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College student mental health: Understanding changes in psychological symptoms in the context of the COVID-19 pandemic in the United States

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Abstract
The COVID-19 pandemic has altered the way higher education is structured and delivered, presenting challenges for college students that have the potential to negatively impact mental health. The current study aimed to identify potential changes in college student psychological symptoms since the onset of the pandemic. The study used analyses of covariance to examine differences in perceived stress, depression, anxiety, and obsessive-compulsive symptoms between a sample of university students collected in Fall 2016 and a sample of students from the same university collected in Spring 2020 and Fall 2020 after the onset of the pandemic. Findings indicated that college students from the 2020 sample reported significantly higher levels of stress, depressive symptoms, and anxiety symptoms than the 2016 sample. For stress and anxiety, there was a significant interaction between cohort (2016 vs. 2020 sample) and year in school (first year vs. advanced) indicating that the pandemic may have had a more prominent negative mental health impact on advanced students in comparison to first year students. There were no significant differences between samples on obsessive-compulsive symptoms. The current sample was somewhat homogenous demographically, consisting of primarily first-year students, thus limiting generalizability. Self-report measures were used. College students may be struggling with increased stress, depressive symptoms, and anxiety symptoms during the pandemic. The current study provides important information to guide the development and implementation of prevention and intervention efforts to support college student mental health in the context of the pandemic.

Keywords COVID-19 · College students · Depression · Anxiety · Stress · Obsessive-compulsive symptoms

Introduction

The transition to college is a significant inflection point for many young adults, brimming with excitement, opportunity, connection, and responsibility. At the same time, college students often face a variety of novel challenges that may be associated with stress (Hurst et al., 2012), including increased academic work, pressure to succeed, competition among peers, financial worries, parental pressure, and concerns about the future. During this transition, students may be more susceptible to mental health problems, and those with existing mental health difficulties may experience amplified symptoms (Cleary et al., 2011). Indeed, previous work has shown psychological difficulties to be both prevalent and persistent in college students (Blanco et al., 2008; Hunt & Eisenberg, 2010; Zivin et al., 2009). Specifically, depression, anxiety, and obsessive-compulsive disorder (OCD) symptoms are common mental health problems encountered by college-aged students (American College Health Association (ACHA), 2019; Beiter et al., 2015; Blanco et al., 2008; Steptoe et al., 2007; Sulkowski et al., 2011).

Depression is one of the most common mental health problems among undergraduate university students, with a prevalence of 17.3% in the United States (U.S.) (Eisenberg et al., 2013). Depression and anxiety co-occur at a rate of 10% in U.S. college students (Liu et al., 2019). One recent large

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survey indicated that 24% of students reported being diagnosed with or treated for anxiety in the previous year (ACHA, 2019). The same survey indicated that nearly one-third of students reported that anxiety affected academic performance, and approximately one-fifth indicated that depression impacted academic performance (ACHA, 2019), demonstrating the functional impact of these mental health struggles.

Obsessive-Compulsive Disorder (OCD) symptoms also affect a significant portion of college students. One survey indicated that 3.7% of college students reported being diagnosed with or treated for OCD within the past year (ACHA, 2019). Another study indicated that 5% of students reported clinically significant OCD symptoms and that these individuals also reported higher levels of anxiety more broadly (Sulkowski et al., 2011). Furthermore, OCD symptoms and final course grade were negatively associated in a college student sample (Mrdjenovich & Bischof, 2003). Given the prevalence of and functional impairment associated with depression, anxiety, and OCD in college students, it is important to understand risk factors that may influence the development or exacerbation of these psychological symptoms in this population.

College Student COVID-19 Concerns

Coronavirus disease 2019 (COVID-19) has had a profound global impact in a multitude of domains (e.g., economic, public health, education). Since the first confirmed COVID-19 cases surfaced in the United States in January of 2020 (Holshue et al., 2020), spread of COVID-19 has been quick and devastating. Data from the PEW Research Center has indicated that as of March 2021, a quarter of Americans surveyed reported having COVID-19, and two-thirds knew someone who had been hospitalized or died due to the novel virus (Funk & Tyson, 2021). As of March 10, 2022, the U.S. COVID-19 death count stands at over 950,000 (CDC, 2022) with the global death toll surpassing 6 million (WHO, 2022). For college students specifically, many of whom already experience depression, anxiety, and obsessive-compulsive disorder symptoms (ACHA, 2019; Beiter et al., 2015; Steptoe et al., 2007; Sulkowski et al., 2011), COVID-19 may invoke a cascade of secondary adversity that ushers in new mental health symptoms or exacerbates current ones.

COVID-19 has necessitated fundamental changes in how higher education is structured and delivered (U.S. Office of Postsecondary Education, 2020). Many of these changes have been both abrupt and drastic, leaving little, if any, time for adjustment. During the spring 2020 semester, many colleges and universities were forced to forgo in-person classes and make rapid transitions to online education in accordance with social distancing guidelines (CDC, 2020; Murphy et al., 2020). Students who lived in campus housing facilities, many of whom were first-year students, had to leave community or on-campus housing, potentially contributing additional stress (Son et al., 2020; Sun et al., 2021; Tang et al., 2020). Furthermore, students rely on various campus resources, such as dining halls, recreational facilities, libraries, office hours, and counseling services. Limited access to these resources may create new avenues for distress. College students may also work to support themselves and others, and with increased unemployment in the U.S. as a result of COVID-19, many college students were facing significant reductions in work hours or a complete loss of employment (Aucejo et al., 2020). In tandem with a loss of income, many students were claimed as dependents on their parents' tax returns, therefore excluding them from the possibility of receiving the first two government stimulus payments as a part of the CARES Act (2020). Furthermore, in a stressful college environment, friends and other social supports are likely key outlets for relieving distress (Hefner & Eisenberg, 2009), and with social distancing guidelines limiting in-person contact, these sources of support may have been reduced or required substantial modifications during this time period (CDC, 2020). These and other COVID-related stressors may overlap and intersect with preexisting hardships to create a maelstrom of new or intensified distress.

College Student Mental Health During the COVID-19 Pandemic

Studies from the U.S., Asia, and Europe have provided some early insights into the negative effects of COVID-19 on the mental health of undergraduate students (Cao et al., 2020; Huckins et al., 2020; Marelli et al., 2020; Odriozola-González et al., 2020; Tang et al., 2020). One study of Chinese undergraduates near the onset of the novel virus indicated that 89.7% of students were quarantined at home, and one month after the emergence of COVID-19, an overall depression rate of 9% was observed (Tang et al., 2020). Specifically, extreme fear, living in "worst hit" areas, being a graduating student, and getting less sleep were associated with depression (Tang et al., 2020). In a large Chinese sample comprised of undergraduate and graduate students, the prevalence of anxiety and depression symptoms increased throughout the duration of the pandemic, while acute stress symptoms decreased (Li et al., 2021). Within this sample, senior status, a presence of known or suspected COVID-19 cases in the community, and COVID-19 associated worries contributed to a heightened risk for development of mental health problems (Li et al., 2021). Another study conducted in China indicated that 24.9% of college students experienced anxiety during the COVID-19 outbreak (Cao et al., 2020). Findings from Huckins et al. (2020) indicated that the COVID-19 time period was associated with greater anxiety and depression symptoms when compared to previous school terms. Approximately one month following

the COVID-19 emergency declaration in the United States, a general young adult sample comprised of both students and non-students between the ages of 18–30 experienced higher rates of depression, anxiety, and PTSD symptoms when compared to prior studies who used the same symptom thresholds (Liu et al., 2020). In comparison to faculty and staff, students attending a Spanish university presented with higher scores on measures of anxiety, depression, and stress, with differential effects observed based on student major (Odriozola-González et al., 2020). Similarly, in a study of Swiss undergraduates surveyed prior to and during the COVID-19 pandemic, students who were surveyed in April 2020 presented with higher levels of anxiety, depression, stress, and loneliness than students surveyed in April 2019 (Elmer et al., 2020). Furthermore, exploratory findings from Elmer et al. (2020) suggest that COVID-19-specific worries and isolation may be associated with poorer mental health outcomes. These initial studies point to the importance of understanding the potential adverse impact of COVID-19 on the mental health of undergraduate students.

Purpose of the Current Study

The purpose of the current study was to examine differences in mental health symptoms between two samples of undergraduates – one from 2016 and 2020, respectively – from the same institution, with the 2020 sample collected after the onset of the COVID-19 pandemic. Specifically, the study examined differences in perceived stress, as well as depressive, anxiety, and obsessive-compulsive symptoms. Given emerging literature indicating the negative impact of COVID-19 on mental health and the prevalence of hardships for college students in the context of the pandemic, we hypothesized that the 2020 sample would show higher levels of stress, depressive, anxiety, and obsessive-compulsive symptoms when compared to the 2016 sample.

Method

Participants and Procedure

College students for both samples were recruited from one large Midwestern University. Undergraduate students earn partial course credit for participating in research studies at the university, and students can select which studies to participate in based on interest and availability. Students can also elect to prepare a research paper in lieu of completing research studies for partial course credit. Sample 1 participants were recruited during the Fall 2016 semester, and data were collected to examine the mediating role of psychotherapeutic processes that relate childhood trauma to internalizing symptoms (Kroska et al., 2018) and problematic health behaviors (Roche et al., 2019). Sample 2 participants were recruited from the same university during the Spring 2020 semester and the Fall 2020 semester after the onset of the COVID-19 pandemic. The current study compared the two cohorts in terms of psychiatric symptoms and general stress. All study procedures for both samples were approved and monitored by the University's Institutional Review Board (IRB). All questionnaires were completed online via Qualtrics following participant review of the consent letter.

Demographic characteristics of Sample 1 and 2 were comparable. Sample 1 included 414 respondents. Sample 1 consisted of 64% females and 34.3% males, and the mean age was 19.16 years ($SD = 1.33$). Sample 2 included 600 respondents and consisted of 69.2% females and 29.7% males, and the mean age was 18.80 years ($SD = 1.04$). Race and ethnicity were measured differently across cohorts, so total across samples is not reported. In the 2016 sample, 282 (68.1%) participants identified as White, Non-Hispanic, 56 (13.5%) as White Hispanic, 40 (9.7%) as Asian American, 13 (3.1%) as African-American or Black, 1 (0.2%) as American Indian or Alaska Native, 1 (0.2%) as Native Hawaiian or Other Pacific Islander, 15 (3.6%) as biracial or multiracial, and 6 (1.4%) did not report racial identity. In the 2020 sample, race and ethnicity were measured separately, with 494 (82.3%) participants identifying as White, 53 (8.8%) as Asian, 17 (2.8%) as African-American or Black, 2 (0.3%) as American Indian or Alaska Native, 3 (0.5%) as Native Hawaiian or Pacific Islander, 26 (4.3%) as biracial or multiracial, and 5 participants did not report racial identity. In terms of ethnicity, 530 (88.3%) participants identified as Not Hispanic or Latino/a/x, 59 (9.8%) participants identified as Hispanic or Latino/a/x, and 11 participants did not report ethnicity. Given the difference in how race and ethnicity were coded in the 2016 and 2020 samples, between-group comparisons (even those that collapse across categories; e.g., White and non-White) were not possible without conflating race and ethnicity, as was done in the 2016 data collection, but not the 2020 data collection.

Measures

Perceived Stress

The Perceived Stress Scale (PSS-10) is a 10-item questionnaire designed to measure symptoms of stress in adults during the previous month (Cohen & Williamson, 1988). Individuals are instructed to rate the frequency of specific thoughts and feelings on a 4-point Likert scale. Total scores range from 0 to 40 with higher scores indicating more perceived stress. The PSS-10 also includes ranges of scores that correspond to levels of severity (0–13 = Low stress, 14–26 = Moderate stress, and 27–40 = High stress). In the validation study, the PSS-10 demonstrated strong internal

consistency and validity in a general U.S. adult population sample (Cohen & Williamson, 1988). Internal consistency in the current samples were adequate (2016 α = .84; 2020 α = .86).

Depression

The Patient Health Questionnaire-9 (PHQ-9) is a brief 9-item measure developed to assess depressive symptomology in adults within the previous two weeks (Kroenke et al., 2001). Individuals are asked to rate the frequency of symptoms they have experienced on a 3-point scale. Total scores range from 0 to 27 with higher scores indicating more severe depressive symptoms. The measure also categorizes ranges of scores into levels of severity (0–4 = Minimal depression, 5–9 = Mild depression, 10–14 = Moderate depression, 15–19 = Moderately severe depression, and 20–27 = Severe depression). The validation study demonstrated strong internal consistency and validity among a primary care sample (Kroenke et al., 2001). Internal consistency in the current samples were adequate (2016 α = .91; 2020 α = .92).

Generalized Anxiety

The Generalized Anxiety Disorder Scale (GAD-7) is a brief 7-item assessment that measures symptoms of anxiety in adults within the previous two-week period (Spitzer et al., 2006). Individuals are asked to rate how frequently they have been bothered by symptoms of anxiety on a 3-point scale. Total scores range from 0 to 21, with higher scores indicating more severe anxiety. Anxiety severity is categorized by total score on the GAD-7 and is organized into four severity categories (0–4 = Minimal, 5–9 = Mild, 10–14 = Moderate, and 15–21 = Severe). The GAD-7 has been validated in a primary care sample and demonstrated strong internal consistency and validity (Spitzer et al., 2006). Internal consistency in the current samples were adequate (2016 α = .92; 2020 α = .93).

Obsessive-Compulsive Symptoms

The Obsessive-Compulsive Inventory – Revised (OCI-R) is an 18-item self-report measure of Obsessive-Compulsive Disorder (OCD) symptoms in adults within the past month (Foa et al., 2002). Individuals are asked to rate how distressed or bothered they have been by various symptoms of OCD on a 4-point scale. Total scores range from 0 to 72 with higher scores indicating more symptoms. A cutoff score of 21 is used to indicate clinically significant OCD symptoms (Foa et al., 2002). The OCI-R demonstrated strong internal consistency and validity in the validation study (Foa et al., 2002). Internal consistency in the current samples were adequate (2016 α = .94; 2020 α = .92).

Mean symptom levels for both samples are displayed in Table 1.

Preliminary Analyses

Demographic characteristics were examined for inclusion in the model based on differences between cohorts and associations with outcome variables. Year in school ((first year vs. advanced year (second year and beyond)) was significantly different across cohorts, $X^2(1) = 30.76$, $p < .001$, with the 2016 sample consisting of 53.04% first-year students and the 2020 sample consisting of 70.17% first-year students. Gender was examined dichotomously (male vs. female), as meaningful comparisons of other gender identities would not have been possible given the small number of participants self-identifying as identities other than male or female. Gender was not significantly different across cohorts, $X^2(1) = 2.63$, $p = .11$. For independent samples t-tests, Levene's test was used to examine equality of variances. Females had significantly higher scores than males on measures of stress, depression, and anxiety ($ps < .001$), but not obsessive-compulsive symptoms ($p = .28$). First-year students had significantly lower scores than advanced year students on measures of perceived stress and depression ($ps < .05$). There were no significant differences between first-years and other students on measures of anxiety ($p = .06$) and obsessive-compulsive symptoms ($p = .08$). As such, a main effect of year in school and an interaction between year in school and cohort were included in all models. Gender was included as a covariate.

Data Analysis

Statistical analyses were conducted using SPSS, version 27. Analyses of covariance examined differences between cohorts (2016 vs. 2020), year in school (first year vs. advanced year), and the interaction between cohort and year among outcomes of stress, depressive symptoms, anxiety, and obsessive-compulsive symptoms while controlling for

Table 1 Mean Symptom Levels of 2016, 2020, and Total Samples

	Total $N = 1014$	2016 $N = 414$	2020 $N = 600$
PSS, M(SD)	20.83 (6.41)[a]	20.34 (6.23)[c]	21.16 (6.52)[e]
PHQ-9, M(SD)	8.14 (6.46)[b]	7.70 (6.23)[d]	8.43 (6.60)[f]
GAD-7, M(SD)	6.93 (5.67)[b]	6.53 (5.52)[d]	7.20 (5.76)[f]
OCI-R, M(SD)	14.34 (12.87)[b]	14.20 (13.60)[d]	14.44 (12.37)[f]

PSS = Perceived Stress Scale-10. PHQ-9 = Patient Health Questionnaire-9. GAD-7 = Generalized Anxiety Disorder Scale-7. OCI-R = Obsessive-Compulsive Inventory – Revised

Superscripts indicate the number of participants who completed respective scale and were included in mean. [a]$N = 991$. [b]$N = 994$. [c]$N = 398$. [d]$N = 399$. [e]$N = 593$. [f]$N = 595$

gender (outcome = cohort + year + gender + year*cohort). Partial eta-squared estimates of effect size were reported. Estimated marginal means (EMM) were reported when differences were significant.

Item-level missing data were handled using mean imputation if ≤20% of data was missing on a given scale for a given participant. If >20% of data were missing, a score was not calculated.

Results

Results indicated a significant difference in perceived stress between cohorts, $F(1,976) = 7.19$, $p = .007$, $\eta p^2 = .007$, with those in the 2020 cohort reporting greater stress than the 2016 cohort. There was a significant difference in perceived stress between first year students and advanced year students, $F(1,976) = 8.81$, $p = .003$, $\eta p^2 = .009$, with advanced students reporting more stress than first year students. Gender was a significant covariate, $F(1,976) = 61.41$, $p < .001$, $\eta p^2 = .059$. Finally, there was a significant cohort by year interaction, $F(1,976) = 4.40$, $p = .036$, $\eta p^2 = .004$. The interaction was probed. Among first years, there was no significant difference between cohorts, $F(1,619) = .20$, $p = .653$, $\eta p^2 = .000$. Among advanced students, there was a significant difference between 2016 and 2020 cohorts, $F(1,356) = 10.61$, $p = .001$, $\eta p^2 = .029$. Advanced year students in the 2020 cohort (EMM = 22.57, 95% CI [21.65, 23.48]) reported higher levels of stress than first year students in the 2020 cohort (EMM = 20.46, 95% CI [19.87, 21.05]), advanced year students in the 2016 cohort (EMM = 20.58, 95% CI [19.69, 21.46]), and first year students in the 2016 cohort (EMM = 20.22, 95% CI [19.38, 21.05]). See Fig. 1 for depiction of the interaction.

There was a significant difference in depressive symptoms between cohorts, $F(1,979) = 4.90$, $p = .027$, $\eta p^2 = .005$, with those in the 2020 cohort reporting more depressive symptoms than the 2016 cohort. There was a significant difference in depressive symptoms between first year students and advanced students, $F(1,979) = 6.96$, $p = .008$, $\eta p^2 = .007$, with advanced students reporting more depressive symptoms than first year students. There was no significant cohort by year interaction, $F(1,979) = 2.25$, $p = .134$, $\eta p^2 = .002$. Gender was a significant covariate, $F(1, 979) = 24.59$, $p < .001$, $\eta p^2 = .024$.

There was a significant difference in anxiety symptoms between cohorts, $F(1,979) = 5.35$, $p = .021$, $\eta p^2 = .005$, with those in the 2020 cohort reporting more anxiety symptoms than the 2016 cohort. There was a significant difference in anxiety symptoms between first-year students and advanced students, $F(1,979) = 4.95$, $p = .026$, $\eta p^2 = .005$, with advanced students reporting more anxiety symptoms than first-year students. Gender was a significant covariate, $F(1, 979) = 41.92$, $p < .001$, $\eta p^2 = .041$. Finally, there was a significant cohort by year interaction, $F(1,979) = 4.11$, $p = .043$, $\eta p^2 = .004$. The interaction was probed. Among first-year students, there was no significant difference between cohorts in terms of anxiety, $F(1,622) = .05$, $p = .832$, $\eta p^2 = .000$. Among advanced year students, however, there was a significant difference in anxiety between cohorts, $F(1,356) = 8.24$, $p = .004$, $\eta p^2 = .023$. Advanced year students in the 2020 cohort (EMM = 8.20, 95% CI [7.38, 9.01]) reported higher levels of anxiety than first year students in the 2020 cohort (EMM = 6.62, 95% CI [6.09, 7.15]), advanced year students in the 2016 cohort (EMM = 6.59, 95% CI [5.79, 7.38]), and first year students in the 2016 cohort (EMM = 6.51, 95% CI [5.77, 7.25]). See Fig. 2 for visual depiction of the interaction.

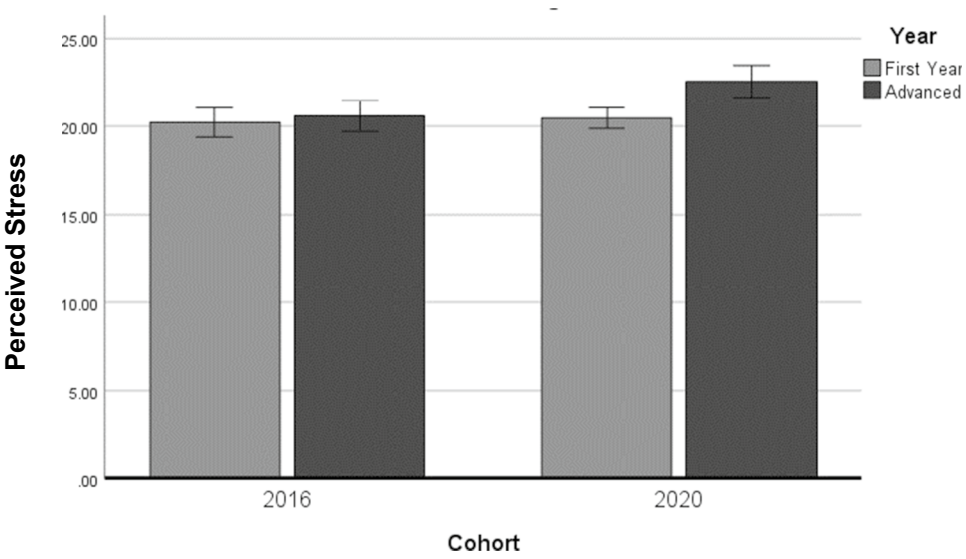

Fig. 1 Interaction Between Cohort (2016 and 2020) and Year (first-year and advanced) on Perceived Stress. *Note*. Values displayed are Estimated Marginal Means. Covariates appearing in the model are evaluated at the following values: Gender = .3231. Error bars = 95% Confidence Intervals. PSS = Perceived Stress Scale-10

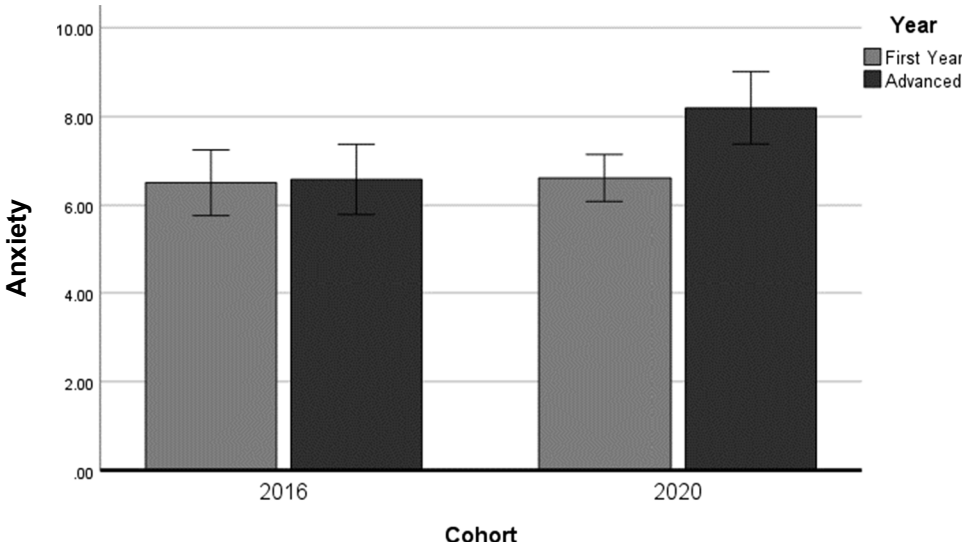

Fig. 2 Interaction Between Cohort (2016 and 2020) and Year (first-year and advanced) on Anxiety. *Note.* Values displayed are Estimated Marginal Means. Covariates appearing in the model are evaluated at the following values: Gender = .3232. Error bars = 95% Confidence Intervals. GAD7 = Generalized Anxiety Disorder Scale-7

There were no significant differences between cohorts in obsessive-compulsive symptoms, $F(1,979) = .79$, $p = .376$, $\eta p^2 = .001$. There were no significant differences in obsessive-compulsive symptoms between first year students and advanced students, $F(1,979) = 2.71$, $p = .100$, $\eta p^2 = .003$. There was no significant interaction between cohort and year in school $F(1, 979) = .94$, $p = .333$, $\eta p^2 = .001$. Gender was not a significant covariate, $F(1,979) = 1.24$, $p = .267$, $\eta p^2 = .001$.

Discussion

College students have faced multiple challenges due to the COVID-19 pandemic, including potential changes in course delivery, social context, work, and housing. Given the prevalence of mental health struggles in college students generally (Hunt & Eisenberg, 2010) and that the pandemic has been shown to have a negative impact on psychological functioning (Fitzpatrick et al., 2020; Wang et al., 2020), it is important to examine the mental health of college students in the context of COVID-19. This understanding will help to inform prevention and intervention efforts to support students as the global pandemic continues to exert unpredictable and far-reaching effects.

Results of the current study indicated that self-reported stress, depressive symptoms, and anxiety symptoms were significantly higher in a sample of United States university students collected during the COVID-19 pandemic (Spring and Fall 2020 semesters) than in a sample of students collected from the same university several years earlier (Fall 2016 semester). These findings align with other initial studies that have indicated that college student mental health has been negatively impacted during this time period (Elmer et al., 2020; Huckins et al., 2020; Tang et al., 2020). Interestingly, the present study's results also indicated a significant interaction between cohort (2016, 2020) and year in school (first-year, advanced) on measures of perceived stress and anxiety, indicating that stress and anxiety levels were similar across cohorts for first-year students but were significantly higher in the 2020 sample for advanced year students. Though statistically significant differences in perceived stress, depressive symptoms, and anxiety symptoms between samples were observed, mean perceived stress levels fell in the moderate range, and mean depression and anxiety levels fell in the mild range for both cohorts. Furthermore, effect sizes for the between-groups differences were small, though statistical significance was observed, so results should be interpreted with this in mind.

At the time of data collection in 2020, students in the 2020 sample had transitioned to increased remote and/or hybrid learning, on-campus housing had been altered, and access to various campus facilities was limited. In the 2016 sample, the primary teaching modality on campus was in-person. Furthermore, while data were not collected from either sample regarding where the students were dwelling at the time of data collection, many students in on-campus housing moved home during the spring of 2020, and others living on-campus or near campus chose to live at home or off campus during 2020 to avoid community housing. Importantly, these data were not collected, and this information is included to provide greater context around the state of the pandemic at the time of data collection in 2020. These hardships, along with social distancing and personal protective equipment requirements, as well as health-related concerns, are likely associated with higher stress and anxiety levels. This aligns with literature to-date that has shown that individuals report both virus-specific fears (Lee et al., 2020) and general anxiety (Cao et al., 2020) during this time, and with research that has indicated that college students are

experiencing increased anxiety since the onset of the pandemic (Huckins et al., 2020). From a behavioral perspective, depressive symptoms may increase when individuals are out of contact with potential sources of positive reinforcement (Manos et al., 2010). In the context of the pandemic, college students likely experienced less social contact, were unable to engage in campus-based activities, and may have missed scheduled travel or important events. Additionally, students were likely taken out of regular routines that previously promoted behavioral engagement with potential positive reinforcers in a structured way (e.g., class schedule). Indeed, one initial study indicated that college students were more sedentary in the context of the pandemic (Huckins et al., 2020). Thus, the inability to engage in meaningful activities, as well as potential adversity associated with the virus itself, may explain the observed differences in depressive symptoms between the 2016 and 2020 samples. Current findings regarding depression align with a recently published large nationally representative survey study which indicated that U.S. adults are experiencing greater depressive symptoms since the onset of the pandemic compared to data collected years earlier (Ettman et al., 2020). Additionally, the study showed that greater exposure to stressors, lower income, and having <$5000 of savings were important risk factors for depressive symptoms (Ettman et al., 2020), all of which may be relevant to college students during this time period.

The significant interaction between year in school and cohort on perceived stress and anxiety outcomes provides important information about the potential drivers of differences in mental health symptoms across cohorts. It may be that advanced students who were previously comfortable in routines and social circles as college students and were then required to change significantly during the pandemic fared worse than first-year students who may not have been as well-established in their roles prior to the pandemic. Additionally, it is possible that many first-year students either returned to a permanent home (Spring 2020 semester) or engaged in online learning from a permanent home (Fall 2020 semester). These students may have found comfort in the familiarity and safety of home, thus serving as a buffer against stress and anxiety. Indeed, Cao et al. (2020) demonstrated that living with parents was a protective factor against anxiety in a sample of Chinese college students.

Finally, though initial literature has highlighted the potential exacerbation of obsessive-compulsive symptoms during the pandemic (Fineberg et al., 2020; French & Lyne, 2020), with one study indicating that approximately one-quarter of Argentine individuals were reporting obsessive-compulsive symptoms during quarantine (Fernández et al., 2020), no differences between samples were observed in the current study. It may be that even if OCD behaviors such as handwashing or cleaning were more frequent during this time period, the *distress* associated with these behaviors may not have been different from the 2016 sample given that these actions (to a degree) are likely reasonable and adaptive during the pandemic. It may also be that the pandemic is more likely to exacerbate pre-existing clinically significant OCD than to lead to an increase in symptoms broadly. Future work may benefit from longitudinally examining changes in symptom severity for those with clinically significant OCD.

Overall, the current study indicated that college students are negatively impacted by the pandemic in terms of stress, depressed mood, and anxiety, but not obsessive-compulsive symptoms. Given the potential negative effects of stress (Cohen et al., 2016), depression (Hare et al., 2014), and anxiety (Härter et al., 2003) on health, these findings have important implications for prevention and intervention efforts. For example, structurally, colleges and universities may benefit from organizing courses and activities in a way that minimizes the stress and anxiety that may result from required adjustments (e.g., clear signage for seating, consistent schedules for hybrid learning). Education surrounding the virus and public health recommendations may also help to relieve some anxiety. Institutions may also benefit from implementing alternate means for social engagement or opportunities for enjoyable or meaningful activities (e.g., seminars, online game nights; Elmer et al., 2020). In addition to these structural changes, prevention and intervention efforts aimed at promoting psychological resilience in college students may benefit from fostering skills for problem-solving and coping with inevitable stress, relating to anxiety in healthy ways (e.g., relaxation or mindfulness; Sun et al., 2021), and on creatively identifying alternative behaviors that allow students to connect with enjoyable or meaningful parts of their lives (e.g., a socially-distanced hike with a friend rather than attending an indoor crowded venue). This is supported by previous work that has also indicated that following a routine, pursuing hobbies, and being outdoors or looking outside are associated with lower levels of depression during this time period (Fullana et al., 2020). These efforts may be especially beneficial for advanced students who have undergone significant changes in routines and roles as college students.

Limitations

Though the current findings have important implications for college student mental health during the pandemic, several limitations should be acknowledged. All data were self-report, thus introducing the potential for bias. The samples were recruited via an undergraduate research pool in which students complete research studies for partial course credit. Notably, the largest course that uses this research pool is a general education credit, so students across many majors are enrolled. Nevertheless, this convenience sample of undergraduates may be different than other same-aged adults who

are at other colleges, not enrolled in college, or dwelling in other areas of the country or the world. The samples were relatively homogenous demographically (e.g., mostly white) and consisted primarily of first-year students, thus limiting claims of generalizability to all college students. Similarly, the homogenous sample limits generalizability of findings to other groups more broadly. Additionally, race and ethnicity were measured differently across the two samples (2016 and 2020), which limited comparisons between different racial and ethnic categories in the current study and may also impact the ability to compare current findings to other studies. Finally, data were cross-sectional, and no longitudinal conclusions can be drawn. Thus, future work will benefit from examining college student mental health longitudinally during and after this time period.

Conclusion

College is an important period of learning, exploration, growth, and independence for many young adults. During the COVID-19 pandemic, college students have faced, and will continue to face, a multitude of alterations that have the potential to negatively impact mental health. The current study demonstrated that college students may be experiencing higher levels of stress, anxiety, and depressive symptoms, but not higher OCD symptoms, in the context of the pandemic. Additionally, results indicated that advanced-year students may be particularly affected by the pandemic in terms of stress and anxiety. These findings make an important contribution to the literature on college student mental health during the COVID-19 pandemic and provide direction for the development and implementation of prevention and intervention efforts aimed at promoting psychological resilience in students as the pandemic and associated hardships continue to unfold.

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Emily B.K. Thomas – study conceptualization, data collection and management, statistical analyses, manuscript preparation.

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Data Availability The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics Approval All study procedures were approved and monitored by the University of Iowa's Institutional Review Board (IRB).

Conflict of Interest The authors have no relevant conflicts of interest to disclose.

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