

## Evaluation of Perceived Stress and Lifestyle Choices at the Beginning of the COVID-19 Pandemic Among Students at A School of Pharmacy in the United States

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## ORIGINAL RESEARCH REPORTS

# Evaluation of Perceived Stress and Lifestyle Choices at the Beginning of the COVID-19 Pandemic Among Students at a School of Pharmacy in the United States

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### Abstract

*Purpose:* Academic stress is a well-known component of life as a healthcare professional student, with the COVID-19 pandemic ushering in additional challenges. This study investigated trends in perceived stress, in relation to demographic and lifestyle choice variables among pharmacy students, during the initial months of the COVID-19 pandemic, at a U.S. school of pharmacy.

*Methods:* A cross-sectional, descriptive study was conducted at Samford University's McWhorter School of Pharmacy utilizing a web-based questionnaire that was distributed to all enrolled second-, third-, and fourth-year Doctor of Pharmacy students. The survey instrument contained 22 items and was arranged into three sections to characterize demographic information, lifestyle choices, and perceived stress – using the validated 10-item Perceived Stress Scale (PSS-10). Results were analyzed using SPSS.

*Results:* A total of 332 students were invited to participate in the study. One-hundred fifty-seven responses were received (47.2% response rate). The median (IQR) Perceived Stress Scale (PSS-10) score of students was 22 (4.0), suggestive of a moderate level of perceived stress. There were no respondents with a PSS-10 score of 0–13, which would indicate low perceived stress. Thirteen (8.2%) students reported a PSS-10 score of  $\geq 27$ , which is suggestive of a high level of perceived stress. Most students reported positive lifestyle choices (e.g., 75.2% reported sleeping 6–8 h per night and 60.5% exercised 6–8 h per week). In the analysis of mean rank PSS-10 score by demographic and lifestyle variables, a statistically significant difference was noted only by gender ( $p = .009$ ), with the female gender reporting a higher mean rank PSS-10 score.

*Discussion:* Despite engagement in positive lifestyle choices (i.e., routine exercise, adequate sleep, and social engagement), trends in perceived stress did not differ significantly from those respondents who reported more unhealthy behaviors (i.e., no exercise, insufficient hours of sleep, and social isolation). Timely study of factors that can positively influence student wellbeing are warranted.

*Keywords:* COVID-19, Perceived stress, Well-being

## 1. Introduction

Prior to the COVID-19 pandemic, several studies in healthcare education, including pharmacy education, were published evaluating stress in the student population. Among the literature published on Doctor of Pharmacy (PharmD) students, an association has been noted between high levels of student stress and negative outcomes, to include

depression, anxiety, impaired decision-making skills, and poor empathy [1–3]. As such, pharmacy education has prioritized student well-being within curricula, with Standards 14 and 15 of the Accreditation Council for Pharmacy Education (ACPE) 2016 Standards encouraging programmatic assessment and implementation of interventions to encourage wellness [4] – which is in line with various healthcare disciplines and their associated educational

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accreditation bodies' guidance on wellbeing and resilience.

In March 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a pandemic. As a result of “stay-at-home” orders in several states, immediate changes were ushered into pharmacy education, including a rapid shift from in-person learning to distance or remote education within both the didactic and experiential curricula. As a result of these changes, pharmacy students may have been exposed to additional stressors beyond the normal academic workload - related to economical (e.g., loss income resulting in concerns for food and shelter), psychological (e.g., prolonged isolation), and safety (e.g., caring for sick family members) needs [5]. Additionally, students were faced with unprecedented academic challenges such as the navigation of a variety of teaching modalities, including asynchronous and synchronous delivery of content on multiple technology platforms [5]. Barriers to access of high-speed internet to actively participate in synchronous delivery and time zone differences also became a challenge for some students [6]. Finally, accessibility and accommodations for those with visual impairities, hard of hearing and other learning disabilities may have been adversely impacted due to the limited time to convert content and delivery methods [5]. The present study aimed to (i) investigate the level of perceived stress among students during the initial months of the COVID-19 pandemic; (ii) evaluate students' lifestyle choices during this time, to include exercise activity, sleep habits, and level of social interaction; and (iii) assess trends in perceived stress levels among the variables of exercise, sleep habits, and social interaction. The information from this research will contribute to the growing body of literature examining perceived stress and coping strategies amid the pandemic.

## 2. Methods

### 2.1. Materials and procedure

A cross-sectional, descriptive study was conducted at Samford University McWhorter School of Pharmacy using a web-based questionnaire that was distributed to all enrolled second-, third-, and fourth-year Doctor of Pharmacy students ( $n = 332$ , representing 120, 113, and 99 students in the rising second, third, and fourth year of the program, respectively). The survey was distributed from June 30th to July 31st of 2020. During this timeframe, Alabama was under “safer at home” orders. Second-

and third-year students were on summer break but had completed approximately two months of exclusively online, didactic and laboratory instruction. Fourth-year students, at the time, were completing either their second or third block of Advanced Pharmacy Practice Experiences (APPEs) – which are clinical experiences that students complete to ensure they are practice-ready to serve on a healthcare team upon graduation. COVID-19 University protocols provided fourth-year students the option to “opt-out” and use their “off-block” for the first APPE beginning in May 2020; however, most fourth-year students were completing an APPE at the time of survey distribution. As a result of site-based COVID-19 restrictions, many APPE preceptors were using a hybrid format of clinical instruction (e.g., partial online, experiential activities combined with in-person patient care activities at a practice site) at this time.

Student participation in the study was both anonymous and voluntary. The Qualtrics® survey setting to “prevent ballot box stuffing” was utilized to prevent multiple submissions from a given respondent. Incoming first-year students were excluded from the study, as their official enrollment commenced in August 2020, following the close date of the survey. This study was approved by the University's Institutional Review Board.

### 2.2. Survey instrument

The survey instrument was a 22-item questionnaire, arranged into three sections, and was distributed online to students via Qualtrics® (Qualtrics, LLC, Provo, UT).

The first section of the questionnaire contained multiple choice items to characterize demographic information of gender, age, marital status, year in the pharmacy curriculum, and current employment. The second section consisted of multiple-choice items on the frequency of respondents' engagement in physical activity, social interaction, and sleep. Additionally, one item in the second section was a multiple-choice question regarding the primary type of exercise that respondents were engaged in. The items in the first two sections of the questionnaire were developed by the School of Pharmacy faculty and piloted in a small cohort of fourth-year Doctor of Pharmacy students. Feedback was incorporated into the final version of the questionnaire prior to distribution. The third section measured stress using questions from the 10-item Perceived Stress Scale (PSS-10), developed by Cohen et al. that is freely permitted for not-for-profit use [7,8]. The PSS-10 is a self-reported questionnaire that was

adapted by Cohen et al. from their original 14-item scale [7,8]. The PSS-10 has been demonstrated as a valid and reliable tool among college students in the United States [8–10].

The PSS-10 is broken into two sections, with six items measuring perception of stressors over the past month and the remaining four items assessing coping strategies for stress. PSS-10 items are scored on a 5-point Likert scale, with a score of 0 equating to “never” and 4 indicating “very often.” [8] Total scores on the PSS-10 range from 0 to 40, with higher perceived stress indicated by a higher score on the scale [8]. Although the PSS-10 is not a diagnostic instrument with predetermined cut-off points to assign a magnitude of stress, some researchers have proposed that scores of 0–13 are indicative of low perceived stress, 14–26 equate to moderate stress, and 27–40 suggests high stress [11,12].

### 2.3. Analysis

Results were analyzed using SPSS, v23 (IBM, Armonk, NY). Chi-square test for independence was used to compare baseline demographic data for students based upon year in the program, with Yates' correction for cells with a frequency of less than five. Differences in mean rank PSS-10 scores by gender, age, year in pharmacy program, employment status, marital status, sleep routine, exercise habits, and social interaction were examined for significance using the Mann–Whitney U test for variables with two categories and the Kruskal–Wallis test for variables with three or more categories. Statistical significance was defined as  $p$ -value  $< .05$  for all tests.

## 3. Results

One hundred sixty-four of 332 students responded to the survey. After the exclusion of six surveys, which were mostly incomplete, responses from 157 pharmacy students were analyzed (47.2% response rate). As shown in Table 1, there were no significant differences in gender, age, marital status, or professional year among respondents; demographics were reflective of the entire student body. Additionally, demographic variables of the current survey respondents were similar to those in a previously published analysis at our institution [13]. Data on race/ethnicity was not collected. The majority (73.9%) of respondents were female. Of the total respondents, 31.2%, 28.0%, and 40.8% were from the rising second-, third-, and fourth-professional year, respectively. The vast majority (93.0%) of respondents were 19–31 years of age and single

Table 1. Demographics of Respondents based on Year in Pharmacy Program.

Variable	Rising P2 n (%)	Rising P3 n (%)	P4 n (%)	p-value
<i>Gender</i>				
Male	9 (18.4)	12 (27.3)	20 (31.2)	.296 <sup>a</sup>
Female	40 (81.6)	32 (72.7)	44 (68.8)	
<i>Age (years)</i>				
19–31	45 (91.8)	38 (86.3)	63 (98.4)	.124 <sup>b</sup>
32 and older	4 (8.2)	6 (13.7)	1 (1.6)	
<i>Marital status</i>				
Single	42 (85.7)	31 (70.5)	49 (76.6)	.202 <sup>a</sup>
Married	7 (14.3)	13 (29.5)	15 (23.4)	
<i>Employment Status</i>				
Employed	34 (69.4)	33 (75.0)	33 (51.6)	.027 <sup>a</sup>
Unemployed	15 (30.6)	11 (25.0)	31 (48.4)	

<sup>a</sup> Chi-square test of independence.

<sup>b</sup> Chi-square test of independence with Yates' correction for cells with frequency  $< 5$ .

(77.7%). Over half of respondents (63.7%) were employed, with 96 of the 100 employed students reporting work in a pharmacy-related setting (e.g., retail and hospital). A significant association was noted between year in pharmacy school and employment status, with fourth-year students on their APPEs reporting a lower employment rate of 51.6% compared with 69.4% and 75.0% in the second and third-year cohorts, respectively. Student engagement in physical activity, social interaction, and sleep are depicted in Fig. 1. Many respondents reported positive sleep habits, regular social engagement, and routine exercise. An embedded item to classify the primary type of exercise was included in the survey for those students who reported routine physical activity ( $n = 112$ ). The options for exercise category were cardio, weightlifting, walking, jogging, yoga, or “other”, with free response capability. The majority (88%) of students reported cardio as their primary exercise category.

Students' median responses to the PSS-10 items are presented in Fig. 2. The overall median (IQR) PSS-10 score of respondents was 22 (4.0), suggestive of a moderate level of perceived stress. There were no respondents with a PSS-10 score of 0–13, which would indicate low perceived stress. Thirteen (8.2%) students reported a PSS-10 score of  $\geq 27$ , which is suggestive of a high level of perceived stress.

The mean ( $\pm$ SD) and median (IQR) PSS-10 scores by demographic and lifestyle choice variables are presented in Table 2. Regarding demographic variables, there was no significant difference in PSS-10 scores across age groups, professional year in the Doctor of Pharmacy program, employment status or marital status. Gender was the only variable where a statistically significant difference in PSS-10 score

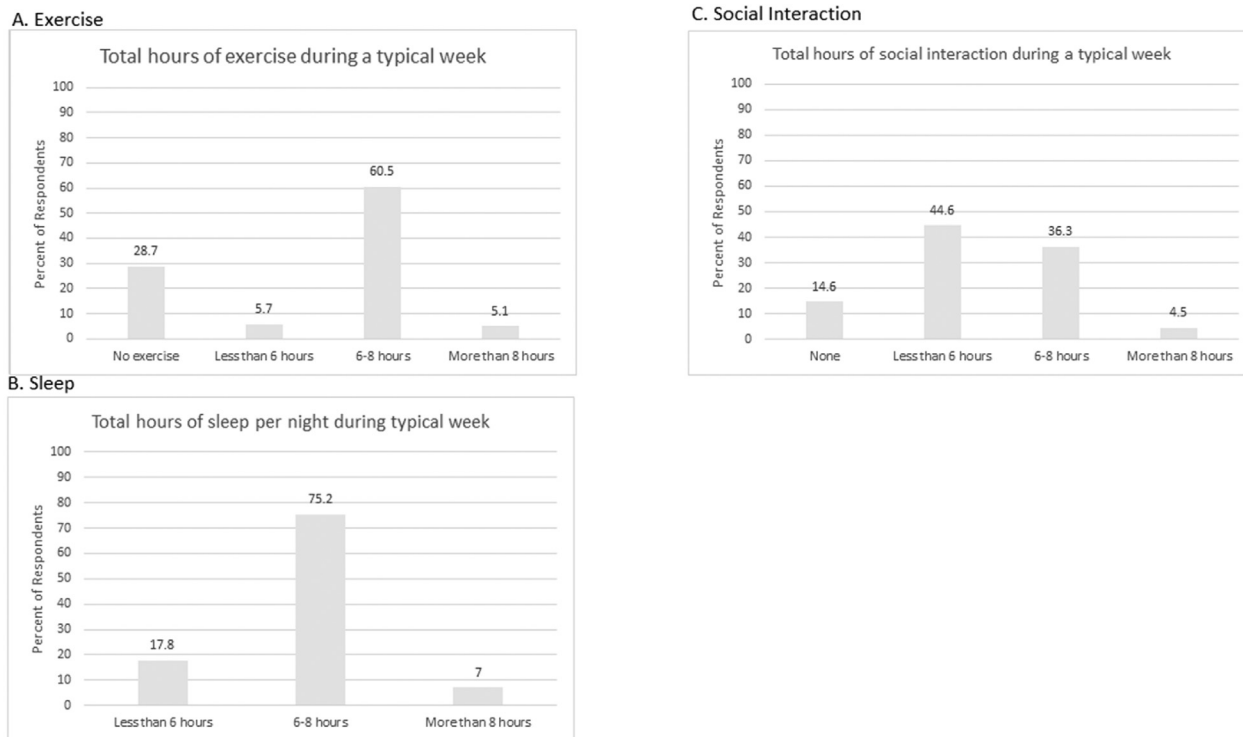


Fig. 1. Descriptive analysis of respondents' exercise, sleep, and social interaction habits.

was noted ( $p = .009$ ), with the female gender having a higher mean rank PSS-10 score vs. male. Among lifestyle choice variables, there was no significant difference in PSS-10 score across students on engaged varying levels or duration of sleep, exercise, and social interaction.

#### 4. Discussion

Academic stress is a well-known component of life as a health care professional student. As such, higher levels of perceived stress and burnout have been documented among the health professional

- Q1. In the last month, how often have you been upset because of something that happened unexpectedly?
- Q2. In the last month, how often have you felt that you were unable to control the important things in your life?
- Q3. In the last month, how often have you felt nervous and "stressed"?
- Q4. In the last month, how often have you felt confident about your ability to handle your personal problems?
- Q5. In the last month, how often have you felt that things were going your way?
- Q6. In the last month, how often have you found that you could not cope with all the things that you had to do?
- Q7. In the last month, how often have you been able to control irritations in your life?
- Q8. In the last month, how often have you felt that you were on top of things?
- Q9. In the last month, how often have you been angered because of things that were outside of your control?
- Q10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

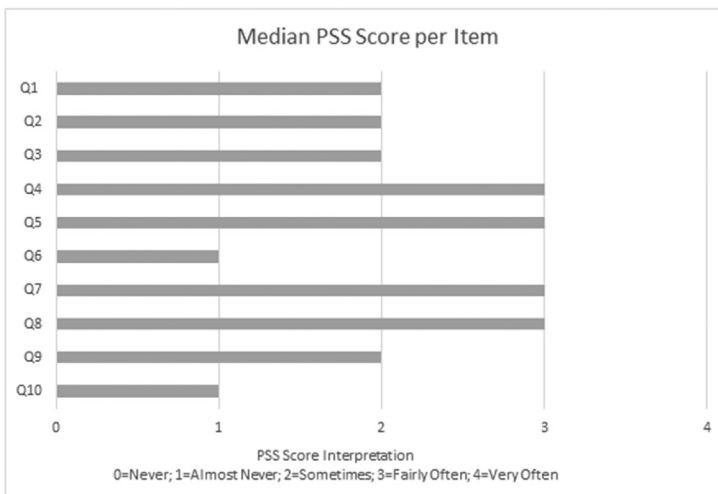


Fig. 2. Student Responses to PSS-10\*. \*Cohen S. Laboratory for the Study of Stress, Immunity and Disease. Available at: <https://www.cmu.edu/dietrich/psychology/stress-immunity-disease-lab/scales/html/pss.html>.

Table 2. Difference in PSS-10 score by demographic and lifestyle choice variables.

	Mean ( $\pm$ SD) PSS-10 score	Median (IQR) PSS-10 score	p-value <sup>a</sup>
<b>Demographic Variables</b>			
<i>Gender</i>			
Male ( <i>n</i> = 41)	20.7 (2.9)	21.0 (4.0)	.009 <sup>b</sup>
Female ( <i>n</i> = 116)	22.2 (3.3)	22.0 (4.0)	
<i>Professional year</i>			
Rising P2 ( <i>n</i> = 49)	22.2 (4.0)	23.0 (7.0)	.619 <sup>c</sup>
Rising P3 ( <i>n</i> = 44)	21.6 (2.7)	22.0 (3.0)	
P4 ( <i>n</i> = 64)	21.7 (2.9)	22.0 (4.0)	
<i>Age (years)</i>			
19-31 ( <i>n</i> = 146)	21.9 (3.3)	22.0 (4.0)	.120 <sup>b</sup>
32 and older ( <i>n</i> = 11)	20.5 (1.9)	21.0 (3.0)	
<i>Marital status</i>			
Single ( <i>n</i> = 122)	21.8 (3.3)	22.0 (4.0)	.956 <sup>b</sup>
Married ( <i>n</i> = 35)	21.9 (3.0)	22.0 (3.0)	
<i>Employment Status</i>			
Employed ( <i>n</i> = 100)	21.9 (3.1)	22.0 (4.0)	.673 <sup>b</sup>
Unemployed ( <i>n</i> = 57)	21.6 (3.5)	22.0 (4.0)	
<b>Lifestyle Choice Variables</b>			
<i>Sleep routine</i>			
<i>During a typical week, how many hours of sleep per night do you typically get each night?</i>			
Less than 6 h ( <i>n</i> = 28)	22.4 (2.9)	22.0 (5.0)	.051 <sup>c</sup>
Between 6 and 8 h ( <i>n</i> = 118)	21.6 (3.3)	21.5 (4.0)	
More than 8 h ( <i>n</i> = 11)	23.4 (2.5)	23.0 (5.0)	
<i>Exercise habits</i>			
<i>During a typical week, how much TOTAL time do you spend exercising?</i>			
Do not exercise ( <i>n</i> = 45)	21.4 (3.0)	21.0 (4.0)	.450 <sup>c</sup>
Less than 6 h ( <i>n</i> = 9)	23.6 (4.0)	22.0 (8.0)	
Between 6 and 8 h ( <i>n</i> = 95)	21.9 (3.2)	22.0 (4.0)	
More than 8 h ( <i>n</i> = 8)	21.3 (3.6)	21.5 (6.0)	
<i>Social interaction</i>			
<i>During a typical week, how much TOTAL time would you say that you spend voluntarily interacting with others for reasons of leisure, support, etc.?</i>			
None ( <i>n</i> = 23)	20.7 (2.9)	21.0 (5.0)	.237 <sup>c</sup>
Less than 6 h ( <i>n</i> = 70)	22.0 (3.4)	22.0 (4.0)	
Between 6 and 8 h ( <i>n</i> = 57)	21.9 (3.1)	22.0 (3.0)	
More than 8 h ( <i>n</i> = 7)	23.4 (3.1)	22.0 (4.0)	

<sup>a</sup> Mean rank analysis.

<sup>b</sup> Mann–Whitney U test for variables with two categories.

<sup>c</sup> Kruskal–Wallis test for variables with more than two categories.

student community before the COVID-19 pandemic [14]. However, to our knowledge, there is limited data examining perceived stress and lifestyle choices among healthcare professional students in the United States during the initial months of the COVID-19 pandemic.

This study utilized the 10-item PSS-10 to measure stress. The survey instrument is designed to solicit respondents' general, self-perceived inventory of experienced stress. The PSS-10 was selected for use in this study, given its well-documented validity and reliability, along with widespread use in a variety of populations and countries [15]. Additionally, an analysis of students' perceived stress at the School of Pharmacy, which utilized the PSS-10 tool, has been published prior [13]. As such, general comparisons in perceived stress could be made between the present results and past findings from before the

pandemic, as both cohorts of students were matriculants of the School's legacy curriculum.

#### 4.1. Trends in demographic variables and PSS-10 score

In the current study, the overall median PSS-10 score was indicative of a moderate level of perceived stress. Mean PSS-10 scores from the present study trended higher than scores from a previously reported analysis at our institution [13]. In the analysis of mean rank PSS-10 score by variable, a statistically significant difference was noted only by gender ( $p = .009$ ). This finding was consistent with prior evidence that female students from our institution reported higher PSS-10 scores than their male peers. No significant association between mean rank PSS-10 score and year in pharmacy program

was found in the present study, which is consistent with previously published findings of no correlation between mean PSS-10 score and professional year [13].

#### 4.2. Trends in lifestyle choices and PSS-10 score

Exercise has been associated with reduced stress and emotional well-being, with research demonstrating that regular physical activity can have beneficial effects on a person's ability to cope with stressors [16]. In the present study, those students who reported no exercise had similar mean and median PSS-10 scores when compared with those who reported engaging in six or more hours of exercise per week. These results are interesting and did not support the hypothesis that students who engaged in routine exercise would have a lower perceived stress in comparison to those without reported exercise. However, the present findings of similar stress levels among those with and without regular engagement in physical activity may be explained by other published evidence that increased exercise may be used as a coping strategy for higher levels of perceived stress [1,17].

The association of sleep duration and perceived stress was evaluated in this study and numerically, but not statistically, significant differences were found. Those who reported sleeping less than 6 h per night had higher perceived stress as evidenced by their median and mean PSS-10 score compared to those who reported 6–8 h of sleep per night. This finding is supported by a recent study of graduate students, including those in professional degree programs, that found a positive relationship between sleep and exhaustion that is weakened as sleep duration increases. The authors concluded that improving sleep habits may improve the negative association between stress and graduate student functioning [18]. Although sleep quality was not specifically evaluated in the present study, in 2014, 55% (n = 140) of respondents in the didactic portion of the School's legacy curriculum suffered from poor sleep quality, based on scores from the Pittsburgh Sleep Quality Index [19]. An association between poor sleep quality and stress has been identified among medical students, where those not suffering from stress were less likely to have poor sleep quality (OR .28,  $p < .001$ ) [20]. More information regarding sleep quality and associated symptoms may have helped the authors explain why the median and mean PSS-10 score for those sleeping more than 8 h per night was the highest among the group. One plausible explanation could be related to hypersomnia and its association with subtypes of

depression [21]; however, further data is needed to make a specific correlation. Additional research is needed to evaluate the impact of sleep quality, including sleep duration, and perceived stress among U.S. pharmacy students.

In the present study, there was no significant difference in mean rank PSS-10 score noted among levels of social engagement, which is intriguing. Social support has been reported as a key contributor to perceived emotional and physical wellbeing, with research demonstrating a positive relationship between social support and coping with stress [22,23]. Likewise, recently published studies of student well-being during the COVID-19 pandemic have reported an association between higher levels of perceived stress and social isolation, which is contrary to the present study findings [24,25]. In the current survey, respondents were only asked to quantify the amount of time that they engaged with others socially for leisure and support; no qualitative data was collected. As such, the authors are unable to make meaningful speculation on a theory for the findings related to social interaction and perceived stress.

#### 4.3. Future plans

The results of our findings have been disseminated to the Offices of Academic and Student Affairs. As a result of this study and other internal analyses, new initiatives are being planned within the School's new curriculum. The most notable programmatic innovation is the implementation of a longitudinal Health and Wellness course that will provide a venue for purposeful integration and assessment of wellbeing initiatives across all four professional years of the program.

#### 4.4. Limitations

There are several limitations to the study, including the generalizability of results, given this was conducted at one School of Pharmacy in the state of Alabama. During the timeframe of the study, Alabama was under a statewide "safer at home" mandate - which allowed businesses, educational institutions, and athletic facilities to reopen with sanitation guidelines, limited capacity, and social distancing requirements. Individuals were encouraged to stay home, and persons attending non-work gatherings were required to maintain 6-feet of distance from non-household contacts. With the reopening of businesses, athletic facilities, and some external partners allowing the return of students to clinical practice sites in the

community, perceived stress among respondents may have been influenced by the increase in social interactions and physical activity. Additionally, lifestyle factors were self-reported in this study; thus, inherent response bias is a possibility. In general, those with a higher level of stress may have felt too overwhelmed to take time to respond to the survey, and those with low stress may not have responded if they felt the survey did not pertain to them. Also, response rates were lower among second- and third-year students, which is likely due to the timing and voluntary nature of the survey. During the study period, second- and third-year students were on summer break where expectations for reading and responding to emails is minimal compared with fourth-year students who were likely expected to check their email during business hours as a requirement of their APPE. Finally, the survey was limited to general perception of stress and did not tease out whether the stressors were specifically academic or COVID-19-related. Given the timing of the survey, perceived stress for second- and third-year students related to academics during the summer was likely lower and the ability to spend time participating in physical activity and social interactions may have been higher. Future studies are needed to discern whether the rates of perceived stress were associated with the timing of the sampling. By tracking the same students throughout the curriculum, this limitation may be alleviated. Further evaluation of coping strategies should also be investigated via qualitative methods such as structured interviews.

## 5. Conclusion

Students across the second through fourth year of the curriculum reported moderate to high levels of perceived stress during the initial months of the pandemic. Despite most students' reporting engagement in positive lifestyle choices (i.e., routine exercise, adequate sleep, and social engagement), trends in perceived stress did not differ significantly from those respondents who reported more unhealthy behaviors (i.e., no exercise, insufficient hours of sleep, and social isolation). Considering the unique changes in personal and academic life that have resulted from the COVID-19 pandemic, timely study of factors that can positively influence student wellbeing are warranted.

## Ethical approval

This study was approved by the Samford University Institutional Review Board.

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## Authors' contributions

All listed authors have contributed substantially to the manuscript, and the paper has been read and approved by all authors. The manuscript has not been published and is not under consideration for publication at any other journal.

## Conflict of interest

The authors declare no conflicts of interest or financial interests that the authors themselves or members of their immediate families have in any product or service discussed in the manuscript, including grants (pending or received), employment, gifts, stock holdings or options, honoraria, consultancies, expert testimony, patents, and royalties.

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