A Mental Health Self-Screening Tool for Graduate Students

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ABSTRACT

Background: Excessive perceived stress and mental health crises are escalating among college students. About 50% meet mental health disorder criteria, and half of them receive inadequate treatment.

Aim: This study aimed to evaluate the feasibility and outcomes of a 15-20 minute online, anonymous, mental health self-screening survey and resource tool for graduate students across a large midwestern university campus.

Methods: A descriptive, correlational design addressed the study's aims. Recruitment occurred through multiple campus communication mechanisms and included a brief study description, quick reference (QR) code, and weblink to access the tool and survey. Data collected with the tool included demographic items and scores from standardized screening instruments measuring burnout, perceived stress, depression, anxiety, post-traumatic stress disorder (PTSD), alcohol misuse, and health behavior practices. Descriptive and correlational statistics were computed.

Results: Among 778 graduate students who accessed and completed the survey, nearly 60% met the burnout threshold, 58% scored 8 (of 16) on the stress scale, 32% met the depression threshold, 47% met the anxiety threshold, 54% reported one or more symptoms of PTSD, and 38% reported poor health behaviors. Significant positive correlations ($r = 0.184$ to 0.615) were found between burnout, perceived stress, depression, and anxiety. Health behavior scores were significantly negatively correlated ($r = -0.151$ to -0.283) with burnout, perceived stress, depression, and anxiety. Scores differed by gender, race, and graduate student status (part-time vs. full-time). Female identifying students, age, and hours worked per week were associated with various outcome scores. Students commented that the tool needed more specific resources tailored to their scores.

Conclusions: The data support the need for tailored coping resources based on student self-reported data. Video-based micromodules guiding individuals through coping skills (breathing, mindfulness, identifying negative thoughts, gratitude exercises) have since been developed and will be studied as a tailored resource for students.

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INTRODUCTION

Across college campuses, there is a growing mental health crisis impacting graduate students at an alarming rate. For example, Evans et al. (2018) found graduate students (n = 2279) to be six times more likely to experience depression and anxiety as compared to the general population, with 41% scoring moderate to severe anxiety and 39% moderate to severe depression. Female and transgender rates were higher (> 50%). Graduate students have unique stressors different from undergraduate students. In a 2015 article, DeRuy and National Journal showed that 76% of graduate students work at least 30 hours a week compared to 40% of undergraduates. According to a report by the Council of Graduate Schools and the Jed Foundation (2021), stressors contributing to the decline in mental health can include poor mentorship, the inability to access counseling services, and a lack of training for non-academic careers. These findings matched those of El-Ghoroury et al. (2012) who reported finances, poor work/school-life balance, and burnout among graduate students, with common barriers to utilizing wellness and coping strategies being cost and lack of time. Furthermore, the Covid-19 pandemic and associated stressors and uncertainties contributed to even higher rates of depression and anxiety among graduate students (Chirikov et al., 2020).

Unfortunately, graduate students have not been the focus of resources when it comes to research on mental health for students. Usually, graduate students are studied together with undergraduate students (Forrester, 2021). To address this gap, the current study aimed to implement and evaluate the usefulness of an 15-20 minute online anonymous mental health screening tool that provided immediate feedback based on participant responses with suggested resources for students across a large Midwest university campus. The tool was specifically designed for individuals to self-screen their stress levels, mental health, healthy lifestyle behaviors, and overall self-care strategies with immediate automated feedback provided on how individual's scores compared to normative scores, recommended strategies for improving their stress, and health and well-being, and resources they could access at the university and beyond for health care and mental and emotional support. Our specific aims were:

1. Determine levels of stress and mental health problems reported by graduate students using validated instruments in the electronic tool.
2. Examine the relationships between demographic variables and mental health symptoms and health behaviors among graduate students who complete the electronic tool.
3. Evaluate the usefulness of a convenient online, anonymous mental health screening tool for university graduate students.

BACKGROUND

Graduate student mental health concerns have grown over the past decade with more visibility and increased research on the topic. In 2014, researchers described an anonymous online screening program to evaluate mental health, suicide, and service utilization (Garcia-Williams et al., 2014). They enrolled 301 graduate students from 2010 to 2012 and found the Patient Health Questionnaire (PHQ-9) scores indicated mild depression, with more than half of participants endorsing feelings of irritability, stress, anxiousness, and loneliness. The report also indicated that 22% of participants (n = 67) were taking medications for mental health, and 19% (n = 56) were currently in counseling or

therapy.

In a 2017 study, Levecque et al. found that one out of every two PhD students to be at risk for a common psychiatric disorder while one in two experience psychological distress. Fifty-one percent of PhD students reported at least two symptoms on the General Health Questionnaire (GHQ-12), indicating psychological distress. Additionally, 32% of PhD students report at least four symptoms on the GHQ-12, which indicates a high risk of developing a mental health disorder, especially depression. Common feelings described amongst this population were being under constant strain, sleeping issues due to worrying, not being able to enjoy day-to-day activities, and unhappiness or depression. Strong predictors of psychological distress and increased risk included family-work conflict, job demands, and job control (Levecque et al., 2017).

Mental health issues accelerated for graduate students during the COVID-19 pandemic with fear of contracting the disease, concern about family members, economic changes, and job loss (Wasil et al., 2021). Common coping strategies included using distractions (e.g., watching TV or eating) or healthier behavioral actions (e.g., physical activity or going outside; Wasil et al., 2021). A national survey of over 15,000 graduate and professional students from nine public research universities found rates of anxiety (39%) and depression (32%) that were double that of 2019 (Chirikov et al., 2020). Moreover, higher rates of both depression and anxiety were found among low-income students, Latino students, and students from gender and sexual minorities. In another study, students who stated that they were not adjusting well to online school reported an increase in anxiety by 60% (Wasil et al., 2021), which may have been fueled by uncertainty involving their academics and concerns about how their futures will be impacted by the pandemic (National Academies of Sciences, Engineering, and Medicine, 2021). A recommendation from these studies was to provide inclusive counseling services that offer different types of care aligned with student need and comfort (Woolston, 2020).

In recent years, mental health resources are becoming more prevalent on university campuses, yet students are not utilizing them often. In 2020, Horwitz et al. conducted a study among four U.S. universities on demographic factors that influenced mental health resource utilization by students at risk for suicide. Overall, 13.9% (n = 5772) of participating students (n = 42,1448) screened positive for risk of suicide. A sub-sample (n = 3358) of participants (excluding those currently on psychotropic medications or seeking mental health services) was examined to identify most prominent barriers to seeking help. Lack of time, questioning the seriousness of needs, and feeling as though stress is a typical aspect of being a college or graduate student were most common barriers. Graduate and professional students were more likely to express issues with logistics (e.g., inconvenient hours, waiting for an appointment is too long, etc.), time, finances, and cultural sensitivity as barriers to mental health services. Racial and ethnic minority groups were more likely to report stigma, finances, logistics, and cultural concerns as barriers to mental health services (Horwitz et al., 2020).

Creative services and approaches are needed to meet graduate students' unique needs. For example, an editorial report in Nature (2019) described the need for a quiet room for "crying time" when the pressure caused by graduate studies becomes overwhelming. This report also indicated that 36% reported they had sought help for anxiety or depression related to their PhD studies, suggesting a need for programs targeting anxiety associated with graduate studies and expectations. In a similar study based in the United Kingdom, students were overall happy about their research, but 86% reported higher anxiety levels (Neves, 2019). More research is needed to understand how to best meet the mental health needs of graduate students considering their unique stressors, demands, and vulnerabilities.

METHODS

Design

A descriptive, correlational design was used to address the study aims. Descriptive statistics were conducted on each of the study variables. Demographic data and relationships among variables were examined using correlational and inferential statistics.

Sample and Setting

The study was conducted at a large Midwestern university. All graduate students were invited through multiple communication venues to participate in the study by completing the anonymous screening with immediate automated feedback and a resources list. Being an enrolled active graduate student was the only inclusion criteria, and the only exclusion criterion was declining consent for the study.

Measures

Study variables included demographic data, perceived stress and burnout ratings; depression, anxiety, and post-traumatic stress disorder (PTSD) symptoms; alcohol use; health behaviors; and participant satisfaction with the tool. Demographic data included gender, ethnicity/race, age, education, marital status, minor children in the home, caring for adult family members, part-time or full-time status, whether they were in a health-related college or non-health related college, hours worked per week, whether they were currently receiving mental health or mental health spiritual counseling, and questions about Covid-19 (i.e., screened positive, been exposed to others positive, and received Covid-19 related treatment). Five standardized brief scales, validated in previous studies, were used to measure the mental health symptoms along with a validated one-item burnout measure. Table 1 presents the variables, scales, number of scale items, definitions, and data on psychometrics for each scale. Health behavior was also measured through a 4-item tool that investigators created using a Likert response scale of 1 = *strongly disagree* to 5 = *strongly agree*. Items covered behaviors related to daily sleep, weekly moderate and vigorous physical activity, daily servings of fruits and vegetables, and weekly stress reduction activities (e.g., mindfulness, meditation, cognitive-behavioral skills building). Scores were summed for the four items with the following interpretations of the summary score: 16-20 = strong health behaviors, 10-15 = moderate health behaviors, and under 10 = poor health behaviors.

Overall satisfaction with the stress and well-being tool included four questions. Two questions asked about the helpfulness of the tool as a just-in-time resource and for raising awareness of stress and coping levels. The third question asked whether students would use it again, and the final question was open-ended for providing general comments to improve the tool.

Table 1

Five Standardized Brief Scales

Variable	Scale and Items	Definition	Testing
Perceived Stress	Perceived Stress Scale (PSS-4) 4 items	Assesses current perceived stress levels over the past month	Scores range from 0 to 16; higher scores are associated with more stress and health problems (Cohen & Williamson, 1988; Lee et al., 2016)
Depressive Symptoms	Patient Health Questionnaire (PHQ-2) 2 items	Screens for depressive symptoms over the past 2 weeks (depressed mood and anhedonia or disinterest in doing any joyful life activities)	Scores range from 0 to 6; a score of 3 or more needs further assessment. Valid and reliable (Kroenke et al., 2003)
Anxiety Symptoms	Generalized Anxiety Disorder (GAD-2) 2 items	Screen current feelings of anxiousness and not being able to stop worrying over the past 2 weeks	A score of 3 is a cut-off for further evaluation. Valid and reliable (Kroenke et al., 2007)
Post-Traumatic Stress Disorder (PTSD)	PC-PTSD-5 5 items	Screens for persons with probable post-traumatic stress disorder over the past month	Answer to three is considered positive. Valid and reliable (Prins et al., 2016)
Alcohol Use and Abuse	Alcohol Use Disorders Identification Test (AUDIT-C) 3 items	Screens for excessive alcohol use and abuse with 3 questions	A score of 4 or more for men was positive; 3 or more for women (National Institute of Alcohol Abuse & Alcoholism, 2003)
Burnout	Non-proprietary measure 1 item	Screens burnout as defined by the respondents themselves a. "I enjoy my work. I have no symptoms of burnout." b. "Occasionally, I am under stress, and I don't always have as much energy as I once did, but I don't feel burned out." c. I am definitely burning out and have one or more symptoms of burnout, such as physical and emotional exhaustion." d. "The symptoms of burnout that I'm experiencing won't go away. I think about frustration at work a lot." e. "I feel completely burned out and often wonder if I can go on. I am at the point where I may need some changes or may need to seek some sort of help."	Single-item measure correlated highly with well-known Masloch burnout emotional exhaustion subscale (Dolan et al., 2015; West et al., 2009, 2012) Score dichotomized as ≤ 2 (no symptoms of burnout) vs. ≥ 3 (1 or more symptoms)

Human Subjects Approval

This study was approved by the Institutional Review Board (IRB) at the study site (#2020B0154) ensuring that this study followed ethical guidelines for research participants. Given the anonymous nature of the study, the IRB deemed the study exempt from further review and reports. Participants were required to first indicate consent in the electronic

survey to access the tool and resources. Included in the consent language was a disclaimer that participants needing immediate help should NOT complete the survey and instead seek emergency help. The screening scales are those commonly utilized in clinical practice for screening, and similar screening programs were in use by the university without any observed adverse events.

Procedures

Recruitment

Recruitment information was posted throughout multiple venues. Information about participating in the study was communicated through newsletter communications, including two daily email communications, a wellness innovator newsletter, medical center nursing newsletter, and organizational wellness news and events. Additional communications included social media, in college lobby areas, on the chief wellness officer website, a medical center newsletter from the graduate school dean, and student life communications to graduate students.

Data Collection

The recruitment information included a brief description of the study, a QR code, and a weblink that took participants directly to the screening and resource survey, which was hosted on the Qualtrics software platform. The goal was that participants could take an image of the QR code or scan the QR code to take the survey at a time and place that works best for them. The survey was estimated to take 15-20 minutes to complete.

Once participants accessed the screening and resource survey, an initial page appeared with a brief description of the study purpose and a disclaimer that ensured participants that their results would be anonymous and confidential. This page also included a sentence stating that participants may exit the survey at any time and a sentence stating, "If you feel you need immediate help, please exit the survey and call 911 or go to the nearest emergency room." Lastly, this disclaimer page included a short acknowledgement and consent section stating that their anonymized results and data will be used for a study. Participants then clicked the "accept to continue" button, and the survey began. If a participant did not indicate consent, they could not continue with the survey.

Participants first answered the demographic questions, and then completed the five brief questionnaires regarding stress, depression, anxiety, PTSD, and alcohol use/abuse, plus the burnout question and health behavior questions. Participants completed the screening scales one at a time and received immediate feedback of their summary score (compared to norms and cut-offs for the scales). For example, "you scored X on Mood Assessment 1. A score of 0 = no suggestive depressive disorder symptoms, 1-2 = mild depressive disorder symptoms, and 3 or greater = moderate to severe depressive disorder symptoms. Here are some next steps/resources".

Resources

A PDF list of resources was presented after scoring each scale and again at the end of the survey. Resources were numerous campus offerings for graduate students including several created during the Covid-19 pandemic. Examples of resources included wellness webinars, counseling and consultation services, student wellness services offered

through the student services department, an online 7-week program for supporting energy management, an online 8-week cognitive behavioral program, mindfulness/meditation programs, and stress reduction strategies. Following completion of all screening items and satisfaction items, participants submitted their overall survey and exited the browser.

Data Analysis

Data analyses were descriptive and correlational. Frequencies, percentages, and central tendencies were used to examine participants' data. Associations were explored between screening scale scores and demographic characteristics using Pearson's correlation coefficients, and differences in scores by demographics were analyzed using a one-way analysis of variance (ANOVA). An apriori power analysis was not conducted, however a post-hoc analysis was conducted based on the correlational data. Based on a sample size of 778, a correlation of 0.40, and an alpha significance level of 0.05, power for this study was 100%.

RESULTS

This study collected data through the tool from September 16, 2020 to December 28, 2020. All participants (n = 778) were graduate students at a large Midwest university, ranging from part-time to full-time students from various academic areas. Sample demographics are shown in Table 2. Of the total participants, 552 selected female identifying gender, and 211 selected male identifying gender. Most participants were under the age of 30 (n = 610). Most participants did not have children (n = 665) nor older/vulnerable adults (n = 732) for which they were primary caregivers. Full-time student status comprised 663 participants, with 319 being in health sciences colleges and 314 being in non-health science colleges. Part-time student status comprised 138 participants, with 86 being in health sciences. Most participants were single and never married (n = 531). The number of hours worked per week varied among participants (Table 2).

Table 2

Sample Demographics

Variable	Frequency (%)
Gender	
Female	552 (71.0%)
Male	211 (27.1%)
Other	12 (1.5%)
Prefer not to say	3 (0.4%)
Age	
18-30 years old	610 (78.4%)
31-45 years old	138 (17.7%)
46+ years old	27 (3.5%)
Prefer not to say	3 (0.4%)
Children (age 0-21) you are responsible for	
1	52 (6.7%)
2-3	55 (7.1%)
4 or more	6 (0.8%)
None	665 (85.5%)
Caring for an older or vulnerable adult	
No	732 (94.1%)
Yes	46 (5.9%)
Marital Status	
Divorced or Separated	21 (2.7%)
In a domestic partnership	32 (4.1%)
Married	193 (24.8%)
Single (never married)	531 (68.3%)
Widowed	1 (0.1%)
Graduate Student Status	
Full-time, in the health sciences colleges	319 (41%)
Full-time, NOT in the health sciences colleges	314 (40.4%)
Part-time, in the health sciences colleges	86 (11.1%)
Part-time NOT in the health sciences colleges	52 (6.7%)
Did not answer	7 (0.9%)
Hours/week worked	
1-10 hours/week	88 (11.3%)
11-20 hours/week	157 (20.2%)
21-30 hours/week	94 (12.1%)
31-40 hours/week	141 (18.1%)
Full-time salaried employee	51 (6.6%)
More than 40 hours/week	101 (13.0%)
Not currently employed	130 (16.7%)
On disability	2 (0.3%)
Part-time salaried employee	12 (1.5%)
Did not answer	2 (0.3%)
Race/Ethnicity	
White/Caucasian	493 (63.4%)
Asian/Pacific Islander	139 (17.9%)
Black or African American	39 (5%)
Hispanic or Latino	35 (4.5%)
Other (combined races, other, Native American, prefer not to say)	72(9.3%)

Study Aims Findings

Aim 1: Determine Levels of Stress and Mental Health Problems Reported by Graduate Students Using Validated Instruments in The Electronic Tool

Table 3 presents overall descriptive data for the stress and mental health scores. Participants' average stress rating (PSS) was 7.84 (*SD* = 3.03) with 16 being the highest possible score. Of the four items on the PSS, the highest mean score was 3.19 (.01) for the following question: "In the last month, how often have you felt that you were unable to control the important things in your life?" The mean score on the burnout instrument was 2.76 (*SD* = 0.94). Of the total participants, 464 (59.9%) scored a three or higher, which meets the threshold for a positive burnout score. The mean score on the PHQ-2, which measures depressive symptoms, was 2.10 (*SD* = 1.60). Out of the total participants, 252 (32.4%) scored a three or higher, meeting the threshold for significant risk of depression. Regarding the GAD-2 anxiety scale, the mean score was 2.60 (*SD* = 1.77). Out of the full sample, 362 (47%) scored a three or higher, meeting the significant risk of anxiety threshold. The mean score for the PTSD scale was 1.22 (*SD* = 1.51) with 401 (52%) participants reporting at least one symptom of PTSD. A "yes" to 3 questions or more suggests a probable cause for considering PTSD.

The mean score on the AUDIT-C scale (alcohol use) was 2.64 (*SD* = 1.87) for students identifying as female gender and 3.11 (*SD* = 2.22) for students identifying as male gender. Of the female gender identifying participants (*n* = 502), 236 (47%) scored above a 3, meeting the threshold for possible alcohol misuse. Among the male participants (*n* = 192), 78 (41%) scored above a 4, meeting the threshold for possible alcohol misuse. Participants mean health behavior score was 11.64 (*SD* = 3.25) indicating moderate health behaviors score (11-15). Among the total participants, 190 (24.5%) scored below a 10, which falls in the poor health behavior category.

Most participants were not involved in mental health counseling (76%) or spiritual counseling (92%). Participants currently seeking treatment had significantly ($p < 0.001$) higher scores for burnout, perceived stress, depression, anxiety, and PTSD. Participants receiving spiritual counseling reported higher PTSD scores (M = 1.68 vs. M = 1.19, $p = 0.026$), yet lower burnout scores (M = 2.48 vs. M = 2.77, $p = 0.004$) and better health behaviors (M = 12.73 vs. M = 11.55, $p = 0.025$) when compared to those not receiving spiritual counseling.

A majority (*n* = 439, 56%) of participants said that their current coping strategies were "somewhat" working. Comparing those who said at least somewhat working to those who said strategies are not working, higher averages for burnout, perceived stress, depression, anxiety, and PTSD came from the latter participants ($p < 0.001$). The lowest average scores (i.e., better mental health) were found with those who answered that their coping strategies were somewhat working or working. Due to this survey taking place in 2020, we included questions related to COVID-19. Significantly higher alcohol use ratings were found for those exposed to someone who had COVID-19 (*M* = 3.16 vs. 2.61, $p = 0.002$) or screened positive for COVID-19 themselves (*M* = 3.55 vs. 2.71, $p = 0.013$).

Table 3

Descriptive Data for Stress and Mental Health Scales

Variable	Mean (SD) n	Minimum/Maximum	Median
Burnout 1-Item	2.76 (.94) 775	1.00 - 3.00	3.00
PSS4	7.84 (3.03) 778	04.00 - 16.00	8.00
PHQ2	2.10 (1.60) 777	0.00 - 6.00	2.00
GAD2	2.60 (1.77) 777	0.00 - 6.00	2.00
PTSD5	1.22 (1.51) 771	0.00 - 5.00	1.00
AUDIT			
Males	3.11 (2.22) 192	0 - 11	3.00
Females	2.64 (1.87) 502	0 - 9	2.00
Other	2.91 (2.02) 12	0 - 6	3.5
Prefer Not to Say	1.00 (0.00) 3	1-1	1
Health Behaviors 4 Items	11.64 (3.25) 777	4.00 - 20.00	12.00

Note. PSS4 = Perceived Stress Scale 4-Item; PHQ-2 = Patient Health Questionnaire 2-Item; GAD2 = Generalized Anxiety Disorder 2 Item; PTSD5 = Post-Traumatic Stress Disorder 5-Item; AUDIT = Alcohol Use.

Study Aim 2: Examine the relationships between demographic variables and mental health symptoms and health behaviors among graduate students who complete the electronic tool.

Bivariate Pearson correlation coefficients were run to explore relationships between demographic variables and stress, burnout, mental health conditions, and health behaviors. Significant positive correlations (0.184 to 0.556) were found between burnout and perceived stress, depression, anxiety, and PTSD ($p < 0.001$). Significant negative correlations (-0.283, -0.151) were found between health behaviors and burnout, perceived stress, depression, anxiety, and PTSD ($p < 0.001$; Table 4).

Table 4

Correlations Among Mental Health Outcomes

Variable	Burnout	PSS4	PHQ2	GAD2	PTSD	AUDIT	Health Behaviors 4 items
Burnout							
Pearson Correlation	1	.556**	.480**	.474**	.184**	.029	-.210**
Sig. (2-tailed)		<.001	<.001	<.001	<.001	.438	<.001
n	775	775	775	775	769	706	774
PSS4							
Pearson Correlation	.556**	1	.611**	.615**	.364**	.038	-.283**
Sig. (2-tailed)	<.001		<.001	<.001	<.001	.313	<.001
n	775	778	777	777	771	709	777
PHQ2							
Pearson Correlation	.480**	.611**	1	.598**	.384**	.065	-.250**
Sig. (2-tailed)	<.001	<.001		<.001	<.001	.083	<.001
n	775	777	777	777	771	708	776
GAD2							
Pearson Correlation	.474**	.615**	.598**	1	.346**	.062	-.223**
Sig. (2-tailed)	<.001	<.001	<.001		<.001	.098	<.001
n	775	777	777	777	771	708	776
PTSD5							
Pearson Correlation	.184**	.364**	.384**	.346**	1	.069	-.151**
Sig. (2-tailed)	<.001	<.001	<.001	<.001		.068	<.001
n	769	771	771	771	771	704	770
Alcohol Use (AUDIT)							
Pearson Correlation							
Sig. (2-tailed)	.029	.038	.065	.062	.069	1	.033
n	.438	.313	.083	.098	.068		.374
	706	709	708	708	704	709	709
Health Behaviors 4 Items							
Pearson Correlation							
Sig. (2-tailed)	-.210**	-.283**	-.250**	-.223**	-.151**	.033	1
n	<.001	<.001	<.001	<.001	<.001	.374	
	774	777	776	776	770	709	777

Note. PSS4 = Perceived Stress Scale 4-Item; PHQ-2 = Patient Health Questionnaire 2-Item; GAD2 = Generalized Anxiety Disorder 2 Item; PTSD5 = Post-Traumatic Stress Disorder 5-Item; AUDIT = Alcohol Use.

** Correlation is significant at the 0.01 level (2-tailed).

A one-way ANOVA test was calculated for each demographic category and the mental health measures. When comparing age groups, anxiety (GAD-2) scores differed significantly ($F = 4.70$, $p = 0.003$). Mean score was 2.69 for 18-30 years old, 2.38 for 31-45 years old, and 1.52 for 46+ years old. The younger the students, the higher the GAD-2 average score. Comparing groups by self-identifying gender revealed significant differences in burnout, perceived stress, and anxiety. Mean burnout score for female identifying students was 2.83, while mean score for male identifying students was 2.56 ($F = 4.82$, $p = 0.002$). Mean perceived stress score for female identifying students was 8.05, for males was 7.27 ($F = 4.82$, $p = 0.016$). For anxiety, mean score for female identifying students was 2.82, while mean scores for males was 1.99 ($F = 12.25$, $p < 0.001$).

Table 5 presents race and ethnicity data for the four major groupings (the remaining cells were varied and small). Exploring differences by ethnicity and race, the ANOVA statistic indicated significant differences for PTSD ($p = 0.014$), alcohol consumption ($p < 0.001$), and total health behaviors ($p < 0 .001$). There were 17 different combinations when asking the participant about their ethnicity/race, making it impossible to look at all specific differences.

Participant mental health variables were also examined by part-time (PT) or full-time (FT) employment status and enrollment in a health science college (HSC) or in a non-health science college (NHSC). Comparisons were made among the following groups: FT-HCS, FT-NHSC, PT-HSC, and PT-NHSC revealing significant differences between groups for perceived stress ($p = 0.041$), depression ($p < 0.001$), anxiety ($p = 0.041$), and health behaviors ($p = 0.025$). The most favorable scores for depression, anxiety, and stress were reported by students from HSC and more significantly for PT students. Health behaviors were lower for participants in non-health science colleges. Burnout showed a significant difference ($p < 0.001$) by work hours. Higher burnout scores were observed as work hours increased: 1-10 hours/week = 2.56; 11-20 hours/week = 2.60; 21-30 hours/week = 2.61 ;31-40 hours/week = 3.02; and 40+ hours/week = 3.04.

Table 5

Descriptive Statistics and ANOVA for Burnout, Stress, and Mental Health Scales by Race/Ethnicity

Variable	White/ Caucasian	Asian/Pacific Islander	Black/African American	Hispanic/ Latino	F statistic p value
Burnout					
M (SD)	2.74 (.901)	2.69 (.977)	2.90 (.940)	2.94 (1.20)	1.09
n	491	139	39	34	.383
Stress					
M (SD)	7.76 (2.95)	8.02 (3.20)	8.05 (2.78)	7.89 (3.05)	.357
n	493	139	39	35	.784
Depression					
M (SD)	2.04 (1.57)	2.24 (1.63)	1.97 (1.51)	2.34 (1.68)	.962
n	492	139	39	35	.410
Anxiety					
M (SD)	2.56 (1.71)	2.64 (1.94)	2.36 (1.86)	2.74 (1.86)	.377
n	492	139	39	35	.770
PTSD					
M (SD)	1.15 (1.42)	1.33 (1.63)	1.51 (1.67)	2.06 (1.75)	4.68
n	487	138	39	35	.003*
Alcohol Use					
Males					
M (SD)	3.44 (1.98)	2.22 (2.11)	2.11 (1.54)	3.41 (2.18)	4.45
n	112	40	9	17	.005*
Females					
M (SD)	2.85 (1.77)	1.86 (1.97)	2.12 (1.45)	3.00 (2.22)	7.45
n	335	80	26	18	.001*
Health Behaviors					
M (SD)	11.85 (2.96)	10.97 (3.23)	10.28 (4.33)	12.03 (3.00)	5.52
n	493	139	39	35	.001*

*Indicates significance level less than 0.05.

Study Aim 3: Evaluate the Usefulness of a Convenient Online, Anonymous Mental Health Screening Tool for University Graduate Students

Participants were asked to rate how beneficial this type of survey tool was for stress and coping resources. Most participants found it somewhat useful to very useful (85%), whereas 12.5% found it not useful. Participants were also asked to rate how useful the screening measure was for making them more aware and conscious of personal stress levels and coping mechanisms in relation to overall mental health. Again, the vast majority (88%) found it somewhat to very useful and only 9.7% found it not useful. Lastly, participants were asked how likely they would use the resource

again if offered in a phone app. The participant's responses were 84% somewhat likely or likely, while 15.8% said unlikely.

DISCUSSION

Bringing attention to the mental suffering and stress of graduate students is critical. The data collected from this study exceeds the national average for adults regarding mental health disorders. The National Alliance on Mental Illness (2022) reported U.S. adults experience depression at 8.4%, anxiety at 19.1%, and PTSD at 3.6%. In this study, burnout was the highest self-reported concern, with most participants meeting the threshold at 59.9%. Burnout was strongly positively correlated with other mental health concerns of depression, anxiety, PTSD, and increased perceived stress. Participants' perceived stress was highest for the item "feeling out of control with important things in life."

Younger students had higher rates of anxiety, which coincides with research done during the time of COVID-19 (Varma et al., 2020). Female identifying participants had higher rates of burnout, perceived stress, and anxiety. Women are nearly twice as likely to experience an anxiety disorder in their lifetime, which is linked to increased stress and burnout (McLean et al., 2011). There were also significant differences between race and ethnicity regarding health behaviors, PTSD, and alcohol consumption. In the literature, racial minorities are more likely to experience poorer health behaviors and outcomes commonly caused by systemic inequality in healthcare, economics, and housing (Carratala & Maxwell, 2020). Given the differences noted between specific races and ethnicities, albeit unequal sample sizes, mental health resources may be needed that focus on tailoring specific counseling needs based on racial and ethnic differences. More research is essential in this area.

Participants in non-health science colleges were more likely to have higher perceived stress, depression, and anxiety rates. This may be related to uncertain non-academic and academic job security compared to health science colleges. It may also reflect the health and well-being focus and knowledge of health sciences students especially given health behaviors were higher in those who were a part of health science colleges. Burnout was found at higher rates with more hours worked. According to Hu et al. (2016) long work hours have an increased association with burnout, especially among those under the age of 50, women, and those who are physically inactive at their place of employment. The current study participants reported similar characteristics, and thereby more likely to burn out by longer work hours.

Participants already in mental health counseling had higher scores of burnout, perceived stress, depression, anxiety, and PTSD. This could reflect that those who experience higher rates of mental illness are more likely to utilize professional counseling to help manage their symptoms. Participants who said that current coping styles were not working had the highest rates of mental health concerns with low scores for health behaviors. Conversely, participants who said current coping styles were working had the lowest rates of mental health concerns with higher scores for health behaviors. This suggests that those who find effective coping skills may have fewer mental health issues or that these coping strategies are protective for managing mental illness symptoms. The COVID-19 pandemic also influenced mental health concerns, noting a significant correlation between those exposed or tested positive for COVID-19 and increased alcohol consumption. In a study focused on alcohol consumption during the COVID-19 pandemic, 60% of participants reported an increase in drinking, with 34.1% reporting binge drinking, and 7% reporting extreme binge drinking (Grossman et al., 2020). With increased stress, isolation, boredom, and access to alcohol, those exposed or tested positive for COVID-19 may turn to alcohol consumption.

Participants reported experiencing high rates of burnout and concerning levels of mental health symptoms, while most participants were not receiving any form of counseling to help with coping. Creating an anonymous mental health self-screening tool that is easily accessible online and provided a list of diverse local resources was thought to help raise awareness of stress and coping and point participants to coping strategies and resources. Some participants found the resources were not tailored enough to their specific needs. The tool has now been developed into a highly interactive software tool with mental health screening and individualized resources based on reported symptoms that include evidence-based skills building video micromodules, encouraging messaging, well-being tips and strategies, access to professional resources, and emergency resources. The tool is currently moving to a go-live stage to be tested locally and then will be made available commercially.

Limitations of this study are important to highlight. The first limitation regards the likely response bias. Due to the study focusing on mental health and providing resources based on answers given, those participants who finished the survey may have been more in need of resources than those who did not complete the survey. The second limitation involves the time that this study took place. The COVID-19 pandemic was still impacting everyone's lives from September to December 2020, during the study period when participants were using the tool. The pandemic had a variety of unique stressors that could have caused an increase in mental health symptoms. Additionally, this study only involved participants from one university, which could influence generalizability to other graduate students on different campuses. Another limitation was the information was self-reported data from participants and no objective measures. Participants may over or under-report their symptom severity, have different interpretations of questions and answers, or have a decreased ability to self-reflect on their mental health. The last limitation regards screening tools, which are not diagnostic, and the health behaviors scale has not been formally tested. Screening tools only evaluate the risk of developing a specific mental health condition.

Recommendations from this study are focused on improving mental health resources to accommodate graduate students' main concerns and decrease barriers to accessing resources. Today, there is significantly more research on mental health issues involving graduate students and more research on the barriers to resource access and utilization. For example, this study indicated that the tool was not specific enough to accommodate every graduate student's needs. Based on this feedback, the tool has been improved through leveraging technology and is currently being deployed for testing locally. Demographic factors such as race, gender, sexuality, graduate program, and others influence the need for mental health resources. Future services must focus on affordable, flexible, diverse, and culturally competent counseling to allow graduate students to integrate these into their schedules. Future research is also needed on mental health outcomes among graduate students from diverse race, ethnicity, and gender groups. Knowing the specific issues and struggles among diverse groups can inform services and interventions that can be tailored to individuals and their unique needs.

The study informs practice and research related to graduate student mental health concerns, self-screening tools, and resources needed to manage stress, mental health, and coping. While not a specific aim of this study, our overall efforts also aim to normalize mental health screening amongst graduate students and contribute to reducing the stigma surrounding psychological distress and disorders. The tool in this study can guide a university to gauge the mental health status of its graduate students, as well as increase graduate students' awareness of the importance of their mental health and guide them to self-help and professional resources. To this end and as discussed above, the study team is committed to advancing this field of study and currently deploying an online and mobile interactive tool and seeking to commercialize this product as a customizable tool for other universities and businesses.

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Author's Note

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