

RESEARCH ARTICLES

Perceived Stress and Quality of Life Among Doctor of Pharmacy Students

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Objectives. To examine stress and health-related quality of life (HRQOL) among third-year doctor of pharmacy (PharmD) students.

Methods. Stress and HRQOL were determined using Perceived Stress and SF-12 HRQOL survey instruments. A questionnaire was administered to determine factors students believed produced and eliminated stress.

Results. Eighty percent of third-year students participated (n=109) in this pilot study. Mental HRQOL scores were significantly below US mean score for individuals aged 20-34 years ($p<0.0001$). As stress increased, mental HRQOL decreased and a significant negative correlation was found between the 2 measures ($p<0.001$). Family and relationships, examinations and scheduling, outside-of-class assignments, and finances were the most common stress triggers reported by students, while exercising, spending time with friends/family, sleeping, watching TV, and drinking alcohol were the most commonly reported stress-alleviating activities.

Conclusion. Third-year PharmD students reported relatively high levels of stress and low mental HRQOL. Students employed mostly positive, but some negative, lifestyle choices to alleviate stress. Further investigation into the effectiveness of students' coping strategies is needed.

Keywords: health-related quality of life, doctor of pharmacy students, mental health, emotional health

INTRODUCTION

Stress is a term often used by individuals in a variety of social, academic, and employment settings. Both negative and positive aspects of a person's life can contribute to stress, and stress does not necessarily result in negative outcomes. University students, however, often experience an undue amount of stress, which can have negative academic, emotional, or health outcomes.¹ This can occur at different time periods during a semester or years in college, during the transition from undergraduate to professional or graduate programs, or upon graduation.¹ Stress in university students has many sources, including academics, personal situations, environment, time, and economic circumstances.^{2,3}

Several instruments have been used to study stress in college students.⁴⁻⁷ One instrument, the Perceived Stress Scale (PSS), which measures perceived stress and reactions to stressful situations, has been correlated with several psychological and physiological scales.⁷⁻¹⁸ Several

different instruments other than the PSS have been used to examine stress in students enrolled in health sciences programs.^{1-3,19-24} The majority of stress research has been conducted in medical, nursing, or dental students.^{2,20-23} In contrast, few studies have examined stress in PharmD students or have compared sources and levels of stress in pharmacy students with those in other health professions students.^{19,24,25} In one study that did, pharmacy students were found to suffer from more stress and distress than medical and dental students.²⁴

Accreditation agencies are beginning to require academic institutions to explore student stress. The current Accreditation Council for Pharmacy Education (ACPE) Accreditation standards and guidelines for the professional program in pharmacy leading to the PharmD degree, Standard No. 15, contains a recommendation to measure perceived stress in students.²⁶ Undue stress in PharmD students may have negative health-related outcomes.^{10,14-16,19} Only 1 previous study examined the relationship between PharmD student stress levels and HRQOL.¹⁹ Sources and consequences of stress and the HRQOL of PharmD students warrant further investigation.

The purpose of this pilot study was to examine self-reported perceived stress and HRQOL, and to investigate

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the relationship between stress and HRQOL within a sample of PharmD students. The study objectives were to: (1) examine perceived stress of the sample and sociodemographic subsets of the sample; (2) examine HRQOL of the sample and sociodemographic subsets of the sample; (3) investigate the relationship between perceived stress and HRQOL of the sample; (4) explore sources of stress, stress coping strategies, and suggestions to ameliorate stress among the sample; and (5) compare stress and HRQOL of the sample of PharmD students to other college students.

METHODS

All third-year PharmD students at one university were invited to participate in a study to detect stress using an IRB-approved subject information sheet. Responses were anonymous, but survey instruments and questionnaires were numbered and collated for data analysis.

The PSS, which measures self-reported was used because of the instrument's established validity and reliability.⁷⁻¹⁸ The PSS contains 14 questions, with answers ranked using a 5-point Likert scale, and assesses stressful experiences and responses to stress over the previous 4 weeks. Questions that relate negative events or responses are scored in reverse manner. Scores range from 0 to 56, with higher scores indicating higher levels of perceived stress.

The SF-12, version 2, HRQOL survey, Quality Metric Incorporated, Lincoln, Rhode Island, which also measures respondents' experiences over the previous 4 weeks, was used to measure quality of life.^{7,27-30} The SF-12 and the SF-36 are the HRQOL instruments most often used in current practice.^{1,3,27, 29, 31,32} The 12 questions on the SF-12 are divided into a mental health component summary (MCS), which includes questions about feelings and possible limitations from emotional problems, and a physical health component summary (PCS), which includes questions about physical health and possible limitations from physical health problems. The reported range of SF-12 scores for the general US population, aged 18+ years, is 13-69 (mean 50) for the PCS, and 10-70 (mean 50) for the MCS portion, with higher scores indicating better self-reported health-related quality of life.^{28,29}

A questionnaire was used to gather sociodemographic characteristics and data on stress triggers, coping strategies employed, and suggestions to alleviate or manage stress. Via a free-write section, students were asked to list their most common stress triggers and effective coping strategies employed to alleviate stress, and to provide suggestions for possible administrative or campus changes to reduce student stress.

The investigators administered the PSS, the SF-12 HRQOL survey instrument, and the sociodemographic questionnaire during class time, while students were completing a required pharmacotherapy module. Data analyses were performed using Microsoft Excel, Quality Metric SF HRQOL scoring software (Quality Metric Incorporated, Lincoln, RI), and Statistix, version 8.0 (Analytical Software, Tallahassee, FL). Statistix was used to estimate Spearman correlation coefficients between the PSS and the SF-12 MCS results, and between the PSS and SF-12 PCS results. Variations in individual PSS scores, individual SF-12 MCS scores, and individual SF-12 PCS scores according to gender, age, prior degree, grade point average (GPA), exercise habits, extent of daily commute, alcohol use, and tobacco use were examined for significance using the Mann-Whitney test. The Kruskal-Wallis test was used to measure significance of score differences for average hours of employment during the academic term. A one-sample *t* test was used to compare the PSS scores of the sample to those of a sample of college students previously reported by the PSS author.⁷ A one-sample *t* test was also used to compare the SF-12 scores of the sample to those in another group of pharmacy students previously published by Gupchup,¹⁹ and then to compare the SF-12 MCS and PCS scores of the sample to the norm-based mean MCS and PCS scores for the US population.^{28,29}

RESULTS

One hundred nine of 135 third-year PharmD students voluntarily completed the 3 survey instruments (80% response rate). Socio-demographic characteristics of the sample are included in Table 1, descriptive results for the PSS and SF-12 surveys are included in Table 2, and the sample response frequencies for the 14-item PSS survey are presented in Table 3. Of those students who drank alcohol, 32 (29.4%) reported drinking an average of more than 4 drinks per week. Forty-three (39.4%) reported sleeping an average of 6 hours or less each night over the previous 4 weeks.

The mean PSS of the female subset ($n = 79$) was 28.1 (SD 7.7); that of the male subset ($n = 30$) was 22.4 (SD 7.7). The 14-question survey instrument and the sample response frequencies are given in Table 3. Sixty-two (56.9%) students reported feeling nervous or stressed fairly often to very often in the previous month; yet 67 (61.5%) reported feeling confident about their ability to handle their personal problems (Table 3). Gender was the only independent variable for which the difference in the PSS scores was significant ($p < 0.002$); the female subset reported significantly higher levels of perceived stress than did the male subset. The mean PSS scores of the entire sample were significantly higher ($p < 0.0004$) than

Table 1. Sociodemographic Characteristics of Third-Year Pharmacy Students Participating in a Survey to Assess Perceived Stress and Quality of Life (n=109)

Variable	No. (%)
Sex	
Male	30 (27.5)
Female	79 (72.5)
Age	
< 30 y	91 (83.5)
≥ 30 y	18 (16.5)
GPA	
≤ 3.0	18 (16.5)
> 3.0	91 (83.5)
Prior degree	
No	45 (41.3)
Yes	64 (58.7)
Smokes cigarettes	
No	97 (88.9)
Yes	10 (9.2)
No response	2 (0.02)
Consumed alcoholic beverages within last four weeks	
Yes	75 (68.8)
No	32 (29.4)
No response	2 (0.02)
Regular exercise	
Yes	57 (52.3)
No	52 (47.7)
Average daily commute from residence to school	
< 30 minutes	90 (82.6)
≥ 30 minutes	17 (17.4)
Hours of employment during academic terms	
0	29 (26.6)
1-15	55 (50.5)
>15	25 (22.9)

the mean PSS scores previously reported by Cohen in a sample of undergraduate students.⁷ This difference was not entirely unexpected when comparing self-reported stress of students in a professional degree program with that reported by undergraduate students. The

difference in male and female PSS results in Cohen's sample was not significant.⁷

SF-12 sample results are presented in Table 2. Figures 1 and 2 represent the comparisons of the mean mental and physical HRQOL among the sample, the pharmacy sample previously reported by Gupchup, and the US population means, age 18+ years, as reported by Quality Metric, Lincoln, Rhode Island, for all subjects and for female and male subsets.^{19,29} The mental health score among these female pharmacy student respondents was significantly lower ($p < 0.009$.) than that of their male classmates. However, there were no significant differences in mental health scores based on subset analysis by age, prior degree, GPA, exercise habits, extent of daily commute, alcohol use, or tobacco use. The physical health component score was not dependent on gender or any of the other variables. Furthermore, there was no significant difference in either the MCS or the PCS scores of 3 sample subsets defined by the number of hours a student worked during the academic term.

A comparison of the mean mental health and physical health scores of this student sample with those of Gupchup's pharmacy student sample¹⁹ (Figures 1 and 2) revealed no significant difference in mean scores on the MCS. However, this student samples' mean PCS score was significantly higher than that of Gupchup's sample ($p < 0.0001$). A comparison of the mean MCS and PCS scores of this pilot project sample to that of the US population norm means²⁹ (Figures 1 and 2) showed a significant difference between the means on both the MCS ($p < 0.0001$) and the PCS ($p < 0.0001$.) Therefore, as measured by the MCS, the sample of pharmacy students' mental HRQOL was significantly lower than the mental HRQOL of the general US population, aged 18+ years. The physical HRQOL of the pharmacy student sample was significantly higher than the norm for the US population, aged 18+ years, as measured by the PCS, which is expected since 84% of the subjects in this sample were under the age of 30 years. To account for age,

Table 2. Perceived Stress and Health-Related Quality of Life Issues Among Third-Year Doctor of Pharmacy Students (n=109)

	Perceived Stress Scale (PSS) ^a	SF-12 HRQOL v.2 ^b Physical Component Summary (PCS)	SF-12 HRQOL v.2 ^b Mental Component Summary (MCS)
Mean (SD)	26.5 (8.1)	55.4 (7.8)	40.6 (11.3)
Median	27	57.5	42.6
Mode	23	61.7	30.9
Range	7-46	32.3-68.5	6.6-61.4

^aCohen S. Laboratory for the Study of Stress, Immunity and Disease. Available at: <http://www.psy.cmu.edu:16080/~scohen>. Accessed September 16, 2006. Possible range = 0-56; scores increase with increased perceived stress

^bWare J, Kosinski M, Turner-Bowker D, Gandek B, User's Manual for the SF-12v2TM Health Survey. Boston: Quality Metric Incorporated and Health Assessment Lab; 2007. Range for U.S. population, 18+ , PCS = 13-69, MCS = 10-70; scores increase with increased Health related quality of life (HRQOL)

Table 3. Pharmacy Students' Responses to the Perceived Stress Scale^a (n=109)

Statement	Never, No. (%)	Almost Never, No. (%)	Sometimes, No. (%)	Fairly Often, No. (%)	Very Often, No. (%)	Overall Response, Mean (SD)
In the last month, how often have you been upset because of something that happened unexpectedly?	9 (8.3)	29 (26.6)	50 (45.9)	20 (18.3)	1 (0.9)	2.77 (0.88)
In the last month, how often have you felt that you were unable to control the important things in your life?	14 (12.8)	30 (27.5)	41 (37.6)	20 (18.3)	4 (3.7)	2.72(1.03)
In the last month, how often have you felt nervous and "stressed"?	1 (0.9)	10 (9.2)	36 (33.0)	46 (42.2)	16 (14.7)	3.61 (0.88)
In the last month, how often have you dealt successfully with day to day problems and annoyances?	0	3 (2.8)	42 (38.5)	48 (44.0)	16 (14.7)	3.71 (0.75)
In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life?	1 (0.9)	14 (12.8)	47 (43.1)	33 (30.3)	14 (12.8)	3.41 (0.90)
In the last month, how often have you felt confident about your ability to handle your personal problems?	1 (0.9)	7 (6.4)	34 (31.2)	50 (45.9)	17 (15.6)	3.69 (0.85)
In the last month, how often have you felt that things were going your way?	2 (1.8)	14 (12.8)	55 (50.5)	29 (26.6)	9 (8.3)	3.27 (0.86)
In the last month, how often have you found that you could not cope with all the things that you had to do?	9 (8.3)	28 (25.7)	45 (41.3)	23 (21.1)	4 (3.7)	2.86 (0.97)
In the last month, how often have you been able to control irritations in your life?	3 (2.8)	13 (11.9)	45 (41.3)	35 (32.1)	13 (11.9)	3.39 (0.94)
In the last month, how often have you felt that you were on top of things?	1 (0.9)	26 (23.9)	52 (47.7)	26 (23.9)	4 (3.7)	3.06 (0.81)
In the last month, how often have you been angered because of things that happened that were outside of your control?	3 (2.8)	27 (24.8)	49 (45.0)	26 (23.9)	4 (3.7)	3.01 (0.87)
In the last month, how often have you found yourself thinking about things that you have to accomplish?	0	2 (1.8)	15 (13.8)	45 (41.3)	47 (43.1)	4.26 (0.76)
In the last month, how often have you been able to control the way you spend your time?	5 (4.6)	22 (20.2)	49 (45.0)	27 (24.8)	6 (5.5)	3.06 (0.93)
In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	11 (10.1)	32 (29.4)	31 (28.4)	25 (22.9)	10 (9.2)	2.92 (1.14)

^aCohen S. Laboratory for the Study of Stress, Immunity and Disease. Available at: <http://www.psy.cmu.edu/~scohen>. Accessed September 16, 2006

^bPSS scale ranges from never (1) to very often (5)

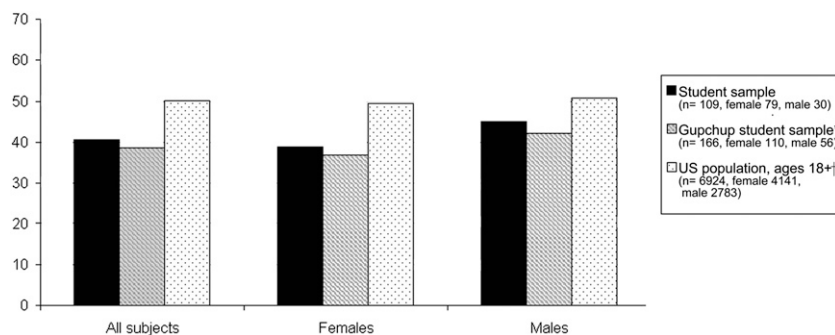


Figure 1. Comparison of mean MCS scores among 3 samples.

a final comparison was made between the mean SF-12 scores for the pharmacy sample subset aged 20-34 years (n=100) to scores of the US population aged 18-34 years,²⁹ and again the mental HRQOL was lower and the physical HRQOL higher in the pharmacy sample than in the US population aged 18-34 years. The differences between the mean scores on both the MCS ($p < 0.0001$) and the PCS ($p < 0.0025$) were significant.

The investigators examined the possible correlation between Perceived Stress and HRQOL. There was a significant negative correlation between the PSS and SF-12 mental health results ($p < 0.001$; Spearman's rank correlation test = -0.7537). Correlation between the PSS and SF physical health results ($p < 0.11$; Spearman's rank correlation test = 0.1575) was not found.

The 5 most common self-reported stress triggers, effective stress coping strategies employed, and student suggestions to alleviate stress are presented in Table 4. Family and relationship issues was the most common stress trigger (n=40, 36.7%), exercise was most often reported as an effective stress relief strategy (n= 52, 47.7%), and eliminating Monday morning examinations was most often suggested to alleviate stress (n=74, 67.9%).

DISCUSSION

Life as a student or health care professional is often stressful. Mild, moderate, and severe levels of stress, and

even burnout, have been documented in pharmacists, physicians, nurses, and dentists.³³⁻³⁷ This pilot project examined stress in and quality of life of third-year pharmacy students at one point during the academic year. The PSS was chosen as the stress instrument based upon its documented reliability and validity.^{7-18,30} The PSS is applicable for a variety of settings and subject types and includes items measuring reactions to stressful situations as well as measures of stress.^{7-18,30} A limitation of other reviewed stress scales for health professions students was a sole focus on academic stress, lack of inclusion of personal issues or reactions to stressful situations, and poor applicability to broader settings and stress after graduation. The Student-Life Stress Inventory³⁸ is an instrument that was used in the one published study of pharmacy students.¹⁹ It was not used in this study because of its 51-item length.

In this pilot study, the female subset of students reported significantly higher levels of perceived stress and lower mental HRQOL than their male classmates. In this pharmacy program the percentage of female students (72%) was slightly higher than the average percentage (62%) of female students enrolled nationwide in PharmD programs, as reported by the American Association of Colleges of Pharmacy in 2006.³⁹ Differences between male and female students in their perception of stress, mental health, and the possible relationship

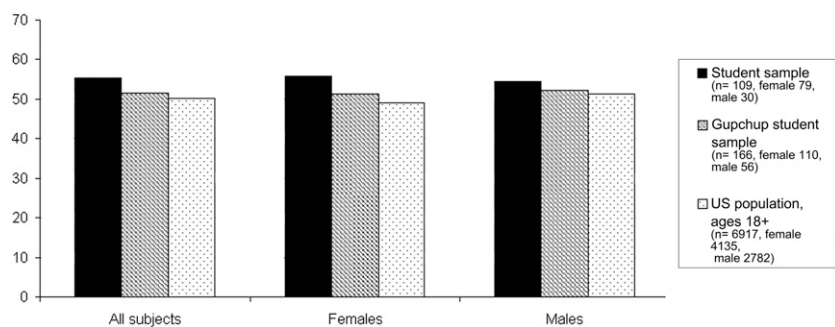


Figure 2. Comparison of mean PCS scores among 3 samples.

between the 2 merits further investigation. In this project, female respondents most often indicated that family and relationships was the most common stress trigger. University-sponsored support groups, increased professional counseling for female students, and even on-campus day-care or afterschool care for elementary-aged children may be needed. Project findings have been shared with the College's administration.

The high level of stress reported by this sample was negatively correlated with self-reported mental health. The lack of correlation between perceived stress and quality of life related to physical health is probably due to the young age (<30 years) of the majority of the sample. The one previously published study that investigated stress and possible impact on quality of life by a one-time survey administered to first- through third-year pharmacy students found that students with higher self-reported stress had worse self-reported mental health.¹⁹ Stress levels were significantly higher for female than male students. Mental health scores were lower in the third-year students than in the first-year students, suggesting a possible decline in self-perceived mental health as students progress through the program.¹⁹

In this study, 3 of the most commonly reported stress triggers were linked to the curriculum. Examinations/tests, Monday morning examinations, and outside-of-class assignments were stressful events in this

particular group of students (Table 4), which appeared to be a fairly competitive class, with 83.5% of the sample having a GPA greater than 3.0. Several studies have reported an inverse relationship between stress and performance among students in undergraduate and professional programs.^{5,40-44} In this pilot project, lower GPAs were not associated with significant differences in stress scores or mental or physical HRQOL.

Examinations and tests are unavoidable in a PharmD program, but 22% of the sample reported Monday morning examinations as stressful events. Monday morning examinations are standard for third-year students in this program. Required pharmacotherapy modules are taught in an intensive block format of 3-4 weeks, with class scheduled 3-4 hours each day, and weekly examinations occurring on Monday mornings. The students may need weekends free for time with family and friends without the pressure of Monday examinations. Female students may have been impacted more by this than male students in this population. Outside of class assignments were reported as greater stress producers than financial concerns, even though the study was conducted at a private institution located in a large metropolitan area. The curriculum requires active learning as a component incorporated into each course with a portion of the assignments and activities completed outside of the classroom, which

Table 4. Most Common Stress Triggers, Coping Strategies, and Suggestions^a

Questionnaire Item	No. (%) ^b
Stress triggers	
1. Family and relationships	40 (36.7)
2. Examinations and tests	26 (23.9)
3. Monday morning examinations	24 (22.0)
4. Outside of class assignments	20 (18.3)
5. Financial concerns	16 (14.7)
Effective activities or strategies employed to cope with stress	
1. Exercising (running or working-out)	52 (47.7)
2. Time with family and friends	48 (44.0)
3. Napping/sleeping	36 (33.0)
4. Watching TV	30 (27.5)
5. Drinking alcohol	20 (18.3)
Suggestions for administrative changes in the pharmacy program or on the campus to alleviate stress	
1. Eliminate Monday morning examinations	74 (67.9)
2. Improve and expand wireless internet, computer labs with sufficient computers and printers in pharmacy and library buildings	56 (51.5)
3. Increase teaching by the experienced professors on faculty	36 (33.0)
4. Improve gym facilities – equipment room and locker room	34 (31.2)
5. Eliminate Block scheduling of courses	16 (14.7)

^aMembers of the sample (n=109) were asked to list their most common stress triggers, effective activities or strategies to cope with stress, and suggestions for administrative changes in the pharmacy program or on the campus to alleviate stress

^bRespondents who reported these items as one of their most common stress triggers, effective activities or strategies to cope with stress, and suggestions for administrative changes in the pharmacy program or on the campus to alleviate stress

can present an academic and time-management challenge in the intensive block schedule.

The authors are investigating programs the college or university can implement to help students learn to effectively manage stress to reduce any negative impact stress may have on lifestyle choices and mental health. Such skills would also serve the students well when they begin professional practice. Careers in the health professions, including pharmacy, can be stressful, and managing that stress effectively makes pharmacists more effective practitioners.³³⁻³⁷ Student suggestions from this study for programmatic and university changes to alleviate student stress were shared with the pharmacy administration.

Limitations of this study include conducting only a 1-time measurement and inclusion of only 1 year of students at a private university located in a large metropolitan area. Students were surveyed during the third week of a 4-week 4-credit hour block. Block scheduling is not used by the majority of pharmacy schools, but has been used at this institution for quite some time. All second- and third-year required pharmacotherapy modules are taught with the block schedule format. Stress and HRQOL may be different with a traditional semester schedule, at a public university, or in a rural setting. Another limitation of this pilot study is the lack of available comparison data from other samples of PharmD students since this information has not been published.

The investigators plan to study a sample of students at this university as they progress from the first year of pharmacy school to the fourth year on advanced practice experiences. Additional factors contributing to stress and mental HRQOL other than those discovered in this study need to be identified. Furthermore, the actual effectiveness of the methods students employ to cope with stress to improve perceived stress levels and mental health warrants further investigation in a longitudinal study.

A final limitation of the study was the use of a parametric statistic—the one sample *t* test—while nonparametric statistics were used for all other statistical analyses. Nonparametric statistics were appropriate for the sample data and used for data analysis whenever possible. An equivalent nonparametric counterpart to the parametric one-sample *t* test does not exist, so the one-sample *t* test was used where indicated.

CONCLUSION

Third-year pharmacy students reported relatively high levels of perceived stress and low mental HRQOL. Higher levels of stress were negatively correlated with mental HRQOL. Students employed mostly positive, but some negative, lifestyle choices to alleviate stress.

Results from this pilot project may be of interest to other academicians since ACPE standards for the curriculum indicate that curricular assessment should include measurement of perceived stress among students. Further study is needed to identify other contributing factors to the high stress and poor mental HRQOL of PharmD students and to investigate the actual effectiveness of strategies to improve stress levels and mental health as students progress through the PharmD program.

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