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Increased mood disorder symptoms, perceived stress, and alcohol use among college students during the COVID-19 pandemic

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The COVID-19 pandemic caused significant disruption during the spring of 2020. Many college students were told to leave campus at spring break and to complete the semester remotely. This study evaluates effects of this disruption on student well-being. A sample of 148 students (86.5% female, 49.3% White) completed measures of psychological symptoms, perceived stress, and alcohol use during the spring 2020 semester at a university in the southeastern U.S. Their results were compared to those of 240 students (87.9% female, 64.2% White) who completed the same measures in the fall 2019 semester. Participants in spring 2020 reported more mood disorder symptoms, perceived stress, and alcohol use than did pre-pandemic participants. Worry about COVID-19 was negatively associated with well-being in multiple domains. Additionally, White students reported a greater effect of the pandemic on well-being than did African American students. Young adults appear to be less vulnerable to the most serious medical complications associated with COVID-19 but nonetheless experience psychological effects from the pandemic. Universities and practitioners who work with college students can help young adults manage their symptoms and avoid behaviors like risky alcohol use when confronted with stressors such as the COVID-19 pandemic.

Keywords: COVID-19, Coronavirus, Depression, Stress, Alcohol, Young adults

## 1. Introduction

The SARS-CoV-2 virus that causes COVID-19 was first detected in China in late 2019 and quickly spread across the globe, causing significant concern for public health as well as disruption to daily life as governments began to restrict citizens' movements and mandate behavioral changes in an effort to reduce the transmission of the virus. On March 17, 2020, the COVID-19 outbreak was declared a national emergency in the United States as the number of cases grew to over 4,000 with a death toll of about 75 (Centers for Disease Control and Prevention, 2020a). This was rapidly followed by an increase in the prevalence of COVID-19 throughout the country, associated strain on medical systems, and a significant increase in deaths attributed to COVID-19. Federal, state, and local leaders responded with orders to close schools and businesses and limit or cancel public gatherings. The impact of COVID-19 on physical health was the primary focus of decisions made during this turbulent time; however, it is also important to consider how experiencing the pandemic affects mental health and well-being. Although young adults appear to be less vulnerable to the worst health complications associated with COVID-19 (Wu & McGoogan, 2020), they are nonetheless impacted as the pandemic may interfere with their academic, occupational, and interpersonal functioning. Accordingly, this study aimed to better understand the psychological well-being of a sample of college students surveyed during the period of mass closures and physical distancing orders in the United States, and to compare this with data collected from a similar sample prior to the emergence of COVID-19.

Research on the psychological impact of previous disease outbreaks offers some insight into what might be expected as a result of the COVID-19 pandemic, though most of this research is focused on individuals who were confirmed to be exposed to the diseases or diagnosed with them rather than those in the general public. Individuals exposed to or infected with MERS (Batawi et al., 2019; Lee et al., 2018), Ebola (Mohammed et al., 2015), and SARS (Mak et al., 2009) reported psychological effects such as traumatic stress symptoms, difficulty concentrating, worry that interfered with sleep, depression, and

a lower quality of life. Even if one does not contract these diseases, being quarantined as a result of exposure appears to have a negative effect on well-being. A review of research on the effects of quarantine reported increases in post-traumatic stress symptoms and anger. It also determined that a longer length of quarantine, limited available information about the crisis, financial loss as a result of the outbreak or quarantine, and stigma in society associated with potential exposure to the disease can all exacerbate these effects (Brooks et al., 2020). Research on the effects of shelter at home orders and similar directives in response to the COVID-19 outbreak is limited, but there is evidence that individuals who are able to keep working experience less negative impact on their mental health than do those who become unemployed (Zhang et al., 2020).

For members of the general public, a pandemic and the associated societal disruption are stressful even when one is not infected or at particularly high risk of exposure to the infection. Community members in Singapore during the SARS outbreak reported elevated rates of post-traumatic stress symptoms, depression, and anxiety (Sim et al., 2010). A study on the mental health impact of SARS in women in Hong Kong found elevated rates of depression and perceived stress (Yu et al., 2005). Similarly, a significant proportion of community respondents in the United Kingdom during the swine flu outbreak reported being “fairly” or “very” worried about the disease (Rubin et al., 2010). During the Ebola outbreak in Africa, fear of contracting the disease led to distrust among community members and frayed social relationships (Van Bortel et al., 2016). These findings are important for our understanding of the overall impact of disease outbreaks, as psychological effects occurring in a substantial proportion of the community impact not only the daily functioning of those individuals but also the resilience of the community as a whole (Allenby & Fink, 2005).

Comparatively less is known about the psychological impact of COVID-19, but several early studies have sought to document mental health symptoms during the pandemic. One study of a general sample of adults in China found that over half of respondents described the psychological impact of

COVID-19 as moderate or severe (Wang, Pan, Wan, Tan, Xu, McIntyre, et al., 2020). Across several studies, specific effects on mental health among adults in the general public in China have included depression, anxiety, sleep difficulties, and stress (Gao et al., 2020; Huang & Zhao, 2020; Liu et al., 2020; Wang, Pan, Wan, Tan, Xu, McIntyre, et al., 2020; Zhang et al., 2020). Outside of China, a study in Denmark compared pre-pandemic and pandemic data and found a negative impact of COVID-19 on well-being (Sønderskov et al., 2020). Some information about individual differences in the psychological impact of the pandemic have also been reported. Factors such as being female, being a student, being younger than 35, and being relatively more concerned about loved ones contracting the disease were associated with greater impact whereas having a low perceived risk of infection was associated with less impact (Huang & Zhao, 2020; Liu et al., 2020; Wang, Pan, Wan, Tan, Xu, McIntyre, et al., 2020). These studies provide valuable information about the mental health effects of the pandemic but also have some limitations, including the scope of mental health symptoms assessed and, for most, a lack of a pre-pandemic comparison group. Further, to our knowledge, there is at present only one published peer-reviewed study of the impact of the COVID-19 pandemic specifically on college students. This study, based in China, found that nearly 25% of college students reported at least mild symptoms of anxiety (Cao et al., 2020). Unfortunately, this study also did not have a comparison group so it is not clear whether this rate exceeds the typical prevalence of anxiety among Chinese college students.

Beyond the effects on mental health, the pandemic may also impact young adults' substance use patterns. Chronic stress, which is likely to occur with the prolonged disruption related to the COVID-19 pandemic, can lead to the development of anxiety disorders (Baum & Posluszny, 1999). Individuals with anxiety disorders, including post-traumatic stress disorder (PTSD), are at increased risk for heavy alcohol use (Overstreet et al., 2017) and developing alcohol use disorder (AUD; Kessler et al., 1995; Paltell et al., 2020). Importantly, high levels of stress, even in the absence of the development of an anxiety disorder, are also associated with increased alcohol use and the development of AUD (Keyes et al., 2012). AUD is

also the most common comorbidity diagnosed among individuals with depressive disorders (McHugh & Weiss, 2019). These results suggest that the increases in anxiety, depression, and stress that have been observed in response to COVID-19 may be associated with increased alcohol use, though this has not been assessed directly. Because the onset of AUD typically occurs in young adulthood (Grant et al., 2015) and college enrollment has been associated with an increased risk of AUD (Slutske, 2005; Slutske et al., 2004) college-aged individuals may be particularly at high risk of developing problematic alcohol use patterns during the COVID-19 pandemic.

Many college students experienced greater disruption to their living situation, work, and education during this time than did other groups in society. Additionally, they may be concerned about the impact of the pandemic on their academic progress and ability to enter the workforce. College students who were not living with their parents prior to the pandemic may also be troubled by returning to a living environment that may not be as comfortable as their college environment or as conducive to their now-online learning; further, they may worry about transmitting the virus from their college to their family's household. Given that approximately 20% of college students have a mental health disorder, though many go untreated (Auerbach et al., 2016), and roughly the same proportion have clinically significant problems with alcohol misuse (Slutske, 2005) this population may be at particular risk for problems in these domains during the pandemic. Consequently, the current study was designed to assess the presence of symptoms of psychological disorders, alcohol misuse, and perceived stress in a sample of college students during the initial weeks of shutdowns and disruptions to community life during the COVID-19 pandemic in the United States. Data collected during the pandemic is compared to data collected in the previous semester in order to assess the extent to which symptoms appear to be related specifically to the pandemic situation. Based on the data available about association between stressful events and both mental health and substance use disorders, it was hypothesized that participants in the spring 2020 semester would report higher levels of depression and anxiety

symptoms, perceived stress, and alcohol misuse. Additionally, it was expected that reported concern about COVID-19 would relate to symptom levels in the spring 2020 sample. Further, exploratory analyses of racial differences in the impact of the COVID-19 pandemic on well-being are examined.

## **2. Methods**

### **2.1. Participants**

Data on perceived stress, coping, and psychological symptoms were collected from 254 college students at a medium-sized public research university in the southeastern United States during September through November of the fall 2019 semester. Data from 168 participants from the same university were collected beginning on April 1, 2020, during the first week when the university's campus was closed due to COVID-19 and classes had been moved online for the duration of the term, and continuing until the end of the spring semester in early May. In total, the majority of the sample was female (88%) and White (58.5%). The mean age of participants was 21.16 years old.

### **2.2. Procedure**

This study was approved by the Institutional Review Board at the university where data collection took place and all participants provided informed consent prior to data collection. The fall 2019 data collection had been approved as part of a larger study on health risk behaviors. When the COVID-19 outbreak spread to the US during the spring 2020 semester, an IRB amendment adding questions about COVID-19 to the questionnaire battery was approved and data collection was reopened to new participants. Participants in both samples were members of the university's psychology subject pool who completed questionnaires online using Qualtrics survey software and received credit that could be used for course requirements or extra credit. Measures were counterbalanced across four versions of the survey that were randomly assigned to reduce the likelihood of order effects. Additionally, two quality assurance questions were embedded within the survey (e.g. "Please select



‘Disagree Strongly’ to answer this item”). Participants who did not meet the quality assurance requirements were removed from the participant pool.

### **2.3. The COVID-19 context of the study**

During data collection for the spring 2020 sample, the COVID-19 outbreak spread across the U.S. and numbers of cases and associated deaths continued to increase while measures such as shelter in place orders were being rolled out by state and local governments. On April 1, more than 213,000 people were diagnosed with COVID-19 in the U.S. By May 8, that number had increased to 1,248,040 (CDC, 2020a). By the week before data collection began, ending on March 28, there had been over 2,000 deaths attributed to COVID-19 across the country (CDC, 2020b). Data collection ended the week of May 8, at which point over 75,000 deaths in the U.S. had been attributed to COVID-19 (CDC, 2020c).

Notably, the COVID-19 pandemic is somewhat unique relative to other disease outbreaks because of the extreme physical distancing and quarantine measures taken by officials in many jurisdictions. On April 1, 32 states were under stay-at-home orders. Ten states and the District of Columbia, including the state where data collection was based, enacted similar orders during the first week of April. Toward the end of the data collection period, some states began to relax their restrictions. The state in which data collection was based continued to have a “safer at home” order but also gradually eased restrictions towards the end of the data collection period (Mervosh et al., 2020).

Several universities, including the university at which this study was conducted, closed their campuses and moved spring 2020 classes online to comply with social distancing guidelines. Although the move to online classes and this study’s online data collection meant that participants might be completing this study from anywhere in the U.S., the university where data were collected typically enrolls most of its undergraduates from the state where the university is located and a handful of neighboring states in the southeastern U.S. An examination of data collection locations from Qualtrics confirmed that 60.1% of participants were responding from the state where the university is located and

32.1% were located in neighboring states in the southeastern U.S. Notably, 8.1% were responding from the New Orleans metropolitan area, which had a higher number of cases and COVID-19-associated deaths than did the surrounding areas during the period of data collection.

## **2.4. Measures**

### *2.4.1. Questions about COVID-19*

Participants' knowledge and perceptions of COVID-19 were measured through a questionnaire created by the research team (see Table 1 for the full list of questions). The measure consisted of Likert scale questions regarding worry surrounding the personal and community impact of COVID-19, changes in daily behavior, and thoughts on how people, including government officials and the media, have responded to the pandemic. Participants were also asked about the level of personal and community exposure they have had to COVID-19.

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Insert Table 1 About Here

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### *2.4.2. DSM 5 Self-Rated Level 1 Cross-Cutting Symptoms Measure- Adult (CCSM)*

The CCSM (APA, 2014) is a 23-question self-report measure of symptoms across 13 psychiatric domains. Participants report on symptoms experienced in the past two weeks using a 5-point Likert scale (0 = none or not at all to 4 = severe or nearly every day). Domains include depression, anger, mania, anxiety, somatic symptoms, suicidal ideation, psychosis, sleep problems, memory, repetitive thoughts and behaviors, disassociation, personality functioning, and substance use. This measure has demonstrated good test-retest reliability (Narrow et al., 2013) and clinical utility (Mościcki et al., 2013).

### *2.4.3. Perceived Stress Scale*

The Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983) is a 10-item self-report measure that assesses the appraisal of stress participants have experienced in their lives within the past

month. Questions are measured on a 5-point Likert scale (0 = Never to 4 = Very Often) and are designed to assess how uncontrollable, unpredictable, and overloaded individuals perceive their lives as well as their current state of stress. This measure has shown good psychometric properties (Lee, 2012).

#### *2.4.4. Alcohol Use Disorders Identification Test (AUDIT)*

The AUDIT (Babor et al., 2001) is a 10-item self-report measure to assess the presence of alcohol use and alcohol related problems. Items are rated using a 5-point Likert scale (0 = never to 4 = daily or almost daily) and gauge the frequency, amount, and consequences of alcohol use participants experience. This measure has demonstrated utility for detecting alcohol misuse in the general population using sex-specific cutoff values (Johnson et al., 2013).

### **2.5. Data analysis**

Data were first evaluated to determine whether participants passed QA controls embedded in the materials and whether there was missing data on variables of interest. Following this, differences in demographic features of the sample across the two semesters were evaluated. Next, the internally-developed questions about COVID-19 were analyzed and relations between these items and the well-being variables among participants in the spring 2020 sample were tested using nonparametric correlations. Finally, the effect of completing the study during the pandemic vs. in the semester prior was examined using multivariate or univariate General Linear Models (GLMs), as appropriate, conducted separately for each measure of well-being due to some participants not completing all measures (described in more detail below). All analyses were conducted in SPSS v26.

## **3. Results**

### **3.1. Description of sample and handling of missing data**

Thirty-four participants failed quality assurance checks and were excluded from analyses, leaving samples of 240 for the fall semester and 148 for spring. Participants in both the fall and the spring were primarily female (87.9% and 86.5%, respectively) however, they differed in racial makeup

(see Table 2). The data were evaluated for missingness and less than 5% of the overall data were missing. The missing data was evaluated using Little's (1988) test, which was not significant ( $\chi^2(929) = 987.21, p = .09$ ) indicating the data were missing completely at random (MCAR). No data were missing from the demographic information, though eight participants (2.1%) entered the current date instead of their birthdate when prompted and were excluded from analyses involving age. There was also no missing data for the DSM-5 Self-Rated Level 1 Cross-Cutting Symptoms Measure-Adult. Some participants had missing data on other measures, typically in the form of an entire measure being skipped. In total, 354 participants (91.2%) had complete data on all measures. Given the low amount of missing data and the pattern by which it was missing, results for specific measures contain data for only those participants who completed that measure.

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Insert Table 2 About Here

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### 3.2. Associations among indicators of psychological well-being

A number of the outcomes of interest were correlated with one another, suggesting that many of the symptoms assessed in this study co-occur. The correlations between outcome measures in each semester are presented in Table 3. Overall, the strongest positive associations found between indicators of psychological well-being were dissociation with personality functioning (fall:  $r(239) = .64, p < .01$ , spring:  $r(147) = .66, p < .01$ ), suicidal ideation with psychosis (fall:  $r(239) = .65, p < .01$ , spring:  $r(147) = .41, p < .01$ ), and depression with anger (fall:  $r(239) = .58, p < .01$ , spring:  $r(147) = .58, p < .01$ )

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Insert Table 3 About Here

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### 3.3. Questions about COVID-19

Of the 148 spring 2020 participants, 138 (93.2%) responded to internally-developed questions about COVID-19. These items had 7-point Likert scales for which a 7 indicates a greater level of the construct being assessed (i.e., more informed, more worried). Items assessing others' reactions to the pandemic were reverse-scored such that high scores on these items indicate that the respondent believes people are not being careful enough about COVID-19. Overall, participants reported feeling relatively well-informed about COVID-19, being more concerned about the dangers of COVID-19 for others than for themselves, and believing that measures like the closure of businesses and schools were necessary to reduce the spread of COVID-19. They also generally approved of the reactions of the government, people in their lives, and the media to the threat of COVID-19. The vast majority of participants (89.1%) reported that there were COVID-19 cases in their city or town at the time of data collection and many reported personally knowing someone who had tested positive for COVID-19. Notably, endorsement of the latter item increased from 12.5% in week 1 of data collection to 47.8% in week 6. Full results for responses to the COVID-19 questions are presented in Table 4.

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Insert Table 4 About Here

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The distributions of scores on the COVID-19 questions were generally non-normal so spearman rank order correlations were used to compare responses on these items to scores on the measures of psychological well-being. Results are displayed in Table 5. A cutoff of +/- .20 was used to determine correlations that were meaningful, rather than simply statistically significant, due to the number of correlations conducted and the exploratory nature of analyses involving these novel items. Findings indicate being more worried about the effects of COVID-19 for themselves or others and believing that close others were not being careful enough about COVID-19 were associated with poorer well-being across several measures.

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Insert Table 5 About Here

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### 3.4. Comparison of fall & spring measures of psychological well-being

General Linear Models (GLMs) were conducted to compare results on measures of psychological symptoms, perceived stress, and alcohol misuse between students tested during the fall 2019 semester and those tested during the spring 2020 semester. A multivariate GLM was conducted on the full sample as all participants completed the DSM 5 CCSM. There was not a statistically significant difference in psychological symptoms across all areas assessed based on semester of data collection,  $F(13, 374) = 1.37, p = .172$ ; Wilk's  $\Lambda = 0.955$ , partial  $\eta^2 = .05$ . However, because it was hypothesized that the COVID-19 pandemic would have a greater impact on some of the psychological symptoms assessed by this measure than others, univariate effects were examined and the results of these analyses are included in Table 6. Overall, results indicate students participating during the pandemic reported significantly more symptoms of depression ( $F(1, 386) = 4.56, p = .033$ ), anger ( $F(1, 386) = 9.12, p = .003$ ), and mania ( $F(1, 386) = 4.19, p = .041$ ) than did students in the pre-pandemic semester. Univariate GLMs conducted on the PSS (spring  $n = 225$ , fall  $n = 141$ ) and the AUDIT (spring  $n = 223$ , fall  $n = 138$ ) found that students in the pandemic semester also reported higher levels of perceived stress ( $F(1, 364) = 4.63, p = .032$ ) and problem alcohol use ( $F(1, 359) = 4.00, p = .046$ ).

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Insert Table 6 About Here

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Due to differences in the racial makeup of participants in the pre-pandemic and pandemic semesters, a second set of GLMs with main effects of semester and race, along with an interaction between race and semester additional analyses were conducted on the subset of participants identifying

as Non-Hispanic White ( $n = 209$ ) or African American ( $n = 144$ ). Descriptive data and results of the GLM analyses are displayed in Table 7. There was not a statistically significant difference in psychological symptoms across all areas assessed based on semester of data collection,  $F(13, 337) = 1.40$ ,  $p = .159$ ; Wilk's  $\Lambda = 0.949$ , partial  $\eta^2 = .05$ . However, there was a statistically significant effect of race,  $F(13, 337) = 3.57$ ,  $p < .001$ ; Wilk's  $\Lambda = 0.879$ , partial  $\eta^2 = .12$ , and an interaction between semester and race,  $F(13, 337) = 2.24$ ,  $p = .008$ ; Wilk's  $\Lambda = 0.920$ , partial  $\eta^2 = .08$ . Main effects of semester were similar to those reported for the original model in the whole sample. There were also main effects of race on anger ( $F(1, 349) = 11.23$ ,  $p = .001$ ), anxiety ( $F(1, 349) = 4.60$ ,  $p = .033$ ), sleep problems ( $F(1, 349) = 4.58$ ,  $p = .033$ ), and alcohol misuse ( $F(1, 325) = 17.81$ ,  $p < .001$ ) such that White students reported more symptoms in these areas than did African American students. In addition, there were interactions between semester and race on depression ( $F(1, 349) = 7.12$ ,  $p = .008$ ) and anger ( $F(1, 349) = 12.65$ ,  $p < .001$ ) such that White students reported higher levels of these symptoms during the pandemic semester than during the pre-pandemic semester but African American students did not show this effect. There was also an interaction between race and semester for symptoms of psychosis ( $F(1, 349) = 4.28$ ,  $p < .05$ ) such that African American students reported higher levels in the pre-pandemic semester than did White students but that levels were similar during the pandemic semester. However, it should be noted that scores on this scale were at the “slight” level for both races across both semesters.

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Insert Table 7 About Here

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#### 4. Discussion

This study compared college students in the southeastern United States tested prior to the COVID-19 pandemic with a similar sample tested during the pandemic on measures of psychological symptoms, perceived stress, and alcohol use. The results provide insight into how the early months of

the COVID-19 pandemic and associated disruption affected the mental health and well-being of young adults. Although young adults are generally not as prone to experiencing severe symptoms of COVID-19 as are older adults, this study demonstrates how they are nonetheless psychologically impacted by the pandemic. Specifically, participants who completed the study during the COVID-19 pandemic reported higher levels of mood disorder symptoms, perceived stress, and alcohol misuse as compared to those who completed the study prior to the pandemic. Further, White participants reported greater effects of the pandemic on their well-being than did African American participants. Beyond these semester-based differences, data collected on associations between students' perceptions of COVID-19 and their well-being during the pandemic semester demonstrates how individual differences in pandemic-related worries may be a mechanism through which the pandemic has a negative impact on well-being.

The results of this study are generally consistent with hypotheses and previous research on the impact of pandemics on psychological well-being. Specifically, the hypothesis regarding the association between concerns about COVID-19 and well-being was supported. Participants who indicated greater concern about them or a loved one contracting COVID-19 and those who reported that others in their life were not being careful enough about avoiding infection reported higher levels of depression, anger, anxiety, and perceived stress. This finding is consistent with research on the general population in China during the COVID-19 outbreak showing that greater concern about oneself or a loved one contracting COVID-19 is associated with higher self-reported stress (Wang, Pan, Wan, Tan, Xu, Ho, et al., 2020; Wang, Pan, Wan, Tan, Xu, McIntyre, et al., 2020) and provides more information about the impact of these concerns on specific domains on psychological symptoms. This result is important given the amount of concern about COVID-19 that is present in the general population in recent surveys (American Psychiatric Association, 2020). Individuals who experience higher levels of worry about the dangers of COVID-19 for themselves or loved ones might benefit from targeted interventions.



Additionally, results examining semester effects supported the hypothesis that participants during the pandemic would report higher levels of depression, perceived stress, and alcohol misuse. However, predicted higher rates of anxiety during the pandemic were not found. Instead, higher scores on items screening for anger problems and mania were found during the pandemic. These findings may be best understood as relating to the increased symptoms of depression during this time period rather than being distinct problems. Specifically, items on the CCSM that were endorsed at higher levels during the pandemic may actually reflect irritability (e.g., “Feeling more irritated, grouchy, or angry than usual”) and sleep disruption (e.g., “Sleeping less than usual, but still have a lot of energy”) experienced during the COVID-19 pandemic, both of which are symptoms of depression (American Psychiatric Association, 2013). Supporting this, depression and anger scores in the spring 2020 sample were positively related ( $r = .58, p < .001$ ) as were sleep problems and mania scores ( $r = .30, p < .001$ ). The increases in depressive symptoms and perceived stress during the pandemic semester are consistent with research on the psychological effects experienced by infected patients during previous epidemics (Batawi et al., 2019; Lee et al., 2018; Mak et al., 2009; Mohammed et al., 2015) and the increases in perceived stress and anger are also congruent with research on the effects of being quarantined (Brooks et al., 2020). The lack of a difference in anxiety scores between the two samples, despite a difference in conceptually-related perceived stress might mean that college-aged individuals, unlike other age groups, do not experience an increase in anxiety during a pandemic. Alternatively, it is possible that the CCSM anxiety items, which describe worry, panic, and avoidance, do not capture the psychological impact of the pandemic on young adults in the area of anxiety.

None of the research to date on the psychological effects of pandemics has included a measure of how pandemics impact substance use behaviors, despite the associations between alcohol misuse and anxiety (Smith & Randall, 2012), depression (McHugh & Weiss, 2019), and stress (Keyes et al., 2012), all of which appear to increase during a pandemic. This study therefore makes a novel contribution to

the literature by demonstrating that across two samples of predominately female college students, those assessed during the COVID-19 pandemic reported drinking alcohol at higher levels that were, on average, in the risky range for women (Johnson et al., 2013). This is of particular concern given the increased rates of comorbid AUD, anxiety and depressive disorders among women as compared to men (Kessler 2003; Kessler et al., 1997; Khan et al., 2013). Further, among individuals suffering from dual diagnoses (e.g., AUD and depression) symptoms and prognosis can be worse than for individuals with only one disorder (Conner et al., 2014).

Exploratory analyses on racial differences in impact of the pandemic revealed that White students reported more anger, anxiety, sleep problems, and alcohol misuse than did African American students in both the pre-pandemic and the pandemic semesters. Additionally, White students reported higher levels of depression and anger symptoms during the pandemic whereas African American students did not show this effect. The lower levels of symptoms reported by African American students is somewhat unexpected given studies of other national disasters which suggest that African Americans may be more vulnerable to experiencing psychological symptoms after such events as compared to White individuals (Elliot & Pais, 2006; Perilla et al., 2002). One difference to note is that these studies were conducted after the disasters had already occurred whereas the current study was conducted during the COVID-19 national emergency. Additionally, African American students could be reporting fewer psychological symptoms due having more resilience to new stressors. African American students are more likely to have experienced other life stressors (e.g., higher rate of poverty, higher mortality rates from disease, fewer employment opportunities, racial discrimination) as compared to White students (Assari & Lankarani, 2016; Brown, 2008; Brown & Tylka, 2011) which could build resilience to new stressors associated with the COVID-19 outbreak. Additionally, racial socialization and supportive social networks have been associated with resiliency among African American college students (Brown, 2008). However, this finding could also be due to African American students' reluctance to share

sensitive information with researchers (Assari & Lankarani, 2016) and greater stigmatization of mental illness among African Americans (Anglin et al., 2006).

The results of this study, in combination with related studies cited here, suggest that members of the general public are at risk for negative impacts of the COVID-19 pandemic on their well-being. Accordingly, they should consider the following recommendations to decrease the likelihood of this occurring: avoid excessive exposure to COVID-19 media coverage but ensure you are well-informed via reliable media sources; develop and/or maintain physical health; seek out safe (e.g., virtual) ways to obtain social support; maintain daily routines; and engage in relaxation techniques to reduce stress. Research on other kinds of life stressors and trauma suggests that coping strategies can mitigate their impact (Benight & Harper, 2002; McPherson et al., 2003; Vosvick et al., 2003), so learning about and using healthy coping skills is also likely to be beneficial. Finally, given the findings suggesting increased psychological symptoms among individuals who were worried about how whether loved ones were engaging in sufficient safety behaviors, it would be helpful to promote the seriousness of COVID-19 and the importance of safety precautions in both personal relationships and society as a whole.

Given the results of this study of college students, mental health professionals and college administrators may consider several recommendations. First, most students generally cope well with the pandemic and show non-clinical levels of symptoms. However, there are average increases in several indicators of psychological maladjustment as well as alcohol use among college students. These effects might impact students' academic success and longer-term well-being, and students may benefit from education and resources targeted toward these outcomes. Professionals should also keep in mind the trajectory and progression of the COVID-19 pandemic, which is different from many other types of trauma in that many disasters are one-day events. The ultimate mental health effects of this pandemic cannot even be known at the time of this study, less than three months into the national emergency in the United States, and it is likely that both short- and long-term mental health services will be needed

for some individuals. One intervention that may be useful to deploy during the initial stages of a pandemic or similar event is psychological first aid, which focuses on mitigating acute distress, providing support, and assessing the need for continued mental healthcare (Everly & Flynn, 2006).

Second, college mental health professionals should consider that students could lack social support or may experience stigma related to seeking mental healthcare once they are away from campus, thereby hindering their ability to reach out for help. Clinicians should find ways to make mental healthcare accessible, such as through telehealth services which have been found effective in treating anxiety and depressive symptoms (Brenes et al., 2015). Further, as was done during the COVID-19 pandemic in the U.S., local jurisdictions should consider relaxing interjurisdictional practice guidelines for college students so that college counseling centers can continue to serve them if they return to a family home out of state. Third, college mental health providers should also consider that alcohol use and associated problems are typically elevated among college students (O'Malley & Johnston, 2002). As indicated by the AUDIT scores in the present study, alcohol use increases to the point of risky or even more elevated levels during the pandemic for some college students. This increased use may be a maladaptive coping pattern that can interfere with social, academic, emotional, etc. functioning (Park & Grant, 2005; Perkins, 2002; White & Hingson, 2013). As such, universities should provide students with resources related specifically to preventing alcohol misuse during stressors like the COVID-19 pandemic.

This study evaluated several indicators of well-being among college students in a unique and important time period in public health. The sample was fairly large and more racially diverse than some research efforts. The study also included a specific examination of racial differences, contributing to research on racial disparities and representation of different racial groups in psychological research. Further, the two utilized samples were examined within the same academic school year, at the same university, and with the same self-report measures. However, it is not without limitations. The study's sample was composed of college students and was primarily female. As such, results may not generalize

to other, different populations. Further, the study relied on self-report measures that were limited in detail and may have been subject to reporting biases. Results in this non-clinical sample also demonstrated only modest increases in symptoms of various problems during the pandemic and many of these symptoms were not expressed at clinically significant levels. However, considering the age of the sample and the general negative impact of even modest increases in mood disorder symptoms, stress, and alcohol use on overall well-being, these results nonetheless illustrate important information about the impact of the COVID-19 pandemic on college students' adjustment. Future research should endeavor to further explore these effects as the pandemic continues.

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Table 1. COVID-19 Questions

1. How informed do you feel about the COVID-19 (also known as coronavirus) outbreak?	1 = Not very informed 2 3 4 = Somewhat informed 5 6 7 = Very informed
2. How worried are you about the effects of COVID-19 for you personally?	1 = Not very worried 2 3 4 = Somewhat worried 5 6 7 = Very worried
3. How worried are you about the effects of COVID-19 for your loved ones (e.g., family, friends, romantic partner)?	1 = Not very worried 2 3 4 = Somewhat worried 5 6 7 = Very worried
4. How worried are you about the effects of COVID-19 for the community in general?	1 = Not very worried 2 3 4 = Somewhat worried 5 6 7 = Very worried
5. How do you think COVID-19 compares to the seasonal flu?	1 = It's much less of a problem 2 3 4 = They are equally problematic 5 6 7 = It is much more of a problem
6. How necessary is it for you to change your daily behavior to reduce the spread of COVID-19?	1 = Not at all necessary 2 3 4 = Somewhat necessary 5 6 7 = Extremely necessary
7. How necessary is it for changes to occur in the community (e.g., workplaces closing, public events cancelled) in order to reduce the spread of COVID-19?	1 = Not at all necessary 2 3 4 = Somewhat necessary 5 6 7 = Extremely necessary
8. How do you think the people you are close with (family, friends) are reacting to the COVID-19 outbreak?	1 = They are not being careful enough 2

	3
	4 = They are being the right amount of careful
	5
	6
	7 = They are overreacting
9. How do you think the government is reacting to the COVID-19 outbreak?	1 = They are not being careful enough
	2
	3
	4 = They are being the right amount of careful
	5
	6
	7 = They are overreacting
10. How do you think the media is reacting to the COVID-19 outbreak?	1 = They are not being careful enough
	2
	3
	4 = They are being the right amount of careful
	5
	6
	7 = They are overreacting
11. How many positive cases of COVID-19 are currently in your state or country? You can provide an exact number, an estimate, or say I don't know.	
12. Are there confirmed COVID-19 cases in your city or town?	Yes
	No
	I'm not sure
13. Do you personally know anyone who has tested positive for COVID-19?	Yes
	No
14. Do you personally know anyone who is currently sick with the flu or a cold?	Yes
	No
15. Do you personally know anyone who is at-risk for especially negative outcomes if they catch COVID-19 (e.g., elderly, has a compromised immune system)?	Yes
	No



Table 2. Demographics

	Fall 2019 Semester N (%)	Spring 2020 Semester N (%)	Total N (%)
Sex			
<i>Male</i>	28 (11.7)	18 (12.2)	46 (11.9)
<i>Female</i>	211 (87.9)	128 (86.5)	339 (87.4)
<i>Prefer not to say</i>	1 (.4)	2 (1.4)	3 (.8)
Race/Ethnicity			
<i>Black or African American</i>	74 (30.8)	70 (47.3)*	144 (37.1)
<i>White or Caucasian</i>	154 (64.2)	73 (49.3)	227 (58.5)
<i>Asian</i>	6 (2.5)	1 (.7)	7 (1.8)
<i>Other</i>	6 (2.5)	4 (2.7)	10 (2.6)
	M (SD)	M (SD)	M (SD)
Age	20.79 (5.27)	21.77 (3.90)	21.16 (4.81)

Note. \* $p < .05$  significant difference between the semesters.

Table 3. Correlations between dependent variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Perceived Stress	1														
2. Depression	<b>.566</b> <b>.329</b>	1													
3. Anger	<b>.453</b> <b>.483</b>	<b>.577</b> <b>.582</b>	1												
4. Mania	.078 .191	.177 .058	.145 .049	1											
5. Anxiety	<b>.517</b> <b>.483</b>	<b>.545</b> <b>.435</b>	<b>.497</b> <b>.530</b>	<b>.424</b> .141	1										
6. Somatic Complaints	<b>.361</b> <b>.288</b>	<b>.415</b> <b>.335</b>	<b>.444</b> <b>.308</b>	<b>.231</b> .063	<b>.424</b> <b>.369</b>	1									
7. Suicide	<b>.332</b> <b>.208</b>	<b>.217</b> <b>.250</b>	<b>.246</b> <b>.291</b>	.167 .022	<b>.231</b> .172	<b>.339</b> <b>.342</b>	1								
8. Psychosis	.152 .102	.129 .117	<b>.211</b> .084	<b>.444</b> -.071	.167 .113	<b>.266</b> <b>.289</b>	<b>.652</b> <b>.411</b>	1							
9. Sleep Problems	<b>.336</b> <b>.481</b>	<b>.435</b> <b>.393</b>	<b>.408</b> <b>.436</b>	<b>.403</b> <b>.295</b>	<b>.444</b> <b>.418</b>	<b>.436</b> <b>.311</b>	.164 .251	.174 .144	1						
10. Memory	<b>.292</b> <b>.346</b>	<b>.363</b> <b>.326</b>	<b>.317</b> <b>.313</b>	<b>.413</b> .080	<b>.403</b> <b>.326</b>	<b>.316</b> <b>.369</b>	<b>.234</b> .158	<b>.208</b> <b>.306</b>	<b>.374</b> <b>.362</b>	1					
11. Repetitive Behaviors	<b>.375</b> <b>.410</b>	<b>.371</b> <b>.282</b>	<b>.368</b> <b>.263</b>	<b>.413</b> .080	<b>.413</b> <b>.440</b>	<b>.373</b> <b>.323</b>	<b>.405</b> <b>.338</b>	<b>.433</b> <b>.358</b>	<b>.392</b> <b>.313</b>	<b>.385</b> <b>.372</b>	1				
12. Dissociation	<b>.479</b> <b>.384</b>	<b>.436</b> <b>.335</b>	<b>.441</b> <b>.337</b>	<b>.486</b> .075	<b>.413</b> <b>.362</b>	<b>.370</b> <b>.434</b>	<b>.357</b> <b>.318</b>	<b>.300</b> <b>.303</b>	<b>.386</b> <b>.325</b>	<b>.424</b> <b>.392</b>	<b>.536</b> <b>.454</b>	1			
13. Personality Problems	<b>.561</b> <b>.497</b>	<b>.522</b> <b>.340</b>	<b>.449</b> <b>.388</b>	.074 .132	<b>.486</b> <b>.408</b>	<b>.394</b> <b>.362</b>	<b>.370</b> <b>.273</b>	<b>.275</b> <b>.206</b>	<b>.392</b> <b>.450</b>	<b>.378</b> <b>.407</b>	<b>.490</b> <b>.532</b>	<b>.641</b> <b>.662</b>	1		
14. Substance Use	.056 .062	.049 .164	.146 .248	<b>.233</b> .090	.046 <b>.229</b>	.168 .120	<b>.269</b> <b>.303</b>	<b>.309</b> <b>.269</b>	<b>.229</b> .163	<b>.241</b> .122	<b>.220</b> <b>.209</b>	<b>.276</b> <b>.269</b>	.141 <b>.200</b>	1	
15. AUDIT	.116 .165	.011 .089	.081 .145	.055 .070	.022 .165	.132 .042	.136 .190	.094 .145	.165 .132	.074 -.004	.049 .095	.158 .176	.106 .113	<b>.615</b> <b>.444</b>	1

Note: Numbers at top of the cells are from the Fall 2019 cohort and numbers on the bottom of the cells are from the Spring 2020 cohort; all correlations >.20 are bolded

Table 4. COVID-19 Question Responses

	% rating a 6 or 7 out of 7	M	SD
How informed do you feel about the COVID-19 (also known as coronavirus) outbreak?	47.1	5.29	1.45
How worried are you about the effects of COVID-19 for you personally?	31.9	4.31	1.92
How worried are you about the effects of COVID-19 for your loved ones (e.g., family, friends, romantic partner)?	60.9	5.62	1.46
How worried are you about the effects of COVID-19 for the community in general?	59.4	5.55	1.52
How do you think COVID-19 compares to the seasonal flu?	53.6	5.57	1.31
How necessary is it for you to change your daily behavior to reduce the spread of COVID-19?	68.8	5.83	1.45
How necessary is it for changes to occur in the community (e.g., workplaces closing, public events cancelled) in order to reduce the spread of COVID-19?	78.3	6.20	1.17
How do you think the people you are close with (family, friends) are reacting to the COVID-19 outbreak? *	8.0	4.21	1.25
How do you think the government is reacting to the COVID-19 outbreak? *	27.5	3.50	1.71
How do you think the media is reacting to the COVID-19 outbreak? *	6.5	5.18	1.73
	% Yes		
Are there confirmed COVID-19 cases in your city or town?	89.1		
Do you personally know anyone who as tested positive for COVID-19?	41.3		
Do you personally know anyone who is currently sick with the flu or a cold?	17.4		
Do you personally know anyone who is at-risk for especially negative outcomes in they catch COVID-19 (e.g. elderly, has a compromised immune system)?	85.5		

Note: \*answers were reverse coded

Table 5. Correlations between independent and dependent variables

	How informed do you feel about the COVID-19 outbreak?	How worried are you about the effects of COVID-19 for you personally?	How worried are you about the effects of COVID-19 for your loved ones?	How worried are you about the effects of COVID-19 for the community in general?	How do you think COVID-19 compares to the seasonal flu?	How necessary is it for you to change your daily behavior to reduce the spread of COVID-19?	How necessary is it for changes to occur in the community in order to reduce the spread of COVID-19?	How do you think the people you are close with are reaction to the COVID-19 outbreak?	How do you think the government is reacting to the COVID-19 outbreak?	How do you think the media is reacting to the COVID-19 outbreak?
Perceived Stress	<b>-.251</b>	.178	.183	<b>.211</b>	.124	.084	.079	<b>-.206</b>	-.020	-.068
Depression	-.116	.112	.190	.135	.150	-.017	.066	<b>-.302</b>	.004	-.103
Anger	-.062	.190	<b>.200</b>	<b>.243</b>	.089	.011	.012	<b>-.238</b>	-.080	-.108
Mania	-.074	.104	.137	.065	.105	.108	.110	.053	-.005	-.060
Anxiety	-.093	<b>.261</b>	<b>.288</b>	.193	<b>.226</b>	<b>.237</b>	.095	<b>-.274</b>	-.160	-.131
Somatic Complaints	-.171	.074	.135	.079	.012	.010	.017	-.143	-.199	-.118
Suicide	-.190	-.027	-.009	.047	-.039	-.143	.014	-.157	.002	-.009
Psychosis	.120	.100	.169	.029	.083	.009	.055	-.134	.041	-.006
Sleep Problems	-.147	.026	.105	.108	.097	.067	.125	<b>-.237</b>	-.076	-.042
Memory	-.030	.055	.044	.033	.031	-.022	.026	-.079	.024	-.058
Repetitive Behaviors	.014	.031	.087	.014	.073	-.034	-.034	-.185	.012	-.081
Dissociation	-.004	.062	.079	.058	.082	-.090	.000	-.075	-.143	-.177
Personality Problems	-.125	.044	.070	.104	.065	-.008	.042	-.151	-.078	-.168
Substance Use	.059	.084	.068	-.032	-.005	-.045	-.129	.026	.093	.068
AUDIT	-.027	.011	.071	.016	-.151	-.001	-.123	-.033	.189	<b>.290</b>

Note: All correlations  $\geq .200$  are bolded

Table 6. Differences in well-being variables between fall 2019 and spring 2020

	Semester	M	SD	F	p	<i>Partial <math>\eta^2</math></i>
Depression	Fall 2019	2.00	1.32	4.56	.033	.012
	Spring 2020	2.30	1.39			
Anger	Fall 2019	1.55	1.23	9.12	.003	.023
	Spring 2020	1.96	1.43			
Mania	Fall 2019	1.64	1.31	4.19	.041	.011
	Spring 2020	1.93	1.43			
Anxiety	Fall 2019	2.22	1.42	.870	.352	.002
	Spring 2020	2.36	1.51			
Somatic Complaints	Fall 2019	1.47	1.48	0.12	.731	.000
	Spring 2020	1.42	1.38			
Suicide	Fall 2019	0.29	0.81	0.24	.626	.000
	Spring 2020	0.33	0.93			
Psychosis	Fall 2019	0.25	0.76	0.00	1.00	.000
	Spring 2020	0.25	0.71			
Sleep Problems	Fall 2019	1.48	1.27	1.44	.230	.004
	Spring 2020	1.64	1.41			
Memory	Fall 2019	0.78	1.12	0.45	.504	.001
	Spring 2020	0.86	1.29			
Repetitive Behaviors	Fall 2019	0.89	1.18	0.00	.956	.000
	Spring 2020	0.90	1.25			
Disassociation	Fall 2019	0.93	1.33	0.06	.812	.000
	Spring 2020	0.97	1.31			
Personality Problems	Fall 2019	1.48	1.41	0.07	.796	.000
	Spring 2020	1.51	1.45			
Substance Use	Fall 2019	0.47	0.94	0.07	.795	.000
	Spring 2020	0.45	0.88			
Perceived Stress	Fall 2019	19.60	6.78	4.626	.032	.013
	Spring 2020	21.21	7.22			
AUDIT	Fall 2019	3.29	3.47	4.00	.046	.011
	Spring 2020	4.14	4.64			

Table 7. Differences in well-being by semester and race in White and African American students

	Semester	Race	M	SD	Significance of the full model		
					<i>F</i>	<i>p</i>	<i>Partial η<sup>2</sup></i>
Depression	Fall 2019	African American	2.11	1.31	4.38	.005	.036
		White	1.96	1.30			
	Spring 2020	African American	2.01	1.40			
		White	2.66	1.31			
Anger	Fall 2019	African American	1.58	1.12	9.56	< .001	.076
		White	1.55	1.27			
	Spring 2020	African American	1.50	1.24			
		White	2.48	1.45			
Mania	Fall 2019	African American	1.69	1.25	2.92	.034	.025
		White	1.58	1.34			
	Spring 2020	African American	2.16	1.48			
		White	1.73	1.37			
Anxiety	Fall 2019	African American	2.16	1.43	2.04	.108	.017
		White	2.31	1.40			
	Spring 2020	African American	2.14	1.57			
		White	2.69	1.39			
Somatic Complaints	Fall 2019	African American	1.51	1.54	0.18	.909	.002
		White	1.48	1.43			
	Spring 2020	African American	1.36	1.29			
		White	1.50	1.45			
Suicide	Fall 2019	African American	0.39	0.86	1.07	.361	.009
		White	0.27	0.83			
	Spring 2020	African American	0.33	0.93			
		White	0.42	1.05			
Psychosis	Fall 2019	African American	0.45	0.98	2.44	.064	.021
		White	0.17	0.65			
	Spring 2020	African American	0.27	0.82			
		White	0.20	0.55			
Sleep Problems	Fall 2019	African American	1.42	1.31	2.56	.055	.022
		White	1.52	1.23			
	Spring 2020	African American	1.44	1.43			
		White	1.97	1.38			
Memory	Fall 2019	African American	0.80	1.06	0.25	.859	.002
		White	0.77	1.16			
	Spring 2020	African American	0.81	1.17			
		White	0.92	1.47			
Repetitive Behaviors	Fall 2019	African American	1.05	1.25	1.13	.997	.010
		White	0.81	1.14			
	Spring 2020	African American	0.81	1.28			
		White	1.06	1.28			
Dissociation	Fall 2019	African American	1.15	1.51	1.31	.272	.011
		White	0.86	1.25			
	Spring 2020	African American	1.13	1.41			
		White	0.83	1.27			
Personality Problems	Fall 2019	African American	1.44	1.42	0.15	.930	.001
		White	1.50	1.41			
	Spring 2020	African American	1.56	1.47			
		White	1.59	1.48			
Substance Use	Fall 2019	African American	0.34	0.86	1.32	.268	.011

Perceived Stress	Spring 2020	White	0.54	0.99	2.73	.044	.024
		African American	0.36	0.78			
	Fall 2019	White	0.55	0.96			
		African American	19.05	6.94			
	Spring 2020	White	20.234	6.55			
		African American	20.81	6.83			
AUDIT	Fall 2019	White	22.40	7.13	7.32	< .001	.063
		African American	2.06	2.78			
	Spring 2020	White	3.91	3.66			
		African American	3.22	4.38			
		White	5.21	4.74			

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*Note:* = African American Fall 2019 N = 64, White Fall 2019 N = 140, African American Spring 2020 N = 64, White Spring 2020 N = 61