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ORIGINAL ARTICLE

Perceived stress and fatigue among students in a doctor of chiropractic training program

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Objective: High levels of stress and fatigue are associated with decreased academic success, well-being, and quality of life. The objective of this research was to quantify levels of perceived stress and fatigue among chiropractic students to identify sources of and student coping mechanisms for perceived stress and fatigue and to identify the relationship between students' perceived stress and fatigue.
Methods: A survey comprised of the Perceived Stress Scale, the Undergraduate Sources of Stress Survey, and the Piper Fatigue Scale was administered to chiropractic students in their 2nd, 5th, and 8th trimesters of doctoral study. Data were analyzed by descriptive statistics, 1-way analysis of variance, and linear correlation tests.
Results: Students reported having moderate to high levels of stress and fatigue, with higher levels of stress and fatigue seen in women than in men. A nonsignificant difference among stress scores and a significant difference among fatigue scores were observed based on program term. Levels of stress predicted levels of fatigue, and stress was strongly correlated with psychological health, relationships with family members, mood, and need for learning accommodations. Fatigue was strongly correlated with psychological health, academic demands, and conflicts between studies and other activities.
Conclusion: There are differences in the reporting of perceived stress and fatigue levels in this chiropractic student population based on gender. The correlation between fatigue and stress also suggests that measures that may alleviate one may likely affect the other.

Key Indexing Terms: Chiropractic; Students; Health Occupations; Stress, Psychological; Fatigue

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INTRODUCTION

High levels of stress and fatigue are associated with depression and anxiety, decreased academic success, decreased psychological and physical well-being, and a reduced quality of life.[1–7] While it is common to identify both stress and fatigue as factors that together create negative effects, they are distinct psychological entities. Furthermore, prior stress affects levels of fatigue,[8] which can affect one's perception of stress.[9] Therefore, it is important to identify the relationships between stress and fatigue to better understand their effects on health, attitudes, and performance.

Numerous studies have examined how students experience stress in professional health education. As these students will become future health care providers, it is important for institutions to teach them how to cope with stress themselves, as well how to treat stress in their future patients.[1] Medical, nursing, dental, pharmacy, occupational therapy, and physical therapy students have reported high levels of perceived stress.[1–3,10] Student stress often stems from academic load, classroom environment, faculty interaction, illness, and emotional concerns outside of the classroom or clinic. Until recently, the literature on stress experienced by students in complementary and alternative medicine (CAM) has been scarce, but a recent study among chiropractic students indicated that students in their 4th year of doctoral study reported the highest levels of stress.[11] At the same time, data from a study by Kizhakkeveettil et al.[12] that uses the validated perceived stress scale (PSS-10) suggests that stress levels were not statistically significantly different across terms. Another study done by Spegman et al.[13] indicates that chiropractic students experience multiple sources of stress, and this stress negatively influences student confidence levels. Also, a study among 116 chiropractic students done by Zhang et al.[14] showed that students experience high levels of stress while performing an objective clinical examination, and these stress levels negatively impact their performance.

Fatigue is another important factor to identify in health professional education as it can also affect student learning. Among nursing students, fatigue was reportedly moderate/intense for 83.5% of students, and 59.8% reported moderate/intense impairment from fatigue in their habitual activities.[7] Tanaka et al.[6] polled medical students and reported fatigue was prevalent in 16.5% of healthy individuals. In these individuals, school attendance, pleasure in school and learning, and lecture understanding were all negatively associated with the prevalence of fatigue.[6] Furthermore, fatigue is a multifaceted, subjective experience, and its different dimensions have been overlooked in students.[7] To our knowledge, no studies on fatigue have been reported among CAM student populations.

The current literature suggests that there are varying levels of stress and fatigue among students in the health sciences, including chiropractic education, and these factors can negatively impact academic experience and professional development. In chiropractic education, the prevalence and relationships between stress and fatigue are largely unexplored, and the aim of this investigation is to (1) quantify the prevalence of stress and fatigue across the doctor of chiropractic curriculum and (2) uncover the factors that are related to the reporting of student stress and fatigue. Furthermore, as the students surveyed are in an integrative health sciences environment, they also offer an opportunity to study how CAM students cope with stress and fatigue. Gaining a better understanding of these relationships will help chiropractic students and educators effectively reduce stress and fatigue with the goal of enhancing quality of life and academic success for future doctors of chiropractic.

The objectives of this study were to (1) quantify levels of perceived stress and fatigue among a population of chiropractic students; (2) determine the differences in perceived stress and fatigue across demographic factors and scholastic terms; (3) identify sources of and student coping mechanisms for perceived stress and fatigue; and (4) identify the relationship between students' perceived stress and fatigue.

METHODS

The institutional review board of Southern California University of Health Sciences approved this in-class survey that was conducted among chiropractic students in their 2nd, 5th, or 8th trimesters. During a single class period, students were asked to complete a survey that comprised the following validated questionnaires: the Perceived Stress Scale (PSS-10),[15] the Undergraduate Sources of Stress Survey (USOS),[16] and the Piper Fatigue Scale (PFS).[17] Prior to the administration of the survey, participants were informed about the purpose of the study and how to complete the survey. Data were analyzed using Statistical Package for the Social Sciences (SPSS) for Windows (version 21; IBM Corp, Armonk, NY). For all analyses, levels of significance were established at $\alpha = 0.05$.

Hypothesis 1: There will be relatively high levels of both stress and fatigue among chiropractic students, and levels will not differ based on demographic factors nor scholastic term.

In order to calculate the prevalence of stress and fatigue across the doctor of chiropractic program, the PSS-10 and PFS were administered. The PSS-10 is a validated, 10-item questionnaire asking students how often they think or feel a certain way that can be related to stress. The PFS is a validated survey consisting of 22 numerically scaled (0–10) items that measure 4 dimensions of subjective fatigue (behavioral, affective, sensory, and cognitive/mood). In addition to the information from the PSS-10 and PFS, participants' demographic data were also collected. Descriptive statistics were computed for stress and fatigue scores based on PFS and PSS-10 scoring instructions, and 1-way analysis of variance (ANOVA) with Tukey's post hoc analyses were used to determine differences in levels of fatigue and stress across demographic factors and differences in levels of perceived stress and fatigue among 2nd-, 5th-, and 8th-term chiropractic students. On the PSS, scores of 0–10 indicate low stress, 11–15 indicate mild stress, 15–20 indicate moderate stress, and above 20 indicate severe stress.[18] On the PFS, the results were broken down into 4 categories used to assess fatigue. Scores of 0 indicate that there was no fatigue. Scores of 1–3 indicated mild fatigue. Scores of 4–6 represent moderate fatigue, and scores of 7–10 relate to severe fatigue.[19]

For analyses, data were pooled in the following ways: (1) race was grouped as either white or non-white; (2) age was grouped as either 22–30 years old or 31–50 years old; and (3) marital status was grouped as single/divorced/separated or married/cohabitating.

Hypothesis 2: The most common sources of stress and fatigue for students will be academic in nature, and there will be a strong correlation between levels of stress and fatigue for each student.

In order to evaluate the sources of stress, the USOS questionnaire was administered. The USOS is a validated, 26-item survey of stressors in 3 categories: academic, financial, and personal. For surveying sources of fatigue, the USOS was modified for an additional set of questions. Contributions to fatigue based on finances (2 questions) or fatigue itself (1 question) were removed from the original USOS. The modified USOS for fatigue was tested for face validity.

Pearson's correlation coefficients were computed to differentiate the relationships between different sources of perceived stress and fatigue. Additionally, the relationship between fatigue and stress for chiropractic students was analyzed to compare PSS-10 and PFS scores for each respondent. Using the guide that Evans suggests,[20] we defined the effect size measured here with the following distinctions for the absolute value of the correlation coefficients: .00–.19 was a very weak correlation; .20–.39 was a weak correlation; .40–.59 was a moderate correlation; .60–.79 was a strong correlation; and .80–1.00 was a very strong correlation.

Hypothesis 3: Chiropractic students will commonly turn to CAM coping strategies for both stress and fatigue.

The compiled survey also included a number of proposed coping strategies for both stress and fatigue.

Table 1 - Average Stress and Fatigue Scores by Demographic Factor

Variable	Stress				Fatigue			
	M	SD	*p*	*F*	*M*	SD	*p*	*F*
Gender								
Male	1.76	.58	.030	4.81	5.12	2.06	.010	6.83
Female	1.99	.57			6.06	1.97		
Age								
30 or less	1.85	.57	.818	0.05	5.45	2.03	.957	0.00
31 or more	1.83	.65			5.43	2.21		
Race								
White	1.84	.57	.680	0.17	5.63	1.92	.345	0.90
Non-white	1.88	.55			5.29	2.11		
Marital status								
Married/cohabitating	1.91	.63	.398	0.72	5.57	2.06	.708	0.14
Non-married/cohabitating	1.83	.53			5.43	2.05		
Education level								
Some college	1.69	.58	.480	0.74	5.57	1.82	.259	1.36
College graduate	1.88	.59			5.61	2.08		
Postgraduate degree	1.78	.57			4.89	2.07		
Health insurance								
Yes	1.85	.54	.903	0.01	5.35	2.05	.370	0.81
No	1.84	.68			5.69	2.11		
International student								
Yes	2.01	.42	.384	0.76	5.02	2.35	.475	0.51
No	1.84	.59			5.51	2.05		
Term								
2nd	1.94	.64	.053	3.00	6.36	1.71	<.001	9.57
5th	1.68	.59			4.85	1.96		
8th	1.93	.44			4.89	2.25		

p represents the p value of a 1-way ANOVA comparing the average stress and fatigue scores by demographic factor.

Students were asked to identify coping strategies commonly employed for stress and for fatigue, and frequency tables were used to identify the most common mechanisms. Different coping strategies for stress (22 choices) and fatigue (9 choices) were selected for the survey based on review of the literature and consensus from the study authors.

RESULTS

Of the 150 total surveys distributed, 140 were returned, indicating a 93% response rate. Among those, 56 students (40%) were in their 2nd term, 48 students (34%) were in their 5th term, and 36 students (26%) were in their 8th term. Of the responses received, 88 (63%) were male and 51 (36%) were female. Participants' ages ranged from 18 to 50 years, with the median age range being 22–30 years. Among the survey participants, 20 (14%) were Hispanic students and 118 (84%) were non-Hispanic/Latino students. Among those, 73 students (52%) were white, 30 students (21%) were Asian, and the remaining students were American Indians/Alaskan Natives, black/African American, and Native Hawaiian/Pacific Islander (8%). Eleven students (8%) had some college level of education, 98 students (70%) were college graduates, and 29 students (21%) had a postgraduate degree. Ninety-four students (67%) reported that they had health insurance.

The mean PSS-10 score was 18.8 (SD 5.4), and the mean PFS score was 5.6 (SD 2.0). Analysis by 1-way ANOVA showed that women tended to have both higher stress scores ($p = .030$) and higher fatigue scores ($p = .010$) than men. This was specific for the behavioral, affective, and cognitive dimensions of fatigue ($p = .009$, $p = .003$, and $p = .012$, respectively), but not the sensory dimensions ($p = .115$). No other significant differences were found for age, marital status, education level, health insurance status, or international student status. A comparison of stress and fatigue scores between students in their 2nd, 5th, and 8th terms revealed a nonsignificant difference among PSS-10 scores ($p = .078$) and a significant difference among PFS scores ($p < .001$). Specifically, students in the 5th term tended to show lower stress levels than those in the 2nd and 8th terms. Post hoc analyses showed fatigue scores across all 4 dimensions were highest between 2nd-term students ($.001 < p < .05$), with no significant differences reported between those in the 5th and 8th terms. Average stress and fatigue scores by demographic factors are summarized in Table 1.

The variables with positive correlations with stress were overall level of fatigue ($r = .521$), psychological health ($r = .462$), relationships with family members ($r = .458$), mood ($r = .439$), and accommodation ($r = .406$). Variables with weaker correlations with stress included loneliness ($r =$

Table 2 - Frequency of Mechanisms Used to Address Stress

Mechanism Used to Address Stress	%
Exercise	67
Sleep	63
Talking to friends	52
Listening to music	51
Chiropractic treatments	51
Eating	44
Sex	42
Hobby	36
Alcohol	34
Massage	29
Seeking family support	26
Meditation	21
Supplements	19
Reading	16
Acupuncture treatments	14
Yoga	14
Drugs	14
Smoking	11
Use of prescription drugs	10
I am not doing anything to address my stress	8
Tai chi	6
Ayurvedic treatments	5

.371), costs of books and equipment ($r = .040$), university fees ($r = .040$), and personal finance ($r = .005$).

All 20 sources of fatigue were positively correlated with fatigue scores. The variables most strongly correlated with fatigue were psychological health ($r = .469$), time demands of the academic term ($r = .434$), and conflict between studies and other activities ($r = .429$). Variables with the weakest correlation included amount of material to be learned in the academic term ($r = .388$), intellectual demands of the academic term ($r = .354$), administrative obstacles ($r = .222$), relationships with friends ($r = .192$), and disability ($r = .170$). Scores on the PSS-10 and PFS assessments showed a positive correlation, suggesting that higher levels of stress were associated with higher levels of fatigue ($r = .575$, $p < .001$).

The most common mechanisms used by students to address stress were exercise (67.1%), sleep (62.9%), talking to friends (52.1%), listening to music (50.7%), and chiropractic treatments (50.0%) (Table 2). The above mechanisms were also the most common among those who stated their preferred method of stress relief as "very effective."

The most common mechanisms used among students to address fatigue were resting (62.1%), chiropractic treatments (47.1%), supplements (23.6%), and massage (22.9%) (Table 2). These mechanisms were also the most common among those who stated their preferred method of fatigue relief as "very effective" (Table 3).

Table 3 - Frequency of Mechanisms Used to Address Fatigue

Mechanism Used to Address Fatigue	%
Resting	62.1
Chiropractic treatments	47.1
Supplements	23.6
Massage	22.9
I am not doing anything to address my fatigue	17.1
Yoga	14.3
Acupuncture treatments	13.6
Use of prescription drugs	7.1
Ayurvedic treatments	6.4

DISCUSSION

The current study quantitatively examined both the levels and sources of perceived stress and fatigue in chiropractic students using validated measures. This study indicates that average levels of stress and fatigue among chiropractic students rank at moderate to high levels. Interestingly, women tended to have significantly higher stress and fatigue levels than men. Other studies have reported a trend in women reporting greater levels of stress than men using the PSS.[21–23] However, the same has not been generalized to the PFS in a systematic manner. Higher stress and fatigue levels among women may be due to a difference in perception, reduced stress and fatigue resilience, increased stressor experiences, reduced coping resources, and/or reporting bias from the survey. Since there are several factors that could be contributing to this difference, additional studies are needed to determine the nature of stress and fatigue differences across genders.

Students in different terms did not differ significantly from each other in levels of stress, but students in their 2nd term of study did report having higher fatigue levels than those in both the 5th and 8th terms. These results are consistent with a previous study done at the same institution that showed no significant differences across terms,[12] but differ from a study done in a different institution, which reported that students in their final year of their chiropractic doctoral studies had higher levels of stress compared with other terms.[11] One reason might be that the nature of the analysis in the latter study was markedly different because of curricular design between institutions. Another factor that needs to be considered is the time of the administration of the survey, which potentially has an influence on perceived stress and fatigue. The survey used in our study was administered during the middle of the term.

That fatigue levels appear as a source of stress is consistent with the observation that a positive correlation was found between stress and fatigue scores. Similar to other studies, the main sources of fatigue were related to academic demands. To cope with such demands and to ameliorate stress, students used wellness strategies and sought social support and chiropractic treatments. Similar strategies were employed by students to cope with fatigue as well. In both cases, students believed that these strategies were effective. Many chiropractic students believed that they were effective at coping with such levels utilizing provided resources.

While students had many different mechanisms for coping with both stress and fatigue, students were more likely to find a coping mechanism to address their stress

than they were to address their fatigue. A common coping mechanism for both stress and fatigue, used with similar frequency by the chiropractic students, was chiropractic treatments. This suggests that students exposed to CAM modalities often use them to address their own stress and fatigue. In a CAM institution, students turning to CAM modalities for stress and fatigue may be the result of a self-selecting population, or it may be related to a curricular environment that promotes wellness through CAM. Further investigation is necessary to determine what steps institutions should be taking, if any, to promote CAM use for health promotion among its student body.

One limitation of this study is that it is an opinion-based survey, and we did not use any biological markers to measure stress and fatigue. Another limitation of this study is that it was conducted within a single institution. Results may not generalize to other chiropractic colleges, as suggested by the differences in results reported. Additionally, the results were based on only 1 cohort at 1 point in the academic term. Results could vary if we administered the survey in multiple cohorts during the same terms. Future studies should compare results from surveys administered at the beginning, middle, and end of the term. It would be greatly beneficial to pool results from many different chiropractic programs across the world, or to study many institutions independently, in order to develop a better picture of the factors contributing to, and shaping the experiences of, students in their clinical education.

CONCLUSION

We found that stress and fatigue levels among chiropractic students differed by gender, and students' experience of fatigue differed based on term in school. Fatigue and stress were strongly correlated, suggesting that measures that alleviate one may likely affect the other. Interestingly, students were more likely to treat their stress than to treat their fatigue. Future studies should be conducted to determine if addressing both will have more beneficial results for managing stress and fatigue. Because stress and fatigue constitute obstacles to academic performance and professional development, it is important to carry out future studies among multiple institutions to improve our understanding of the causes of and solutions for stress and fatigue experienced by students in chiropractic programs throughout the world.

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Author Contributions

Concept development: AK, AMV. Design: AK, AMV. Supervision: AK. Data collection/processing: AK, AMV, MB. Analysis/interpretation: AK, AMV, MB, MAP. Literature search: AK, AMV, MAP. Writing: AK, AMV, MB, MAP. Critical review: AK, AMV, MAP.

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