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Prevalence and Correlates of Depression, Anxiety, Stress, Healthy Beliefs, and Lifestyle Behaviors in First-Year Graduate Health Sciences Students

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Abstract

Background: Graduate and professional students are reported to have higher than average rates of depression compared to age- and gender-matched populations. Further, more than half of student health visits are due to anxiety, yet little is known about the relationships among depression, anxiety, and healthy lifestyle behaviors in this population as well as what factors predict depression and anxiety.

Aims: The purposes of this study were as follows: (a) to examine the prevalence of depression, anxiety, stress, physical health, healthy beliefs, and lifestyle behaviors in incoming first-year health sciences professional students; (b) to describe the relationships among these variables; and (c) to determine predictors of depression and anxiety.

Methods: A descriptive correlational study design was used with baseline data collected from first-year graduate health sciences students from seven health professions colleges who were participating in a wellness onboarding intervention program, including Dentistry, Medicine, Nursing, Optometry, Pharmacy, Social Work, and Veterinary Medicine.

Results: Seventeen percent of incoming students reported moderate-to-severe depressive symptoms with 6% reporting suicidal ideation. In addition, 14% of the participating students reported moderate-to-severe anxiety. Factors that predicted depression and anxiety included having less than 7 hr of sleep per night, worse general health, lower healthy lifestyle beliefs, lower healthy lifestyle behaviors, higher stress, and a perceived lack of control.

Linking Evidence to Action: These findings highlight the need to routinely screen incoming health sciences students for depression and anxiety upon entrance into their academic programs so that evidence-based interventions can be delivered and students who report severe depression or suicidal ideation can be immediately triaged for further evaluation and treatment. Providing cultures of well-being and emphasizing self-care throughout academic programs also are essential for students to engage in healthy lifestyles.

Keywords

depression; anxiety; health behaviors; mental health; evidence-based practice; intervention research

BACKGROUND

The prevalence of depression is growing in the United States (Weinberger et al., 2018), and it is estimated that depression will be the leading cause of illness globally by 2030 (Mathers & Loncar, 2006). Anxiety disorders, the most prevalent of the mental disorders in the United States, affect one in three adults (Bandelow & Michaelis, 2015). Suicide is the second leading cause of death among people ages 15–34, with an estimated 9.3 million adults reporting having suicidal thoughts in the past year (Substance Abuse & Mental Health Services Administration, 1999). Many of these mental disorders begin during the adolescent and early adult years with increasing pressure during transition periods, such as the college and graduate school years, as these are particularly stressful times. In a national survey of 100,000 college-aged students, the Center for Collegiate Mental Health (2016) found that more than half of the student campus clinic visits were a result of anxiety. Graduate and professional students are reported to have higher than average rates of depression compared to age- and gender-matched populations (Dyrbye, Thomas, & Shanafelt, 2006). The correlation between generalized anxiety disorder (GAD) and major depressive disorder (MDD) is particularly strong, with over 50% of college-aged students who screen positive for GAD also screening positive for MDD (Eisenberg, Gollust, Golberstein, & Hefner, 2007). A recent survey of graduate students found that 7.3% reported experiencing suicidal thoughts, 2.3% reported having a plan for suicide, and 1.7% had hurt themselves in the past 2 weeks (Dredge, Gleeson, & de la Piedad Garcia, 2014).

Whereas more research is focusing on the health and well-being of graduate students, far less has focused specifically on health sciences professional graduate students, who may be at a unique risk for adverse mental health concerns due to high levels of stress and burnout as well as the rigor of their academic programs (Dyrbye et al., 2014; Elani et al., 2014). Health sciences programs typically include nursing, medicine, dentistry, health and rehabilitation sciences, optometry, pharmacy, social work, and veterinary medicine. Most research on this population has focused on individual health professional schools, with a paucity of studies focused on health professional students as a whole and their unique mental health concerns. Surveys and systematic reviews have been conducted on medical students' mental health, finding that their prevalence of depression is high during medical school (Dyrbye et al., 2006) and often higher during medical school than in residency or their early career. One study found that nearly 60% of medical students surveyed screened

positive for depression, and nearly 10% had suicidal ideation in the last 12 months (Dyrbye et al., 2014). A paucity of research has focused on health professional students other than medical students; however, more research has begun to examine the effects of depression and anxiety on health sciences graduates, finding that nurses and residents with higher levels of mental health issues are at higher risk of making medical errors (Fahrenkopf et al., 2008; Melnyk et al., 2018). In one of the few studies of health professional students as a whole, it was found that 41% of the students had elevated self-reported scores of depression and nearly 30% had elevated scores of self-reported anxiety when entering the first year of their graduate program (Melnyk et al., 2016). As these students are future practitioners who will be providing health care to others, their own mental health needs are of particular importance.

Research has found that healthy lifestyle behaviors correlate with measures of depression and anxiety in the general adult population (Loprinzi & Mahoney, 2014; Saneei et al., 2016; Vallance et al., 2011). Other studies specific to college students have found that physical activity and dietary habits are related to motivation and perceived barriers (Downes, 2015). In general, college and graduate students have been found not to engage in the levels of physical activity and nutritious diets recommended by the U.S. Department of Health and Human Services and the U.S. Department of Agriculture (2010; Downes, 2015; Garcia-Williams, Moffitt, & Kaslow, 2014; Office of Disease Prevention and Health Promotion, U.S. Department of Health and Human Services, n.d.; Rye et al., 2012). However, it is not currently known how healthy lifestyle behaviors and beliefs correlate with depression and anxiety in graduate health sciences students. Knowledge regarding these associations would be important for determining potentially effective interventions (Melnyk et al., 2016).

AIMS

The purposes of this study were as follows (a) to examine the prevalence of depression, anxiety, physical health, and healthy lifestyle beliefs and behaviors in incoming first-year health professional students; (b) to describe the relationships among these variables; and (c) to determine predictors of depression and anxiety.

METHODS

A cross-sectional descriptive correlational study design was used with baseline data collected from first-year graduate health sciences students from seven health professions colleges that were participating in a wellness onboarding intervention program. The seven health science colleges included Dentistry, Medicine, Nursing, Optometry, Pharmacy, Social Work, and Veterinary Medicine. The Ohio State University's Institutional Review Board approved the study, which was conducted from August 2017 to May 2018.

Qualified first-year graduate students were recruited from the seven health sciences colleges within a large, land-grant university located in the Midwest. Recruiting consisted of informing students of the study via flyers posted within the various colleges and subsequent emails. After providing consent, students completed the study instruments. A total of 197 students consented to participate in the study.

Measures

Participants completed a personal wellness assessment (PWA) and basic demographic information through REDCap survey software. The PWA consisted of demographics, the Healthy Lifestyle Beliefs Scale (HLBS), Healthy Lifestyle Behaviors Scale (HLBHS), Brief Inventory of Perceived Stress, Patient Health Questionnaire 9 (PHQ-9), General Anxiety Disorder Scale (GAD-7), and single items regarding general health (e.g., physical activity, sleep, and smoking).

Healthy Lifestyle Beliefs Scale—The HLBS (Melnik, 2003b) is a 16-item instrument that was adapted from other belief scales by the second author (Bernadette Melnyk) in multiple prior studies. This scale taps beliefs about various facets of maintaining a healthy lifestyle (e.g., “I believe that I can be more active” and “I am sure that I will do what is best to lead a healthy life”). Participants respond to each item on a Likert scale that ranges from 1 (*strongly disagree*) to 5 (*strongly agree*). Cronbach’s alphas have consistently been above .80 in prior studies.

Healthy Lifestyle Behaviors Scale—The HLBHS (Melnik, 2003a) is a 15-item scale that assesses healthy lifestyle behaviors (e.g., “I exercise regularly,” “I talk about my worries or stressors,” and “I made choices that lead to a healthy lifestyle”). Participants respond to each item on the scale from 1 (*rarely or none of the time*) to 5 (*most or all of the time*). Cronbach’s alphas have consistently been above .80 in prior studies.

Brief Inventory of Perceived Stress Scale—The Brief Inventory of Perceived Stress Scale (BIPS; Lehman, Burns, Gagen, & Mohr, 2012) is a nine-item instrument that assesses levels and categories of stress on a 5-point Likert scale ranging from 0 (*never*) to 4 (*very often*). This scale categorizes stress into groups (lack of control, being pushed, and conflict and imposition.) Scores range from 0 to 36, with a higher score indicating greater stress. BIPS has demonstrated strong validity in assessing individual perceived stress levels, with Cronbach’s alphas above .85.

Patient Health Questionnaire 9—The PHQ-9 (Spitzer et al., 1999) is a nine-item instrument that uses a summative rating scale to assess depressive symptoms. Study participants rank their depressive symptoms for the previous 2 weeks on a scale of 0 (*not at all*) to 3 (*nearly every day*). The psychometric properties of the instrument have been tested in a variety of populations and settings across time, and a review of the literature has found that it has good sensitivity (.88) and specificity (.88) for detecting major depressive disorders, with Cronbach alphas above .87.

General Anxiety Disorder Scale—The GAD-7 (Spitzer, Kroenke, Williams, & Löwe, 2006) is a seven-item instrument that uses a summative response scale to assess individual anxiety levels. Study participants rank their anxiety levels for the previous 2 weeks on a scale of 0 (*not at all*) to 3 (*nearly every day*). The psychometric properties of the instrument have been tested in a variety of populations and settings across time. The literature demonstrates good sensitivity and specificity for GAD (.89 and .82), panic disorder (.74 and .81), social anxiety (.72 and .80), and posttraumatic stress disorder (.66 and .81).

Statistical Analysis

Descriptive statistics were used to summarize sample characteristics. Pearson correlation coefficients were used to examine the pairwise correlations among measures of healthy lifestyle beliefs, healthy lifestyle behaviors, stress, depression, and anxiety. Bivariate tests (e.g., t test, ANOVA, or chi-square) were used to examine the unadjusted associations of sample characteristics with the prevalence of having depression (PHQ-9 score ≥ 10) and anxiety (GAD-7 score ≥ 10). Multiple logistic regression models were used to identify significant predictors of depression or anxiety, adjusting for other covariates in the model. We used two-sided significance level of 0.05 for all the tests. SAS version 9.4 was used for the analyses.

RESULTS

Demographics

The average age of the sample ($N = 197$) was 24.5 years ($SD = 4.9$; see Table 1). A majority of the students were non-Hispanic White (74.1%). Proportions of other minority groups were non-Hispanic Black (6.6%), Asian or Pacific Islander (5.1%), Hispanic (7.1%), and multiracial (5.1%). Most students were from the colleges of Veterinary Medicine (40.6%), Pharmacy (22.3%), Social Work (10.2%), and Nursing (9.1%). A considerable percent of students did not see a consistent healthcare provider (41.1%), had less than the recommended minimum of five servings of fruits and vegetables per day (73.6%), had less than 7 hr sleep per day (38.1%), and did not meet the recommended amount of physical activity (i.e., 30 min or more at least five times per week [57.4%]). The distributions by hours worked per week were 42.6% none, 41.6% 1–19 hr, and 14.7% 20+ hr.

Overall, the students reported good general health (mean \pm SD of 3.3 ± 0.9), strong healthy lifestyle beliefs (48.3 ± 6.4), good engagement in healthy lifestyle behaviors (37.4 ± 7.4), and fairly low depressive symptoms (5.1 ± 4.1), anxiety (5.6 ± 4.6), and stress (BIPS: 18.3 ± 5.4 ; see Table 2). Depression, anxiety, and stress scales were all highly correlated (correlation coefficient = 0.69 for depression and anxiety, 0.51 for depression and stress, and 0.64 for stress and anxiety). All three mental health measures (depression, anxiety, and stress) were negatively correlated with general health, healthy lifestyle beliefs, and healthy lifestyle behaviors (correlation coefficients: -0.13 to -0.38). Among the stress subscales, conflict and imposition had the strongest association with anxiety and depression, followed by the subscales of lack of control and being pushed.

Prevalence of Adverse Mental Health Outcomes

Table 3 includes the prevalence of depressive symptoms among the students. Whereas the majority endorsed no or mild symptoms ($n = 167$, 84.8%), 15.2% ($n = 30$) reported moderate ($n = 26$, 13.2%), moderately severe ($n = 2$, 1%), or severe ($n = 2$, 1%) symptoms of depression per the PHQ-9. Table 4 shows the prevalence of anxiety symptoms among the students. Again, whereas the majority of students reported no or mild symptoms ($n = 169$, 85.8%), 14.2% ($n = 28$) endorsed moderate ($n = 15$, 7.6%), or severe ($n = 13$, 6.6%) symptoms of anxiety per the GAD-7. Lastly, 6.6% ($n = 13$) answered positively to question

9 on the PHQ-9, which asks about thoughts that you would be better off dead or thoughts of hurting yourself in some way.

Predictors of Depression and Anxiety

Table 5 includes the results on predictors of having depression in both unadjusted and adjusted analyses. Factors significantly associated with depression in unadjusted analysis included having less than 7 hr of sleep per night ($p = 0.023$), worse general health ($p = .017$), lower healthy lifestyle beliefs ($p = .002$), lower healthy lifestyle behaviors ($p = .016$), and higher stress ($p = .001$ for BIPS subscale on feeling pushed and $p < .001$ for subscales on conflict and imposition and lack of control, and BIPS total score). Results from the adjusted analysis using logistic regression modeling were that stress was the only significant predictor for depression after adjusting for other factors in the model with estimated odds ratio (OR) = 1.411 and 95% confidence interval (CI) = 1.040–1.915 ($p = .027$). Specifically, when including the three subscales from the BIPS scale as predictors, the lack of control subscale was the single predictor. This finding was from the model including BIPS total score as a predictor, OR = 1.212, 95% CI = 1.078–1.363 ($p = .001$) for BIPS total score.

Similarly, Table 6 includes the results on predictors of having anxiety in both unadjusted and adjusted analyses. Factors significantly associated with depression were also significant risk factors for anxiety, including lack of sleep ($p = .008$), worse general health ($p = .036$), lower scores in healthy lifestyle beliefs ($p = .001$) and behaviors ($p = .001$), and stress ($p = .001$) in unadjusted analysis. Also, stress was the only significant predictor in adjusted analysis (OR = 1.730 for conflict and imposition BIPS subscales and 2.261 for lack of control BIPS subscale from a model including all three BIPS subscales as predictors; OR = 1.488 for a BIPS total score).

DISCUSSION

A substantial number of graduate health sciences students in this study reported depression and anxiety shortly after entering their professional health sciences programs. Seventeen percent of incoming students reported moderate-to-severe depressive symptoms, with 6% reporting suicidal ideation. In addition, 14% of the participating students reported moderate-to-severe anxiety. These findings point to the need to routinely screen incoming health sciences students for depression and anxiety upon entrance into their academic programs so that evidence-based interventions can be delivered and students who report severe depression or suicidal ideation can be immediately triaged for further evaluation and treatment.

Cognitive behavioral therapy (CBT) remains the gold standard evidence-based treatment for depression and anxiety in adolescents and young adults, yet less than 25% receive treatment, often due to the shortage of mental health providers to deliver it (Cheung et al., 2018). In order to increase access to evidence-based, CBT-based treatment, the second author (Bernadette Melnyk) developed a manualized, seven-session, cognitive behavioral skills-building program entitled MINDSTRONG (also known in the literature as Creating Opportunities for Personal Empowerment) that has all of the key elements of CBT in the program, which can be delivered by professionals other than mental health providers to

adolescents and young adults with depression and anxiety. Findings from several previous studies using this program have indicated decreases in depression, anxiety, suicidal ideation, anger, and disruptive behavior as well as improvements in self-esteem, healthy lifestyle behaviors, and academic performance among high school and middle school students (Hoying, Melnyk, & Arcoleo, 2016; Lusk & Melnyk, 2011a; Lusk & Melnyk, 2011b; Melnyk, Jacobson, O'Haver, Small, & Mays, 2009). Other intervention studies also have shown that the integration of this CBT-based program into college courses, the U.S. Air Force Academy, and university counseling programs has resulted in decreases in depressive and anxiety symptoms and increases in healthy lifestyle behaviors and grade performance (Buffington, Melnyk, Morales, Lords, & Zupan, 2016; Hart Abney, Lusk, Hovermale, & Melnyk, 2019; Melnyk et al., 2015; Melnyk, Kelly, Jacobson, Arcoleo, & Shaibi, 2013).

Unfortunately, it continues to take decades to translate evidence-based interventions into clinical settings to improve outcomes (Melnyk & Fineout-Overholt, 2019). We must accelerate the translation of evidence-based interventions to real-world settings to improve outcomes. Although crisis interventions and counseling remain critical for health sciences students, we must place more emphasis on prevention if we are going to see sustained improvements in mental health outcomes among this population.

CONCLUSIONS

Understanding the tremendous pressure placed on incoming graduate students and their ability to practice healthy cognitive-behavioral coping skills to improve their mental resilience, and overall well-being continues to be a priority. Graduate health sciences students should be screened for depression and anxiety shortly following entrance into their programs so that those with elevated symptoms can be identified and treated with a CBT-based intervention (e.g., the MINDSTRONG program). CBT-based interventions should be integrated into college courses to improve mental health outcomes in this age group. Wellness cultures need to be built and sustained with an emphasis on self-care in academic programs. **WVN**

DISCLOSURE

The Ohio State University College of Nursing disseminates the MINDSTRONG program that is referred to in this paper.

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LINKING EVIDENCE TO ACTION

- Depression will be the leading cause of illness globally by 2030.
- Suicide is the second leading cause of death in college-aged youth.
- Routine screening of health sciences students for depression and anxiety is needed.
- Evidence-based CBT programs should be implemented with health sciences graduate students as a preventive and early intervention strategy to decrease depressive and anxiety symptoms as well as improve healthy lifestyle behaviors and grade performance.
- Cultures that emphasize well-being should be sustained, and self-care emphasized in academic programs with graduate health sciences students.

Table 1.

Sample Characteristics

Characteristics	All (<i>N</i> = 197)
Age, mean \pm <i>SD</i>	24.5 \pm 4.9
Ethnicity, <i>N</i> (%)	
White, not of Hispanic origin	146 (74.1)
Black, not of Hispanic origin	13 (6.6)
Asian/Pacific Islander	10 (5.1)
Hispanic	14 (7.1)
Multiracial	10 (5.1)
Other	3 (1.5)
Missing	1 (0.5)
College/school enrolled, <i>N</i> (%)	
Dentistry	1 (0.5)
Health and Rehabilitation	17 (8.6)
Medicine	14 (7.1)
Nursing	18 (9.1)
Optometry	3 (1.5)
Pharmacy	44 (22.3)
Social Work	20 (10.2)
Veterinary Medicine	80 (40.6)
See a consistent healthcare provider, <i>N</i> (%)	
Yes	116 (58.9)
No	81 (41.1)
5+ servings fruit/veg per day, <i>N</i> (%)	
No	145 (73.6)
Yes	52 (26.4)
7+ hr sleep per day, <i>N</i> (%)	
No	75 (38.1)
Yes	122 (61.9)
30+ min PA at least five times per week, <i>N</i> (%)	
No	84 (42.6)
Yes	113 (57.4)
Hours work for pay per week, <i>N</i> (%)	
0	85 (43.1)
1–19	82 (41.6)
20+	29 (14.7)
Missing	1 (0.5)

Table 2.

Description of and Correlation Among Measures on General Health, Healthy Lifestyle Beliefs, Healthy Lifestyle Behaviors, PHQ-9, GAD-7, and BIPS (Total Scale and Subscales)

Measures	Mean ± SD	HL beliefs	HL behaviors	PHQ-9 (depression)	GAD-7 (anxiety)	Pearson correlation coefficient p-value			
						BIPS (stress)	BIPS subscale—pushed	BIPS subscale—conflict and imposition	BIPS subscale—lack of control
General health (range 1–5)	3.3 ± 0.9	.41 < .001	.46 < .001	-.32 < .001	-.25 < .001	-.13 .070	-.03 .714	-.20 .004	-.09 .187
HL beliefs (range 0–64)	48.3 ± 6.4	1.00	.54 < .001	-.38 < .001	-.37 < .001	-.36 < .001	-.26 < .001	-.38 < .001	-.19 .009
HL behaviors (range 0–60)	37.4 ± 7.4	–	1.00	-.32 < .001	-.27 .001	-.28 < .001	-.16 .026	-.30 < .001	-.24 < .001
PHQ-9 (depression) (range 0–27)	5.1 ± 4.1	–	–	1.00	.69 < .001	.51 < .001	.341 < .001	.471 < .001	.421 < .001
GAD-7 (anxiety) (range 0–21)	5.6 ± 4.6	–	–	–	1.00	.635 < .001	.435 < .001	.555 < .001	.56 < .001
BIPS (stress) (range 0–36)	18.3 ± 5.4	–	–	–	–	1.00	.84 < .001	.814 < .001	.74 < .001
BIPS subscale—pushed (range 0–12)	7.4 ± 2.7	–	–	–	–	–	1.00	.47 < .001	.44 < .001
BIPS subscale—conflict and imposition (range 0–12)	5.2 ± 2.3	–	–	–	–	–	–	1.00	.48 < .001
BIPS subscale—lack of control (range 0–12)	5.7 ± 1.7	–	–	–	–	–	–	–	1.00

Note. BIPS, Brief Inventory of Perceived Stress Scale; GAD-7, General Anxiety Disorder Scale; PHQ-9, Patient Health Questionnaire 9.

Table 3.

Prevalence of Depressive Symptoms

		PHQ-9 (Depression)											
All		No (0-4)		Mild (5-9)		Moderate (10-14)		Moderately severe (15-19)		Severe (20+)			
N	Row %	N	Row %	N	Row %	N	Row %	N	Row %	N	Row %		
197	101	51.3	66	33.5	26	13.2	2	1.0	2	1.0	2	1.0	
College/school enrolled													
Dentistry	1	0	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0	
Health and Rehabilitation	17	9	52.9	4	23.5	3	17.6	1	5.9	0	0.0	0	0.0
Medicine	14	9	64.3	4	28.6	1	7.1	0	0.0	0	0.0	0	0.0
Nursing	18	11	61.1	7	38.9	0	0.0	0	0.0	0	0.0	0	0.0
Optometry	3	2	66.7	1	33.3	0	0.0	0	0.0	0	0.0	0	0.0
Pharmacy	44	19	43.2	18	40.9	6	13.6	1	2.3	0	0.0	0	0.0
Social Work	20	9	45.0	6	30.0	5	25.0	0	0.0	0	0.0	0	0.0
Veterinary Medicine	80	42	52.5	26	32.5	10	12.5	0	0.0	0	0.0	2	2.5

Note. PHQ-9, Patient Health Questionnaire 9.

Table 4.

Prevalence of Anxiety Symptoms

		GAD-7 (Anxiety)							
All		No (0-4)		Mild (5-9)		Moderate (10-14)		Severe (15+)	
N	Row %	N	Row %	N	Row %	N	Row %	N	Row %
All	197	119	60.4	50	25.4	15	7.6	13	6.6
College/school enrolled									
Dentistry	1	0	0.0	0	0.0	0	0.0	1	100.0
Health and Rehabilitation	17	10	58.8	5	29.4	2	11.8	0	0.0
Medicine	14	10	71.4	3	21.4	0	0.0	1	7.1
Nursing	18	11	61.1	7	38.9	0	0.0	0	0.0
Optometry	3	3	100.0	0	0.0	0	0.0	0	0.0
Pharmacy	44	24	54.5	10	22.7	7	15.9	3	6.8
Social Work	20	8	40.0	9	45.0	1	5.0	2	10.0
Veterinary Medicine	80	53	66.3	16	20.0	5	6.3	6	7.5

Note. GAD-7, General Anxiety Disorder Scale.

Table 5.

Predictors of Depression (PHQ-9) 10)

Predictors	Mean ± SD or N (%), by depression			Odds ratio	95% CI
	No	Yes			
All	167 (84.8)	30 (15.2)			
Age	24.5 ± 4.9	24.5 ± 4.8	1.053	0.926	1.197
Ethnicity					
White, not of Hispanic origin	125 (85.6)	21 (14.4)	Reference		
Black, not of Hispanic origin	10 (76.9)	3 (23.1)	3.608	0.535	24.351
Asian/Pacific Islander	9 (90.0)	1 (10.0)	1.136	0.080	16.210
Hispanic	12 (85.7)	2 (14.3)	0.443	0.045	4.379
Multiracial	8 (80.0)	2 (20.0)	0.389	0.024	6.240
Other	2 (66.7)	1 (33.3)	1.878	0.038	93.473
College/school enrolled					
Dentistry	0 (0.0)	1 (100.0)	Not estimable		
Health and Rehabilitation	13 (76.5)	4 (23.5)	2.355	0.480	11.565
Medicine	13 (92.9)	1 (7.1)	0.640	0.050	8.205
Nursing	18 (100.0)	0 (0.0)	Not estimable		
Optometry	3 (100.0)	0 (0.0)	Not estimable		
Pharmacy	37 (84.1)	7 (15.9)	0.511	0.120	2.183
Social Work	15 (75.0)	5 (25.0)	1.061	0.195	5.762
Veterinary Medicine	68 (85.0)	12 (15.0)	Reference		
See a consistent healthcare provider					
Yes	100 (86.2)	16 (13.8)	Reference		
No	67 (82.7)	14 (17.3)	1.239	0.412	3.727
5+ servings fruit/veg per day					
No	126 (86.9)	19 (13.1)	0.456	0.130	1.592
Yes	41 (78.8)	11 (21.2)	Reference		
7+ hr sleep per night ^a					

Predictors	Mean ± SD or N (%), by depression		Odds ratio	95% CI
	No	Yes		
No	58 (77.3)	17 (22.7)	1.658	0.531 5.177
Yes	109 (89.3)	13 (10.7)	Reference	
30+ min PA at least five times per week				
No	72 (85.7)	12 (14.3)	0.699	0.193 2.532
Yes	95 (84.1)	18 (15.9)	Reference	
Hours work for pay per week				
0	74 (87.1)	11 (12.9)	Reference	
1-19	70 (85.4)	12 (14.6)	1.098	0.322 3.745
20+	23 (79.3)	6 (20.7)	2.147	0.365 12.628
General health ^a	3.4 ± 0.9	2.9 ± 0.9	0.562	0.256 1.234
HL beliefs ^a	49.0 ± 5.8	44.1 ± 7.7	0.922	0.817 1.040
HL behaviors ^a	38.1 ± 6.9	33.6 ± 9.1	0.993	0.882 1.118
BIPS subscale—pushed ^a	7.1 ± 2.6	9.0 ± 2.7	1.074	0.818 1.411
BIPS subscale—conflict and imposition ^{a,b}	4.8 ± 2.1	7.4 ± 2.2	1.411	1.040 1.915
BIPS subscale—lack of control ^a	5.5 ± 1.6	6.9 ± 2.0	1.197	0.848 1.690
BIPS—total score ^{a,b,c}	17.4 + 4.9	23.3 + 5.6	Not included	

Note. BIPS, Brief Inventory of Perceived Stress Scale; PHQ-9, Patient Health Questionnaire 9.

^aSignificantly associated with depression using bivariate tests (*t* test or chi-square). *p*-values are .023 for sleep, .017 for general health, .002 for healthy lifestyle beliefs, .016 for healthy lifestyle behaviors, .001 for BIPS subscale—pushed, <.001 for BIPS other two subscales (conflict/imposition and lack of control), and total score.

^bSignificantly associated with depression using multiple logistic regression analysis (*p* = .027).

^cOR = 1.212, 95% CI = 1.078–1.363 (*p* = .001) for BIPS—total score in a multiple logistic regression model that included BIPS total score rather than subscale scores.

Table 6.

Predictors of Anxiety (GAD-7 10)

Predictors	Mean ± SD or N (%), by anxiety			Odds ratio	95% CI
	No	Yes			
All	169 (85.8)	28 (14.2)			
Age	24.5 ± 5.0	24.6 ± 4.7		1.067	0.891 1.278
Ethnicity					
White, not of Hispanic origin	129 (88.4)	17 (11.6)		Reference	
Black, not of Hispanic origin	10 (76.9)	3 (23.1)		9.448	1.048 85.182
Asian/Pacific Islander	8 (80.0)	2 (20.0)		1.157	0.022 61.325
Hispanic	12 (85.7)	2 (14.3)		0.507	0.033 7.839
Multiracial	7 (70.0)	3 (30.0)		4.070	0.290 57.174
Other	2 (66.7)	1 (33.3)		1.138	0.006 210.491
College/school enrolled					
Dentistry	0 (0.0)	1 (100.0)		Not estimable	
Health and Rehabilitation	15 (88.2)	2 (11.8)		1.192	0.128 11.071
Medicine	13 (92.9)	1 (7.1)		2.549	0.110 59.243
Nursing	18 (100.0)	0 (0.0)		Not estimable	
Optometry	3 (100.0)	0 (0.0)		Not estimable	
Pharmacy	34 (77.3)	10 (22.7)		0.556	0.110 2.802
Social Work	17 (85.0)	3 (15.0)		0.182	0.014 2.376
Veterinary Medicine	69 (86.3)	11 (13.8)		Reference	
See a consistent healthcare provider					
Yes	104 (89.7)	12 (10.3)		Reference	
No	65 (80.2)	16 (19.8)		3.518	0.841 14.719
5+ servings fruit/veg per day					
No	127 (87.6)	18 (12.4)		0.664	0.122 3.619
Yes	42 (80.8)	10 (19.2)		Reference	
7+ hr sleep per night ^a					

Predictors	Mean ± SD or N (%), by anxiety		Odds ratio	95% CI
	No	Yes		
No	58 (77.3)	17 (22.7)	1.450	0.321 6.553
Yes	111 (91.0)	11 (9.0)	Reference	
30+ minutes PA at least five times per week				
No	72 (85.7)	12 (14.3)	1.447	0.264 7.939
Yes	97 (85.8)	16 (14.2)	Reference	
Hours work for pay per week				
0	77 (90.6)	8 (9.4)	Reference	
1–19	69 (84.1)	13 (15.9)	5.141	0.819 32.261
20+	23 (79.3)	6 (20.7)	8.517	0.758 95.689
General health ^a	3.4 ± 0.9	3.0 ± 0.9	0.590	0.223 1.564
HL beliefs ^a	48.9 ± 6.0	44.6 ± 7.1	0.936	0.797 1.100
HL behaviors ^a	38.1 ± 7.1	33.0 ± 8.2	0.995	0.850 1.164
BIPS subscale—Pushed ^a	7.0 ± 2.6	9.5 ± 2.3	1.045	0.728 1.499
BIPS subscale—conflict and imposition ^{a,b}	4.8 ± 2.1	7.8 ± 2.1	1.730	1.124 2.662
BIPS subscale—lack of control ^{a,b}	5.3 ± 1.5	7.8 ± 1.6	2.261	1.378 3.709
BIPS—total score ^{a,b,c}	17.2 ± 4.7	25.1 ± 4.8		

Note. BIPS, Brief Inventory of Perceived Stress Scale; GAD-7, General Anxiety Disorder Scale.

^aSignificantly associated with anxiety using bivariate tests (*t* test or chi-square). *p*-values are .008 for sleep, .036 for general health, .001 for healthy lifestyle beliefs, healthy lifestyle behaviors, and BIPS subscale—pushed; <.001 for BIPS subscales on conflict/imposition and lack of control and total score.

^bSignificantly associated with anxiety using multiple logistic regression analysis (*p* = .013 for conflict/imposition; = 0.001 for lack of control).

^cOR = 1.488, 95% CI = 1.251–1.770 (*p* < .001) for BIPS—total score in a multiple logistic regression model that included BIPS total score rather than subscale scores.