is a major problem associated with adverse health outcomes, cognitive performance, substance use, and psychological distress. Our study explored how substance use and psychological distress are associated with the sleep quality of college students. We analyzed secondary data collected in 2019 using a cross-sectional survey design. Measures included participants' demographic characteristics, sleep quality using the Pittsburgh Sleep Quality Index (PSQI), drug use, depression using the Patient Health Questionnaire-9 (PHQ-9), and suicidality. After excluding participants with missing information for sleep quality, a total of 555 students remained for the analysis. Our bivariate analysis found that most of the variables associated with poor sleep quality. Also, finding suggested a strong correlation between poor sleep quality and indicators of psychological distress (depression, suicidal ideation, planning, and attempt). Furthermore, using a multivariable regression analysis, we found a significant association between depression and poor sleep quality. In addition, there were strong correlations between substances, with the exception of alcohol and binge drinking, and daytime dysfunction and sleep disturbances. Surprisingly, we found that none of the substances were associated with sleep duration. Initially, we had not contemplated self-stigma, but after analyzing the results, and its relevance to psychological dysregulation, we decided to include it in our analysis. We found significant associations between self-stigma and poor sleep, depression, suicidal ideation, plans, and attempts. Given the high prevalence of sleep problems in college students, these findings are valuable for institutions to address suicidality, depression, or substance use. Because sleep is a more easily modifiable behavior, it is more likely that students get help for sleeping problems than substance use or depression.

Acknowledgements

I would first like to thank my advisor Dr. Robert Davis, whose guidance was invaluable in the entire writing process. His encouragement always pushed me to work harder, but also allowed me to rest when I needed to. I would also like to thank Dr. Robert Davis, Nicole A. Doyle, and Dr. Vinayak K. Nahar for allowing me to utilize their collected data to conduct this analysis.

In addition, I would like to thank members of the Substance Use and Mental Health Laboratory, Krishen Samuel, Nicole A. Doyle, Oluwatoyin Olatunde, and Kayla Simon for your constant support throughout the writing process and providing insightful feedback.

I would also like to thank my committee members Dr. Page Dobbs and Dr. Russell. They provided important feedback during my writing process and in the design of the study.

Lastly, I would like to acknowledge the opportunity to study in the United States given by SENACYT-IFARHU and the Panamanian government. Without the scholarship, I would have not been able to study outside of my country.

Dedication

I dedicate my thesis to my *familia* and close friends who supported me throughout all these years in the United States. I dedicate this work to my loved family members that are longer with me today but made me the person I'm today, Mami, Laya, y Tia Elda, I'll forever remember you.

Gracias familia por todo su amor y apoyo durante toda mi vida. Gracias, papá y mamá por brindarme tanto amor y educarme en valores. Gracias, Rolando por ser inspiración y atreverte a salir del país lo cual me motivó a seguir tus pasos. Mariel, gracias por ser la mejor hermana y brindarme no solo todo tu apoyo, pero amor y un abrazo y un oído siempre que lo necesite. Audrey, mi mejor amiga, gracias por tus palabras de apoyo desde el día uno y gracias por seguir a mi lado a pesar de la distancia. José, gracias por motivarme cada momento que dudaba de mi misma y gracias por tanto amor y cariño durante estos últimos anos. Sin todos ustedes no hubiese podido alcanzar mis sueños.

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Chapter I: Introduction

Sleep duration is an essential factor for overall health and well-being (Watson et al., 2015). The American Academy of Sleep Medicine along with the Sleep Research Society recommends that people get at least 7 hours of sleep per night. Sleeping less than seven hours per night is associated with, and may lead to, adverse health outcomes such as obesity (Ogilvie et al., 2017), hypertension (Yuan et al., 2021), and depression (Zou et al., 2020). Sleep quality comprises of quantitative aspects of sleep (e.g., sleep duration, sleep latency, or number of arousals) along with more subjective aspects (e.g., depth or restfulness) (Buysse et al., 1988). Sleep is also shown to affect cognitive performance, increase errors, and increase risk of accidents (Watson et al., 2015). These cognitive consequences of lack of sleep can threaten the lives (Hershner & Chervin, 2014) and academic performance (Okano et al., 2019) of college students. According to the Behavioral Risk Factor Surveillance (BRFSS) 32.2% of adults ages 18-24 and 37.9% ages 25-34 in the United States reported short sleep duration. In addition, a large multi-university study in the United States showed that as many as 62% of college students were classified as poor sleepers (Becker et al., 2018a). Sleep problems appear to be more common during weekdays (Lund et al., 2010), among females (Cheng et al., 2012; Lund et al., 2010; Ogeil et al., 2013), those with lower socioeconomic status, and older students (Moura de Araújo et al., 2014).

Importantly, poor sleep quality in young adulthood is associated with anxiety and depression (Cunningham & Wheaton, 2015; Ghrouz et al., 2019). On the other hand, the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM-5; American Psychiatric Association, 2013), a manual for assessment and diagnosis of mental disorders, describes sleep disorders as a common symptom of major depressive disorder and anxiety disorders. This

indicates a bidirectional relationship in which psychological disorders associate with poor sleep quality and vice versa. Additionally, studies have found there to be a relationship between poor sleep and suicidality among adolescents (Gong et al., 2021), college students (Becker et al., 2018b; Supartini et al., 2016), and older adults (Bernert, et al., 2015). It is suggested that various factors, such as trauma exposure and post-traumatic stress disorder (PTSD) may strengthen the association between sleep disturbance and suicidality (Betts et al., 2013; King et al., 2021).

Another factor associated with both poor sleep and psychological distress is substance use (Kenney et al., 2013). Substance use has been found to be significantly associated with both poor sleep quality (Barahona-Correa et al., 2018; Navarro-Martinez et al., 2020) and anxiety and depression (Esmaealzadeh et al., 2018) in college students. One experimental study among moderate social drinkers with insomnia showed that low doses of alcohol before bed initially improved sleep duration, but after five consecutive days of consuming alcohol, the participants developed tolerance, and the same dose of alcohol no longer improved their sleep quality (Roehrs & Roth, 2018). On the contrary, other studies have found frequent (Valerio et al., 2016) and heavy alcohol use to be associated with poor sleep quality (Chaudhary et al., 2015).

In addition to alcohol use, studies report a negative correlation between cannabis use and sleep quality (Babson et al., 2013; Ogeil et al., 2015). Drazdowski, Kliewer, and Marzell (2019) found greater use marijuana as a sleep aid associated with poor sleep efficiency. Those who report using marijuana as a sleep aid are at an increased likelihood of problematic marijuana use. Illicit drugs ecstasy, methamphetamine, cocaine, and heroin have additionally been shown to negatively relate to sleep quality (Liao et al., 2011; Mahoney III et al., 2014; Ogeil, Rajaratnam et al., 2013). However, these relationships may be moderated by drug quantity consumed (Mahoney III et al., 2014). Likewise, prescription drug use and misuse negatively impact sleep

quality (Clegg-Kraynok et al., 2011; Hartwell et al., 2014). For example, prescription stimulant use and misuse are common among college students. Evidence associates this behavior with worst subjective sleep quality and more sleep disturbances than nonusers (Clegg-Kraynok et al., 2011).

Findings in the literature demonstrate a relationship between psychological distress, substance use, and sleep quality (Begdache et al., 2019; Babson et al., 2013; Kenney et al., 2012). However, there is a gap of research that considers all these three variables together. Among the few studies that did investigate these co-factors, poor mental health and depression were related to sleep quality and substance use which included alcohol and cannabis, respectively (Babson et al., 2013; Kenney et al., 2012). Interestingly, Babson and colleagues' study showed that participants with high levels of depression had higher levels of problematic cannabis use if they also reported good sleep quality (Babson et al., 2013). It was speculated that this might be due to the reported cannabis effect on short-term sleep improvement. This short-term improvement in sleep benefit may be dangerous for people with chronic depression because it might promote dependence. Both these studies were conducted in the United States, specifically on the West Coast. However, only Kenney and colleagues (2012) studied a student population.

Existing studies collectively investigating, substance use, sleep quality, and psychological distress have failed to include substances outside of cannabis and alcohol. For example, Kenney and colleagues (2012) only focused on alcohol in college students, and there is a need to investigate additional substances commonly found in universities such as prescribed stimulants or marijuana (Arria et al., 2017). Whereas Babson et al. (2013) did include other drugs such as cocaine and prescribed medication, they did not use a college sample, so the type of drug might

differ between target populations. Finally, another aspect that should be examined in isolation is use of sleep aid medication. Specific control of formal sleep aid medications can aid in our understanding of the relationships between sleep quality, psychological distress, and substance use.

Therefore, this study aims to explore how substance use and psychological distress are associated with the sleep quality of college students. In addition, we look to answer the following research questions:

1. Is there an association between drug use, suicidal ideation, depression, and sleep quality?
2. Are drug users more likely than non-drug users to report use of sleep aids (prescribed or non-prescribed)?

For this study we hypothesized:

H_{10} = There is no association between substance use, suicidality, depression, and sleep quality.

H_{11} = Substance use, suicidality, depression, are negatively associated with sleep quality.

H_{20} = There is no association between substance use and use of sleep aids (prescribed or non-prescribed).

H_{21} = Drug users are more likely than non-drug users to report use of sleep aids (prescribed or non-prescribed).

The few research studies that have analyzed substance use, psychological distress, and sleep quality have designed models to demonstrate that psychological distress predicts substance use mediated by sleep quality (Babson et al., 2013; Kenney et al., 2012). However, due to the nature of the cross-sectional study, they lack causality. Our rationale of not constructing a model lies on the need for a prospective investigation to determine directionality.

One delimitation of this study is that results can only be generalized to college students ages 18-23. Furthermore, limitations include that the data is cross-sectional, it was collected at one point in time and cannot result in causal inferences. Also, social desirability and bias could have occurred, especially when the survey included questions related to substance use and psychological distress.

Chapter 2: Literature Review

Substance use and sleep quality

Alcohol and marijuana have been found to have a strong relationship with sleep quality (Ogeil et al., 2015). Haario and colleagues (2013) investigated the bidirectional relationship between insomnia and unhealthy behaviors (including smoking, heavy and binge drinking, physical inactivity, and unhealthy food habits). They found a high prevalence of insomnia in women who reported heavy and binge drinking. Along with this result, another study found that participants who reported both risky drinking and cannabis use also reported higher sleep problems. Following participants with both behaviors, participants with risky alcohol consumption reported more sleep problems than cannabis users (Ogeil et al., 2015).

Besides alcohol and cannabis, other studies demonstrated this negative association with sleep quality with other substances such as ecstasy (Ogeil et al., 2013), prescribed opioids (Hartwell et al., 2014), and tobacco (Zhabenko et al., 2016). On the contrary, other studies discovered an association between cannabis use and short-term improvement in sleep quality (Babson et al., 2013) and alcohol (Roehrs & Roth, 2018), or there was a lack of evidence of a significant relationship between substance use and sleep quality (Valerio et al., 2016).

Furthermore, negative effects on sleep quality have been observed for students using substances. One study examined predictors of poor sleep quality in a large population of college students in a Midwestern university in the United States. They found that poor-quality sleepers reported more physical and psychological issues than did good-quality sleepers. The poor-quality sleepers also reported higher consumption of alcohol per day (Lund et al., 2010). Similarly, another study found alcohol and smoking as predictors of poor sleep quality in college students (Yildirim et al., 2020). Nevertheless, alcohol has been found to be used as a sleep aid.

Goodhines and colleagues (2017) looked at not only alcohol but also marijuana, and/or over-the-counter medication as means of self-medication for sleep. They found an association between the use of alcohol and marijuana as a sleep aid with changes in negative drinking consequences, but not in insomnia symptoms. The most popular sleep aid was over-the-counter medications (16%) and marijuana (15%), rather than alcohol (10%) (Goodhines et al., 2017). Consistent with this result, another study showed that half of their participants used marijuana to help with sleep. However, they found that marijuana did not help with sleep efficiency (Drazdowski et al, 2021). The problem with the use of substances as a sleep aid is to the risk of developing dependency.

In addition, another substance that affects the quality of sleep of college students is tobacco. Adults diagnosed with DSM-5 tobacco use disorder were more likely to report short sleep duration (Hayley et al., 2017). One important factor is the number of cigarettes, or the frequency smoked. For instance, Zunhammer and colleagues (2014) found that smoking 20 cigarettes weekly was associated with poor sleep quality reflected by a higher Pittsburgh quality of sleep index score. Similarly, Moura de Araújo and colleagues (2014) found daily smoking to be correlated with poor sleep.

Prescribed drugs and sleep quality

Alamir and colleagues (2019) investigated the relationship between nonmedical use of prescription drugs (NMUPD) and subjective sleep quality in college students. They found that students who reported nonmedical use of painkillers reported poor sleep quality by having fewer days of getting enough sleep, more days of early awakening, more days of daytime sleepiness, and difficulty falling asleep. Another study looked at prescription opioid (PO) dependence and sleep disturbances in individuals (Alamir et al., 2019). Besides the participants with PO dependence, they also had a healthy control group. They found that in comparison with the

control group, the participants with PO dependence showed lower total time asleep, sleep efficiency, greater latency of onset sleep, total time awake, and time mobile (Hartwell et al., 2014). Alternatively, Harwell et al (2014) did not include college students as their sample size; however, it was a relevant article found in the literature review. There is a lack of research on the use of opioids and sleep impairments in college students.

Apart from opioids, another important substance found in the literature and relevant to college students is prescribed or non-prescribed psychostimulant medication. Clegg-Kraynonet al. (2011) looked at the sleep quality of students who used psychostimulant medications nonmedically. These included Ritalin, Adderall, Dexedrine, DextroStat, Provigil, and Nuvigil. They found that students who used these psychostimulant medications nonmedically had lower sleep quality and more sleep disturbances than nonusers. It is important to highlight that they excluded participants who were prescribed psychostimulant medications but had not to use them for any other purpose other than medical. Also, the most frequent reason behind using psychostimulant medications was to enhance study/work performance (41.4%). Therefore, students might tend to have poorer sleep quality because they are using the psychostimulant medication to prevent sleeping and improve their work.

Psychological distress and sleep quality

The 2018-2019 Healthy Minds Networks Study, a web-based cross-sectional survey that examines mental health in undergraduate and graduate students, reported that 36% of students had major or moderate depression, 31% had elevated levels of generalized anxiety, 37% of lifetime diagnoses of mental disorders (Healthy Minds Network, 2019). Additionally, 2020 and 2021 have been challenging to students regarding mental health because of the COVID-19 pandemic. The Healthy Minds Network in collaboration with the American College Health

Association conducted a study on the impact of COVID-19 on college students' well-being. They found that mental health conditions have remained high. Comparing it with the date from 2019, the prevalence of depression was higher (The Healthy Minds Network and American College Health Association, 2020). Similarly, Active Minds, a non-profit organization that works with mental health on college campuses, reported that in 2020, students surveyed experienced increased levels of stress (84.25%), anxiety (82.35%), sadness (73.3%), and depression (60.7%) since the beginning of the pandemic (Active Minds, 2020).

The most frequent psychological disorders experienced on college campuses include depression, anxiety, stress, and suicidality. These factors have been collectively examined by existing studies. For instance, one study in a college campus in Ohio, United States, looked at the correlation between depression, anxiety, and stress. They found that 11% of students surveyed reported symptoms of severe or extremely severe levels of stress, 15% reported severe or extremely severe anxiety and 11% severe or extremely severe depression. They also ranked the top ten sources of stress which included academic performance, pressure to succeed, post-graduation plans, financial concerns, quality of sleep, relationship with friends, relationship with family, overall health, body image, and self-esteem (Beiter et al., 2015). On a more global scale, the World Health Organization examined mental health in college students in 21 countries. The results showed that the most prevalent disorders were anxiety disorders (14.7%) followed by mood disorders (9.9%), substance disorders (6.7%), and behavioral disorders (5.3%) (Auerbach et al., 2016).

Ultimately, one of the most pressing issues on college campuses is suicide. According to the Center for Disease Control and Prevention (2021) suicide is the second leading cause of

death among people aged 10-34. The Healthy Minds Study Fall 2020 reported that 13% of students had suicidal ideation (The Healthy Minds Network, 2021).

As previously mentioned, depression is one of the psychological factors that are more prevalent in college students which can be a risk factor for suicide. The literature showed a pattern in common among depression, sleep quality, and suicidality. This pattern finds an association between poor sleep quality or sleep disturbances and suicide and depression being a mediator. Higher levels of depression contribute to the likelihood of suicide ideation (Bozzay et al., 2016). Bernet and colleagues (2017) looked at the parameters of disturbed sleep as a warning sign of suicidal ideation. They found sleep disturbances (e.g., insomnia, nightmares) predicted acute suicidal ideation independently of depression levels. Furthermore, there have been limitations in this direct connection. For instance, one longitudinal study looked at the relationship between sleep, depression, and suicide in young adults and found that participants who reported fewer hours of sleep (4-6 hours) had a higher risk of suicide as well as those who required sleeping pills to fall asleep. However, they did not measure any psychological disorder that could have mediated this association (Gunnell et al., 2013). Overall, the literature showed a bidirectional relationship between psychological distress and sleep quality. Psychological distress can also add another element of suicide which might be directly related to poor sleep but most likely to be mediated by depression or other psychological disorders.

The literature has shown a relationship between substance use, psychological distress, and sleep quality (Begdache et al., 2019; Babson et al., 2013; Kenney et al., 2012). Many have associated psychological distress and sleep quality as a bidirectional relationship. One way is in which sleep problem is a symptom psychological disorders such as generalized anxiety and depression (5th ed.; DSM-5; American Psychiatric Association, 2013). In contrast, other studies

found anxiety, depression, and stress positively correlated with poor sleep (Zou et al., 2020). Furthermore, substance use has also been associated with sleep quality. Specifically, alcohol and marijuana are mostly found in the literature as being used as sleep aid (Dradowski et al., 2019; Lund et al., 2010). However, this presents a risk for dependence since studies have shown that years of use compared to quantity is associated with poor sleep (Liao et al., 2011). In addition, studies have found a significant association between psychological distress and substance use (Esmaeelzadeh et al., 2018). Young adults with recent history of mental health issues were more likely to have used illicit drugs, engage in drinking or smoke according to the National Survey on Drug Use and Health (2018). Finally, these three variables have an association between them, and there have been fewer studies that have looked at the relationship between the three of them. What these studies have found psychological distress to be a predictor of sleep quality which then has an impact on negative substance use (Babson et al., 2013; Kenney et al., 2013).

Chapter 3: Methods

Participants and Procedures

The current study will utilize data collected by Davis, Doyle, and Nahar (2019) using a cross-sectional survey design. Participants included students from a large university located in the south-central United States. Students were recruited via convenience sampling from general education classrooms and through a link posted in the University's daily news email. Data was collected in 2019. Participants were notified that by clicking on the study link, they were providing consent to participate. As an incentive for participation, students were given the option of entering a drawing for a chance to win a \$20 gift card. To address any risk, after the students completed the survey, they were provided with information and a link to free mental health and substance use resources available to students through the University's student health center. The Institutional Review Board at the University of Arkansas approved the study design and protocol.

Measures

Participant's Characteristics

Measured participant characteristics included biological sex (male/female), racial minority status (White/Minority), age (open ended), sexual minority status (heterosexual/other), employment status (yes or no), academic classification in school (freshman to graduate student), fraternity or sorority affiliation (yes/no), grade point average (open ended). These covariates were selected based on a previously identified relationship with depression and suicidality (Abdalla et al., 2019; Barnett et al., 2019; Lamis et al., 2014; Wilcox et al., 2010). Please see Appendix A for all items included in the survey.

Sleep Quality

Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI). Developed by Buysse et al (1989), the PSQI consists of a 19-question self-report scale that evaluates sleep quality in seven domains over a one-month period. These domains include subjective sleep quality, latency, sleep duration, habitual sleep efficiency, sleep disturbances, sleep medication, and daytime dysfunction. Participants rate each domain on a 0-3 Likert scale (0 = *Not during the past month*, 1 = *Less than once per week*, 2 = *Once or twice per week*, 3 = *Three or more times a week*), and the sum of all domains yield a global PSQI score (range from 0-21), with higher scores indicating worse sleep quality. Internal consistency of the PSQI in the present study was $\alpha = 0.65$.

Drug Use

To assess drug use, participants answered how often in the past 12 months they had used the following type of drugs: cocaine, marijuana, ecstasy, methamphetamine, heroin, as well as misuse of prescription opioids, stimulants, tranquilizer, and sedative drugs. For the items assessing prescription medication misuse, participants were provided with examples of common drugs for each prescription drug category. They were also provided with a brief explanation about misuse which stated: "Prescription drug misuse refers to use of prescription medication in a way not specifically directed by a doctor. By this, we mean any use without your own prescription, for recreational purposes, taking a higher dose than prescribed, using more frequently than directed or continued use despite no longer experiencing the problem for which it was prescribed." Sample questions included: "On how many occasions in the past 12 months have you used prescription stimulant medications in a way that was not specifically directed by a doctor? (i.e., Adderall, Ritalin, Concerta, Dexedrine, or other such stimulants)" and "On how

many occasions in the past 12 months have you used prescription Sedative medications in a way that was not specifically directed by a doctor? (i.e., Ambien, Lunesta, Sonata, Zaleplon, Zolpidem, or other such sedatives)”. Responses to drug use items were coded on a 1-7 scale with options ranging from 1 “never” to 7 “40 or more occasions”. Students who answered “never” to the drug-related question did not receive questions regarding depression and, subsequently, were not included in the current study.

Depression

Depression was measured using The Patient Health Questionnaire – 9 (PHQ-9) (Kroenke et al., 2011). The PHQ-9 consists of a nine-item scale measuring the presence of specific depressive symptoms. The questionnaire asks participants to rate from “0” (not at all) to “3” (nearly every day) different problems that have bothered them in the last two weeks. Some of the statement problems included “*little interest or pleasure in doing things*”, “*feeling down, depressed, or hopeless*”, “*feeling bad about yourself, that you are a failure, or have let yourself or your family down*” and “*trouble falling or staying asleep or sleeping too much*”. Cronbach’s alpha for our sample was within the acceptable range (alpha = 0.83).

Suicidality

Suicidality was measured using two questions that assessed suicide planning and attempts and one related to suicidal ideation. The specific questions included “*At any point in the past 12-months have you made a plan to commit suicide?*” and “*At any point in the past 12-months did you attempt suicide?*” to which participants responded with ‘yes’ or ‘no’ and “*How often have you seriously thought about committing suicide over the past 12 months?*” with the response options 1=never, 2=rarely, 3=often, or 4=nearly every day.

Self-Stigma

Self-stigmatizing beliefs regarding personal drug use were measured using an 8-item scale (Bozinoff et al., 2018) adapted from the depression self-stigma scale (Kanter et al., 2008). This scale measures the internalization of stigma and shame by the drug user from the perceived negative stigmatizing beliefs of others. This scale was validated in a non-student sample and, as such, was evaluated based on face and content validity by an expert panel and deemed appropriate for use in the current study. Sample items read, *“Others view me as morally weak because I use drugs”*, *“People’s attitudes about drugs make me feel worse about my life”*, *“Others think that I am not worth the investment of their time and resources because I use drugs”*, and *“Some people who know I use drugs have grown more distant from me”*. Responses to these items were recorded on a (1-7) scale ranging from 1 “completely disagree” to 7 “completely agree”. In the current study, Cronbach’s alpha for the self-stigma subscale was 0.90.

Data Analysis

All analytic procedures were carried out in IBM Statistical Package for Social Sciences (SPSS) v. 25. Descriptive statistics were calculated to reflect the characteristics of the study sample. To investigate the relationships between substance use, suicidality, depression, and sleep quality bivariate and multivariate techniques will be applied. Specifically, correlation analyses will be used to determine an association between variables. Next, binomial logistic regression will examine the relationship between variables of interest and sleep quality, while adjusting for important covariates. For model building, only those variables exhibiting a significant association to sleep quality will be included. The outcome variable “sleep quality” will be constructed dichotomously to reflect a positive screen for poor sleep quality (i.e., score ≥ 5 on

the PSQI). To examine the relationship between use of sleep aids and drug use, chi square test of association will be applied. To further examine the relationship between substance use and sleep quality, point biserial correlations will examine 7 individual components of sleep quality and their relationship to specific forms of substance use.

Results

After excluding participants with missing information for sleep quality, a total of 555 students remained for the analysis. As summarized in Table 1, the average age was 21.96 years, and more than fifty percent were females ($n = 360$). Most participants were white/Caucasians (66.3%), and the majority were employed. There was a fair distribution among the academic classes (e.g., freshman-graduate student), and the average GPA was 3.44. Furthermore, 63.8% of the sample reported non-sanctioned drug use (i.e., illicit drug use or prescription drug misuse). In addition, 47% ($n = 265$) of students reported indicators of depression, while 43.1% ($n = 239$) reported suicidal ideation.

Moreover, Table 1 shows the bivariate association between the study variables and poor sleep quality. Within the demographic variables, employed students were less likely to present with poor sleep quality ($OR: 0.62, 95\% CI: 0.39-0.99$). Importantly, participants engaging in cocaine ($OR: 12.81, 95\% CI: 3.98-41.16$) and ecstasy ($OR: 10.70, 95\% CI: 3.32-34.43$) use were significantly more likely to present with poor sleep quality. In addition, depression was significantly associated with poor sleep quality ($OR: 21.92, 95\% CI: 8.74-55.01$).

Bivariate correlations between poor sleep quality and psychological distress are shown in Table 2. Poor sleep quality was positively associated with depression, suicidal ideation, suicidal planning, and suicidal attempt. In particular, depression was the strongest correlate of poor sleep

quality and also correlated strongly with suicidal ideation ($r = 0.538, p < 0.001$) and planning ($r = 0.412, p < 0.001$) and attempts ($r = 0.336, p < 0.001$).

A multivariable model was constructed with IVs that exhibited a significant bivariate relationship to poor sleep quality, (Table 3). Step 1 of this model included the demographic variables racial minority, GPA, sexual minority, and employment. GPA and sexual minority were significantly correlated to poor sleep quality. In step 2, substance use variables were added. After adjustment, significance was observed for cannabis use and prescribed opioids. Next in step 3, depression, suicidal ideation, and diagnosed psychological disorder were analyzed along with control variables. Herein, opioid prescription misuse and depression were significant predictors of poor sleep quality. Depression was associated with the largest increase in adjusted odds ($AOR = 8.998, 95\% CI: 3.277$ to $24.709, p < 0.001$) followed by prescription opioid misuses ($AOR = 5.759, 95\% CI: 1.125$ to $29.478, p = 0.036$). This model explained 36.2% of variance in poor sleep (Nagelkerke $R^2 = 0.362, X^2 = 141.02, p < 0.001$). We observed a moderate increase in the Nagelkerke R^2 . The initial model containing the lower-order terms resulted in Nagelkerke R^2 of 0.103, which improved to 0.241 with the inclusion substance use factors in step 2 and 0.362 in step 3 with addition of the psychological distress variables. The variables suicide planning and attempts, as well, as heroin and methamphetamine were not included in logistic modeling because of perfect or near perfect separation.

Table 4 shows correlations between sleep quality components and substance use. Heroin, methamphetamine use, and prescription tranquilizer misuse were correlated with the total PSQI score. In addition, binge drinking, cannabis, cocaine, ecstasy, heroin, methamphetamine use, prescription opioid, sedative, stimulant, and tranquillizer misuse were positively associated with use of sleep medication. Strong correlation was found between all the substances, except for

alcohol use and binge drinking, with sleep disturbances and daytime dysfunction. Surprisingly, none of the substance use or misuse variables were significantly correlated with sleep duration. Furthermore, we found that substance users and misusers had 2.38 times the odds of using sleep medication than the non-users ($X^2 = 7.82, p = .005, OR = 2.38$).

Though not an initial aim of this study, we chose to further explore psychological distress among this sample by inclusion of an additional variable, substance-related self-stigmatizing beliefs. The data set being used for this study included substance-related self-stigmatization measures for each participant reporting substance use which applied to the majority of our sample. Because we observed such a large representation of substance use and strong correlations between sleep quality, substance use, and depression and suicidality we theorized that self-stigmatization could better explain the existence of sleep quality and psychological distress measures among substance users. Thus, we conducted a series of *t*-tests between self-stigmatic beliefs and poor sleep as well as variables representing psychological distress (Table 5). Importantly, self-stigma significantly differentiated between substance users with poor sleep, depression, suicidal ideation, suicidal plans, and suicidal attempts. Observed mean differences were relatively large between self-stigmatic beliefs for each test conducted.

Discussion

Results of the current study make an important contribution to the limited research examining substance use, depression, suicidality, and sleep quality in college students. Findings suggest that poor sleep quality is associated with all measured forms of substance use, depression, suicidal ideation, planning and attempt. Our finding regarding poor sleep quality and depression is consistent with prior findings that suggest depression is associated with poor sleep quality on college students (Barahona et al., 2018; Becker et al., 2018a; Zou et al., 2020). We

observed a strong relationship between sleep quality and depression. Depression was also strongly correlated with measured suicidality variables which may highlight depressive symptomatology as a focal concern triangulating variables of interest within this investigation. Moreover, depression and suicidal ideation were strongly correlated which adds to the growing body of literature pointing depression as a risk factor of suicidal ideation (Bernet et al., 2017; Bozzay et al., 2016; Gunnell et al., 2013).

Furthermore, after accounting for covariates, depression was the strongest predictor of poor sleep quality. We observed a drastic increase in explained variance in step 3 of our hierarchical modeling, and we observed depression still being positive associated with poor sleep quality. This result was consistent with previous research that suggest positive correlation between PSQI scores and depression (Zou et al., 2020). Another factor found to be strongly associated with poor sleep quality after adjustment was opioid prescription misuse. This may suggest uniquely influential characteristics of prescription opioid drugs, or the individuals who take them, in relation to sleep quality. This finding is consistent with the literature demonstrating a significant correlation between prescribed opioid dependent individuals and poor sleep quality (Hartwell et al., 2014).

In relation to substance use, we found all substances to be associated with poor sleep quality in our bivariate analysis. However, they were not significantly related to the continuous variable of sleep quality. In addition, we found all substances – with the exception of alcohol and binge drinking – to be correlated with sleep disturbances and daytime dysfunction. It is important to mention that one strength of this study was the inclusion of all aspects of sleep quality included in the PSQI and their relationship to different varieties of substances, which were lacking in previous studies. Poor sleep overall through the total PSQI score was associated with

heroin, methamphetamine use, and prescribed tranquilizer misuse. Drugs such as cocaine, heroin, and methamphetamine were strongly correlated with poor sleep given the excitatory effect they have on individuals (Valentino & Volkow, 2020). However, sedative use was also strongly correlated with poor sleep quality which differs from studies stating that this group of substances improved sleep (Satheesh et al., 2020). This might be explained by the difference in the components of the PSQI. Similar than alcohol, sedative use was associated with poor sleep, but it was not correlated with components of the PSQI such as sleep duration or sleep latency. Contrary to previous literature associating alcohol consumption and poor sleep quality in college students, we found alcohol consumption to be correlated with sleep efficacy, despite it being associated with overall poorer sleep quality. One important finding was that none of the substances were correlated with sleep duration consistent with current literature (Lydon et al., 2016). This might suggest that sleep duration may remain unchanged even in instances where sleep quality may be affected by substance use.

Initially, we had not contemplated the idea of including self-stigmatizing beliefs in the analysis. However, we found a large representation of substance use in our sample and strong correlations between poor sleep, substance, depression and suicidality which led us to analyze the role of self-stigmatizing beliefs since only participants that indicated substance use were asked to answer the substance-related self-stigmatizing beliefs questions. Self-stigma was positively and significantly associated with poor sleep, depression, suicidal ideation, planning, and attempt. This might indicate an important role of self-stigma in substance users in association with poor sleep, depression, and suicidality.

Given the high prevalence of sleep problems in college students, these findings are potentially valuable for institutions to address sleep quality and the overall quality of life of the

students. In our bivariate analysis, all of the substances were significantly associated with poor sleep quality. These findings thus provide support for the need for substance use prevention interventions that include sleep-related factors in order to address these associations. In the same way, we found depression as one of the strongest factors associated with poor sleep quality. Therefore, psychological services in universities should also screen for sleep quality as it may serve as an indicator or additional health related factors. There is a complex interrelationship between sleep, substance use and psychological distress. Targeting a more easily modifiable behavior such as improved sleep habits and hygiene could result in an overall improved quality of life, thereby assisting with efforts aimed at modifying behaviors such as substance use, or interventions for psychological distress. Also, information on sleep quality should be included in programs that address mental health, stress management, general health, and substance use.

Several limitations are important to note and could be used to inform future research. Directionality and causality cannot be determined because this study was cross-sectional in nature. Longitudinal studies will be needed to determine directionality or potential causal relationships. Furthermore, this sample consisted of college students from one geographic area, so our findings are not necessarily generalizable to the United States. Another limitation of the study was the borderline internal consistency reliability ($\alpha = 0.65$) of the PSQI measure in our sample. Even though similar alpha levels (e.g., $\alpha = .65-.69$) have recently been reported for the PSQI in other published studies (Becker et al., 2018; Drazdowski et al., 2021) and an alpha of .65 is considered “minimally acceptable”, it is nonetheless important to interpret findings with this in mind. Next, this study was a secondary analysis drawn from an existing data set. The initial data was collected in order to study relationships between psychological functioning and drug use. Because of this, our sample exhibited a large degree of drug and/or alcohol use which

may impact generalizability to various student populations. Future studies should consider other psychological disorders such as anxiety, PTSD, or bipolar disorder to see if they are also strongly associated with poor sleep quality. Despite the limitations, findings from this study indicate that substance use, depression, and suicidality are associated with poor sleep, and poor sleep might at the same time exacerbates symptoms of depression or suicidality or increase of substance use.

In conclusion, substance use, depression, and suicidality were associated with poor sleep in our student sample. We found depression as an important factor associated with poor quality of sleep. Another key factor found in the association between poor sleep, substance use, depression and suicidality was substance-related stigmatizing-beliefs. The current study expands the literature of sleep quality in college students and its correlation with substance use, depression, and suicidality. These findings may be used to design effective interventions targeting college students who exhibit problematic sleep, psychological distress, and/or substance use-related behaviors.

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Glossary of Terms

Term	Definition
Sleep efficiency	Ratio of total sleep time (TST) to time in bed (TIB) (multiplied by 100 to yield a percentage). When taken literally, TIB includes non-sleep-related activity (e.g., reading, texting, conversing with a partner, watching television) both prior to initiating sleep and after the final awakening (Reed & Sacco, 2016).
Sleep disturbance	Encompass disorders of initiating and maintaining sleep (DIMS, insomnias), disorders of excessive somnolence (DOES), disorders of sleep-wake schedule, and dysfunctions associated with sleep, sleep stages, or partial arousals (parasomnias) (Cormier, 1990, p. 398).
Daytime disfunction	Lack of energy to carry out daily functions and having trouble staying awake.
Sleep duration	Total amount of sleep obtained.
Sleep latency	The length of time it takes from lying down for the night until sleep onset ("Sleep latency," n.d.).

Appendix

Appendix A: Tables

Table 1

Participant Characteristics with Binomial Logistic Regression Models: Unadjusted Associations to Poor Sleep quality (N = 555)

	<i>n (%)</i>	Poor Sleep Quality: <i>OR (95% CI)</i>
Demographics		
Age ^Δ	21.96 (5.45)	0.98 (0.94 – 1.02)
GPA ^Δ	3.44 (0.47)	0.25 (0.14 – 0.46)**
Gender: Female ^R	360 (64.9)	1.27 (0.78 – 2.05)
Male	195 (35.1)	
Racial minority	187 (33.7)	1.73 (1.03 – 2.90)*
Caucasian/White ^R	368 (66.3)	
Sexual minority	426 (76.8)	2.79 (1.40 – 5.57)*
Heterosexual ^R	129 (23.2)	
Employed	320 (57.7)	0.62 (0.39 – 0.99)*
Unemployed ^R	235 (42.3)	
Greek affiliated	175 (31.5)	1.04 (0.64 – 1.70)
Non-Greek ^R	380 (68.5)	
Academic class		
Freshman ^R	88 (15.9)	-
Sophomore	164 (29.5)	1.18 (0.56 – 2.49)
Junior	104 (18.7)	0.73 (0.34 – 1.56)
Senior	101 (18.2)	1.08 (0.476 – 2.44)
Graduate student	98 (17.7)	0.57 (0.27 – 1.20)
Drug use		
Alcohol	462 (83.2)	1.77 (1.03 – 3.04)*
No use ^R	93 (16.8)	
Binge drinking	405 (73.0)	1.79 (1.11 – 2.87)*
No binge ^R	150 (27.0)	
Cannabis	303 (54.6)	3.48 (2.14 – 5.66)**
No use ^R	252 (45.4)	
Cocaine	144 (25.9)	12.81 (3.98 – 41.16)**
No use ^R	411 (74.1)	
Methamphetamine	107 (19.3)	0.80 (0.76 – 0.84)**
No use ^R	448 (80.7)	
Ecstasy	127 (22.9)	10.70 (3.32 – 34.43)**
No use ^R	428 (77.1)	
Heroin	107 (19.3)	0.80 (0.76 – 0.84)**
No use ^R	448 (80.7)	
Prescription drug misuse		
Opioids	161 (29.0)	23.20 (5.64 – 95.44)**
No misuse ^R	394 (71.0)	
Stimulants	187 (33.7)	5.00 (2.52 – 9.89)**

Table 1 Participant Characteristics with Binomial Logistic Regression Models: Unadjusted Associations to Poor Sleep quality continued

No misuse ^R	368 (66.3)	
Sedatives	136 (24.5)	36.93 (5.09 – 267.74)**
	<i>n (%)</i>	Poor Sleep Quality: <i>OR (95% CI)</i>
No misuse ^R	419 (75.5)	
Tranquilizers	155 (27.9)	10.49 (3.78 – 29.13)**
No misuse ^R	400 (72.0)	
Psychological variables		
Depression	265 (47.7)	21.92 (8.74 – 55.01)**
No depression ^R	290 (52.3)	
Suicidal ideation	239 (43.1)	7.03 (3.65 – 13.54)**
No ideation ^R	316 (56.9)	
Suicide plans	86 (15.5)	4.67 (1.67 – 13.08)*
No plans ^R	469 (84.5)	
Suicide attempts	68 (12.3)	0.81 (0.78 – 0.85)**
No attempts ^R	487 (87.7)	
Psychological disorder	198 (35.7)	3.98 (2.15 – 7.37)**
No diagnosis ^R	357 (64.3)	

^RReference category. ^ΔContinuous variable: statistics presented are mean and standard deviation.
GPA = grade point average.

* $p < 0.05$

** $p < 0.001$

Table 2*Correlation Matrix of Poor Sleep and Indicators of Psychological Distress*

Variable	1	2	3	4	5
1. Poor Sleep Quality	-	0.375**	0.277**	0.136*	0.165**
2. Depression		-	0.538**	0.388**	0.336**
3. Suicidal ideation			-	0.412**	0.341**
4. Suicidal planning				-	0.341**
5. Suicide attempt					-

Correlations presented in the form of Cramer's V. All variables are dichotomous.

**p < 0.001

*p < 0.01

Table 3
Multivariable Logistic Regression of Factors Associated with Poor Sleep Quality

Variable	<i>Nagelkerke R²</i>	<i>Hosmer & Lemeshow</i>	<i>SE</i>	<i>Odds Ratio</i>	<i>95% CI</i>	<i>p</i>
Step 1	0.103*	0.493				
Racial Minority			0.281	1.155	0.665 – 2.005	0.609
GPA ^Δ			0.313	0.300	0.162 – 0.553	< 0.001
Sexual Minority			0.360	2.286	1.129 – 4.628	0.022
Employment			0.248	0.628	0.386 – 1.021	0.061
Step 2	0.241*	0.556				
Racial Minority			0.302	0.826	0.457 – 1.493	0.527
GPA ^Δ			0.338	0.553	0.285 – 1.073	0.080
Sexual Minority			0.393	1.338	0.619 – 2.892	0.459
Employment			0.260	0.613	0.369 – 1.020	0.060
Alcohol			0.407	1.733	0.781 – 3.845	0.176
Binge drinking			0.362	0.711	0.350 – 1.446	0.347
Cannabis			0.309	1.891	1.032 – 3.465	0.039
Cocaine			0.779	1.665	0.362 – 7.658	0.513
Ecstasy			0.825	0.684	0.136 – 3.447	0.645
Rx opioids			0.800	6.340	1.321 – 30.424	0.021
Rx sedatives			1.097	7.546	0.879 – 64.770	0.065
Rx stimulants			0.434	0.925	0.395 – 2.165	0.857
Rx tranquilizers			0.648	1.433	0.402 – 5.102	0.579
Step 3	0.362*	0.856				
Racial Minority			0.324	0.831	0.440 – 1.568	0.567
GPA ^Δ			0.353	0.666	0.333 – 1.331	0.250

*Table 3 Multivariable Logistic Regression of Factors Associated with Poor Sleep Quality
Continued*

Variable	<i>Nagelkerke R²</i>	<i>Hosmer & Lemeshow</i>	<i>SE</i>	<i>Odds Ratio</i>	<i>95% CI</i>	<i>p</i>
Sexual Minority			0.450	0.915	0.379 – 2.209	0.843
Employment			0.274	0.583	0.341 – 0.997	0.049
Alcohol			0.434	1.951	0.833 – 4.569	0.124
Binge drinking			0.394	0.749	0.346 – 1.621	0.463
Cannabis			0.331	1.565	0.817 – 2.994	0.177
Cocaine			0.837	1.117	0.216 – 5.760	0.895
Ecstasy			0.878	0.718	0.128 – 4.008	0.705
Rx opioids			0.833	5.759	1.125 – 29.478	0.036
Rx sedatives			1.121	3.884	0.431 – 34.985	0.226
Rx stimulants			0.454	1.116	0.458 – 2.719	0.808
Rx tranquilizers			0.688	0.745	0.193 – 2.871	0.669
Depression			0.515	8.998	3.277 – 24.709	< 0.001
Suicidal ideation			0.401	1.709	0.779 – 3.751	0.181
Diagnosed psychological disorder			0.372	1.714	0.826 – 3.556	0.148

^ΔContinuous variable. For dichotomous variables, the absence of the listed variable serves as reference group. SE = standard error. CI = confidence interval.

Table 4*Correlations between sleep quality components and substance use*

	Total PSQI	Subjective sleep quality	Sleep latency	Sleep duration	Habitual sleep efficiency	Sleep disturbances	Use of medications for sleep	Daytime dysfunction
Alcohol use	-0.03	-0.02	0.08	0.01	0.092*	0.02	-0.03	0.04
Binge drinking	0.02	0.04	0.10*	-0.05	-0.016	0.08	0.13*	0.07
Cannabis use	0.03	0.12*	0.12*	0.08	0.089*	0.26**	0.23**	0.19**
Cocaine use	0.07	0.13*	-0.01	0.01	-0.132*	0.42**	0.33**	0.26**
Ecstasy use	0.05	0.14*	0.00	0.05	-0.135*	0.39**	0.34**	0.26**
Heroin use	0.116*	0.14*	0.01	0.03	-0.166**	0.41**	0.41**	0.26**
Methamphetamine use	0.10*	0.14*	0.01	0.05	-0.144**	0.41**	0.37**	0.24**
Prescription opioid misuse	0.06	0.15*	0.06	0.07	-0.073	0.41**	0.35**	0.27**
Prescription sedative misuse	0.08	0.19**	0.08	0.04	-0.069	0.42**	0.35**	0.30**
Prescription stimulant misuse	0.02	0.10*	0.04	-0.02	-0.058	0.31**	0.28**	0.21**
Prescription tranquilizer misuse	0.11*	0.14*	0.10*	0.01	-0.116*	0.41**	0.35**	0.25**

Correlations presented are point-biserial correlations.

**p < 0.001

*p < 0.05

Table 5

Test of Group Differences in Self-stigmatic Beliefs by Poor Sleep and Psychological Dysregulation

Self-stigma	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>Mean difference</i>	<i>t</i>	<i>p</i>
Poor sleep	317	21.06	11.50	11.68	13.41	< 0.001
Quality sleep	37	9.00	2.51			
Depression	214	24.48	10.91	11.73	11.41	< 0.001
No depression	140	12.74	8.39			
Suicidal ideation	188	25.03	10.70	11.07	10.36	< 0.001
No ideation	166	13.96	9.40			
Suicidal plans	75	29.01	7.85	11.64	10.37	< 0.001
No plans	279	17.37	11.09			
Suicidal attempts	68	31.71	6.85	14.69	14.14	< 0.001
No attempts	286	17.01	10.56			

†Welch's t-test.

Appendix B: Survey

Demographics

Sex

- a. Male
- b. Female

Age _____yrs.

Race

1. White/Caucasian
2. Black or African American
3. Hispanic
4. Asian
5. Native American or Alaskan
6. Other

Do you identify as a member of a sexual minority group such as LGBTQ (i.e. lesbian, gay, bisexual, transgender, or queer).

1. Yes
2. No

Are you currently a member of a fraternity or sorority?

1. Yes
2. No

What is your academic classification at the University?

1. Freshman
2. Sophomore
3. Junior
4. Senior
5. Graduate student

To the best of your knowledge, what is your current grade point average (GPA)?

1. (._.) *Example (3.2)*

In addition to being a student, are you currently employed?

1. Yes
2. No

Have you ever been diagnosed by a doctor with a depressive or other mental health disorder?

- a. Yes
- b. No

Prescription Medication Misuse

The following questions will refer to “use of prescription medication in a way that was not specifically directed by a doctor”. By this we mean any of the following;

- Use of these drugs without your own prescription.

- Taking a higher dose than was prescribed.
- Using more frequently than directed.
- Continued use despite no longer having the problem for which the drug was prescribed.

On how many occasions in the past 12 months have you used prescription opioid pain relieving medications in a way that was not specifically directed by a doctor? (i.e., opioids like Vicodin, OxyContin, Percocet, Darvocet, buprenorphine, morphine, hydrocodone, oxycodone, methadone, fentanyl, or other such opioids)

1. Never
2. 1 – 2 occasions
3. 3 – 5 occasions
4. 6 – 9 occasions
5. 10 – 19 occasions
6. 20 – 39 occasions
7. 40 or more occasions

On how many occasions in the past 12 months have you used prescription Stimulant medications in a way that was not specifically directed by a doctor? (i.e., Adderall, Ritalin, Concerta, Dexedrine, or other such stimulants)

1. Never
2. 1 – 2 occasions
3. 3 – 5 occasions
4. 6 – 9 occasions
5. 10 – 19 occasions
6. 20 – 39 occasions
7. 40 or more occasions

On how many occasions in the past 12 months have you used prescription Sedative medications in a way that was not specifically directed by a doctor? (i.e., Ambien, Lunesta, Sonata, Zaleplon, Zolpidem, or other such sedatives)

1. Never
2. 1 – 2 occasions
3. 3 – 5 occasions
4. 6 – 9 occasions
5. 10 – 19 occasions
6. 20 – 39 occasions
7. 40 or more occasions

On how many occasions in the past 12 months have you used prescription Tranquilizing medications in a way that was not specifically directed by a doctor? (i.e., Xanax, Klonopin, Soma, Valium, Clonazepam, Flexeril or other such sedatives)

1. Never
2. 1 – 2 occasions
3. 3 – 5 occasions
4. 6 – 9 occasions

5. 10 – 19 occasions
6. 20 – 39 occasions
7. 40 or more occasions

Use of non-prescription substances

On how many occasions over the past 12 months have you used alcohol?

1. Never
2. 1 – 2 occasions
3. 3 – 5 occasions
4. 6 – 9 occasions
5. 10 – 19 occasions
6. 20 – 39 occasions
7. 40 or more occasions

On how many occasions over the past 12 months have you consumed (four or more alcoholic drinks if you are a woman) or (five or more alcoholic drinks if you are a man) within a 2 hour period?

1. Never
2. 1 – 2 occasions
3. 3 – 5 occasions
4. 6 – 9 occasions
5. 10 – 19 occasions
6. 20 – 39 occasions
7. 40 or more occasions

On how many occasions over the past 12 months have you used cocaine?

1. Never
2. 1 – 2 occasions
3. 3 – 5 occasions
4. 6 – 9 occasions
5. 10 – 19 occasions
6. 20 – 39 occasions
7. 40 or more occasions

On how many occasions over the past 12 months have you used marijuana?

1. Never
2. 1 – 2 occasions
3. 3 – 5 occasions
4. 6 – 9 occasions
5. 10 – 19 occasions
6. 20 – 39 occasions
7. 40 or more occasions

On how many occasions over the past 12 months have you used ecstasy?

1. Never
2. 1 – 2 occasions
3. 3 – 5 occasions

4. 6 – 9 occasions
5. 10 – 19 occasions
6. 20 – 39 occasions
7. 40 or more occasions

On how many occasions over the past 12 months have you used methamphetamine (i.e. meth)?

1. Never
2. 1 – 2 occasions
3. 3 – 5 occasions
4. 6 – 9 occasions
5. 10 – 19 occasions
6. 20 – 39 occasions
7. 40 or more occasions

On how many occasions over the past 12 months have you used heroin?

1. Never
2. 1 – 2 occasions
3. 3 – 5 occasions
4. 6 – 9 occasions
5. 10 – 19 occasions
6. 20 – 39 occasions
7. 40 or more occasions

Suicidality

Have you had thoughts about committing suicide in the past 12 months?

- a. never b. rarely c. often d. nearly every day

At any point in the past 12 months have you made a plan to commit suicide?

- a. Yes b. No

Have you attempted suicide in the past 12 months?

- a. Yes b. No

Self-Stigma Scale Items (1-7 scale) (Only those who acknowledged drug use were presented the stigma scale.

1=completely disagree, 2=mostly disagree, 3=somewhat disagree, 4=neither agree nor disagree, 5=somewhat agree, 6=mostly agree, 7=completely agree

1. Others view me as unable to care for myself because I use drugs.
2. Others view me as morally weak because I use drugs.
3. Others think that I am not worth the investment of time and resources because I use drugs.
4. People have told me that using drugs is what I deserve for how I've lived my life.
5. Since starting to use drugs, I worry about people discriminating against me.
6. When people learn I use drugs, they look for flaws in my character.
7. People's attitudes about drugs make me feel worse about my life.
8. Some people who know I use drugs have grown more distant from me.

Sleep

1. During the past month, when have you usually gone to bed (ex: 11pm)

2. During the past month, how long (in minutes) has it taken you to fall asleep?
3. During the past month, what time have you usually gotten up in the morning?
4. A. how many hours of actual sleep did you get at night?
B. how many hours were you in bed?

The following questions (5 – 8) will be answered on a 0-3 frequency scale.

0 = Not during the past month, 1 = Less than once per week, 2, Once or twice per week, 3 = Three or more times a week.

5. During the past month, how often have you had trouble sleeping because you....
 - A. Cannot get to sleep within 30 minutes
 - B. Wake up in the middle of the night or early morning
 - C. Have to get up to use the bathroom
 - D. Cannot breathe comfortably
 - E. Cough or snore loudly
 - F. Feel too cold
 - G. Feel too hot
 - H. Have bad dreams
 - I. Have pain
 - J. Other reason (s)
6. During the past month, how often have you taken medication (prescribed or over-the-counter) to help you sleep?
7. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?
8. During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?
9. During the past month, how would you rate your sleep quality overall?
(0-3) frequency scale: 0=very good, 1=fairly good, 2=fairly bad, 3=very bad.

Depression

The Patient Health Questionnaire – 9 (PHQ-9) will be use to assess depressive symptoms among the participants. The **9 items** forming the PHQ-9 will be incorporated into the qualtrics survey instrument. These items can be viewed below.

Over the last 2 weeks, how often have you been bothered by any of the following problems?

- Scoring range (0 = not at all) to (3 = nearly every day)
1. Little interest or pleasure in doing things 0 1 2 3
 2. Feeling down, depressed, or hopeless 0 1 2 3
 3. Trouble falling or staying asleep, or sleeping too much 0 1 2 3
 4. Feeling tired or having little energy 0 1 2 3
 5. Poor appetite or overeating 0 1 2 3
 6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down 0 1 2 3
 7. Trouble concentrating on things, such as reading the newspaper or watching television 0 1 2 3
 8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual 0 1 2 3

9. Thoughts that you would be better off dead or of hurting yourself in some way 0 1 2 3

Link to separate survey to record email address for gift card drawing.

Question: Thank you for participating in this survey. Would you like to be entered for a chance to win one of 50 \$20 Amazon gift cards? Please click 'yes' or 'no' below.

The “yes” option will link to a separate survey where one question will ask the participant to enter his/her email address.

Because this survey deals with sensitive topics the link (see below) to the university’s counseling center will follow the above questioning. This will provide the participant with information on available resources they can access if they or someone they know are dealing with substance abuse or mental health issues.

Appendix C: IRB Approval



To: Robert E Davis
BELL 4188

From: Douglas James Adams, Chair
IRB Committee

Date: 11/01/2018

Action: **Exemption Granted**

Action Date: 11/01/2018

Protocol #: 1809144759

Study Title: Prescription drug misuse, self stigmatization and suicidal ideation among college students

The above-referenced protocol has been determined to be exempt.

If you wish to make any modifications in the approved protocol that may affect the level of risk to your participants, you must seek approval prior to implementing those changes. All modifications must provide sufficient detail to assess the impact of the change.

If you have any questions or need any assistance from the IRB, please contact the IRB Coordinator at 109 MLKG Building, 5-2208, or irb@uark.edu.

cc: Nicole A Doyle, Investigator