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**Measuring Perceived Medical School Stress (PMSS) scores
among physician assistant students**

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Abstract

Introduction: Perceived stress has not been examined among physician assistant students using the Perceived Medical School Stress (PMSS) scale which measures students' perception of stress over four areas: medical school curriculum and environment, personal competence and endurance, social and recreation life, and finances. The purpose of this study is to identify items on the PMSS scale that elicit higher perceived stress responses and observe changes throughout the first semester of the didactic curriculum while implementing a 15-week wellness intervention focusing on wellbeing, stress reduction, coping strategies, and burnout.

Methods: 31 students completed the Perceived Medical School Stress scale at week 1, week 8, and week 15 of their physician assistant didactic education.

Results: Significant statistical differences were found in four of the thirteen PMSS items. A maladaptive response, defined as an initial low stress score becoming high, was observed in "Medical training controls my life and leaves me too little time for other activities" ($p=0.002$). An adaptive response, defined as an initial high stress score becoming low, was observed in: "I am concerned that I will be unable to master the entire pool of medical knowledge," ($p=0.015$) "I am concerned that I will not be able to endure the long hours and responsibilities associated with clinical training and practice," ($p<0.001$) and "Personal finances are a source of concern for me" ($p=0.010$). The other nine items were categorized as resistive responses, defined as an initial low stress score remaining low, thus no statistically significant changes were observed.

Discussion: The four statistically significant changes were observed from the Pre-to-Mid test with no changes from Mid-to-Post test suggesting the greatest shifts in stress perception occurs within the first few weeks of PA school. Of the four areas of perceived stress that the PMSS surveys, the "PA Curriculum and Environment" category had no high perceived stressors, while the other 3 areas "Personal Competence & Endurance," "Social and Recreational Life," and "Finances" had at least one item with a higher perceived stress score, suggesting that external factors may exacerbate higher levels of stress more than curricular components. The three adaptive responses suggest that first semester physician assistant students benefited from the wellness intervention that emphasized stress management and resiliency skills. These findings suggest that wellness curriculum within the PA programs should provide additional support, resources, and education on managing external factors that perpetuate student and professional burnout.

Introduction

Wellness initiatives among the physician assistant (PA) profession is not a novel concept. In 2000, 30 out of the 123 PA programs in the United States had implemented health promotion and wellness topics into their curricula.^{1,2} However, following the recent COVID-19 pandemic, the pervasiveness of practitioner stress, depression, anxiety, and burnout has become a major topic of interest. Further examination of practitioner wellbeing has encouraged a paradigm shift throughout the profession from crisis intervention to mental health promotion. Many studies have looked at the contributing factors of high rates of physician assistant burnout which include the workload, work inefficiencies, decline in feeling of purpose, control, social isolation, and conflicts.³ However, these stressors are not unique to the profession but often commence in the setting of physician assistant education and training.

Physician assistant education is recognized for its rigorous, accelerated curriculum completing on average 120 credits over 27 consecutive months. PA school is based on a medical education model, consisting of didactic curriculum, followed by clinical rotations. The average age of a PA student is 26 years old, due to the clinical experience requirement that is most commonly fulfilled in the years following an undergraduate degree. From the start, this curriculum demands quick adjustment to the academic workload, new peer relations, time management, as well as maintaining one's personal health and financial responsibilities. With the recognition of the prevalence of burnout among health profession students, educational programs are just beginning to examine their curriculum delivery systems and seeking to improve learning environments. However, research examining two curricular models showed no statistical significance between the two for burnout, suggesting stressors outside of the PA curriculum exacerbate students' burnout during their education.⁴

Wellness curriculum was introduced at James Madison University's PA program in 2019. The intervention is student-led by upperclassmen and is two-part, consisting of wellness seminars and peer group discussions with a heavy emphasis on wellbeing, stress reduction, coping strategies and burnout. In addition to this curriculum, pairings are assigned between the first- and second-year cohorts, intended to create a more personal support system throughout the entirety of their PA education. The aim of seminars and student-led discussions have been to promote mental health awareness and mindfulness practices, so that students experience lower perceived stress and greater life satisfaction. Perceived stress is an individual's feelings of stress,

uncontrollability, or unpredictability that they feel over their life, specific problems, or towards difficulties.⁶ It is not measured by frequency of stressful events, but rather by perception of general stressfulness that the individual feels about a situation.⁶ Perceived stress was first measured in 1983 by Cohen et al with the Perceived Stress Scale (PSS) with a 14 question survey that evaluated an individual's experienced stress over the past month and used as a predictor of disease.⁷ This scale was adapted in 1989 to be applied to medical school by Vitaliano et al.⁸ The Perceived Medical School Stress scale (PMSS) measures students' perception over four areas: medical school curriculum and environment, personal competence and endurance, social and recreation life, and finances (Table 2).⁸ The PMSS survey was administered throughout the first year of medical school and the results were compared to the "Symptom Checklist Anxiety Scale" and "Beck Depression Inventory Scale" as a way to predict the individuals' coping strategies and health outcomes. Vitaliano et al categorized students' PMSS outcomes by their stress score going from high to low (adaptors), low to high (maladaptors), low to low (resistors), or high to high (persistors).⁸ Maladaptive responses to stress has been correlated with greater emotional distress and burnout as compared to adaptive responses, which were suggested to provide a greater benefit to academic success and the development of resiliency skills.^{5,9-12} With this background in mind, the objective of this study is to examine a cohort of physician assistant students' perceived stress scores throughout their first semester to identify specific factors that elicit maladaptive responses and higher levels of stress.

Methods

This study provides prospective, longitudinal data on the relationship between perceived stress measures and wellness curriculum at three time points during the first semester of physician assistant school. This study is approved by the James Madison University institutional review board.

Participants

Participants were drawn from the James Madison University (JMU) PA class of 2024 (n=32). In August 2022, a link to the pretest wellness survey was provided to 32 students. Of those who received the link, we had 32 participants. Participation was elective and all responses were anonymous. Each participant created a unique confidential identifier to be used for each subsequent survey administered. Students were given the presurvey at the beginning of their didactic learning, prior to the initiation of a 15-week wellness curriculum that combines four

wellness seminars with four small group discussions. A mid-survey was administered at week 8 and the postsurvey was administered after conclusion of the curriculum during week 15.

Wellness Intervention

The intervention took place in the initial semester of students' didactic learning. By electing to be a participant, all 32 students received the wellness curriculum. Over 15 weeks, the cohort of 2023 received four seminars covering material on the transition to the first semester course load, stress, anxiety, burnout, coping with change, and a seminar discussing the remaining didactic courses. Every 3-4 weeks a seminar was presented lasting 15 minutes in duration. Immediately following each wellness seminar, peer focus groups would meet to further discuss the topic(s) presented for an additional 45-60 minutes. Peer groups were led by second year students who facilitated focused discussions regarding stress, coping mechanisms, balancing work and personal life, burnout, and recommended resources. These sessions aimed to create a more cohesive learning environment while improving participant insight. The students were put into groups of four participants led by one second-year student.

Measures

The participants completed a wellness survey consisting of three validated tools to assess depressive related disorders, anxiety related disorders, and perceived stress: the Patient Health Questionnaire-2 (PHQ-2), Generalized Anxiety Disorder-7 (GAD-7), and the Perceived Medical School Stress (PMSS) score. This wellness survey was first introduced to the JMU PA program in 2019 as part of a larger longitudinal study assessing the impacts of a wellness curriculum on PHQ-2, GAD-7, and PMSS scores. The wellness curriculum implemented at JMU and wellness survey are consistent variables. However, this year the study received IRB approval to administer the survey mid-curriculum in addition to pre- and post-curriculum.

Perceived Stress

James Madison University PA faculty received approval by the author of the Perceived Medical School Stress scale, Dr. Peter Vitaliano, to be adapted and used in physician assistant programs. The PMSS consists of thirteen items that are then rated on a five-point Likert scale (0=strongly disagree, 4=strongly agree). Low perceived stress was graded as 0-2 (strongly disagree, disagree, neutral), whereas high perceived stress was defined by scores of 3 or 4 (agree, strongly agree). For the purpose of this study, the total PMSS scores for each item will be utilized to measure changes in perception of stressors between the Pre, Mid, and Post time points.

Curriculum Feedback

During the post-survey, PA students were asked to provide feedback on potential topics to be incorporated in the wellness curriculum in the future: burnout, stress reduction, mindfulness, meditation, improving empathy, personal well-being, nutrition, conflict management, finances, compassion fatigue, work-life balance, and how to handle failure. They indicated their interest level on a 5-point Likert scale from strongly disagree to strongly agree. The data collected are intended for future longitudinal studies.

Demographics

Survey participants recorded their age, sex, and race/ethnicity for longitudinal data collection. Additionally, subjects were asked to choose their top two motivations for entering PA school, in which they chose from a list of eight categories (eg. friends/family studying in a PA program, financial reasons, curing and preventing disease, helping people, working with people, intellectual satisfaction, professional independence, professional encouragement).

Statistical Analyses:

SPSS software was used for analysis. Since our primary outcomes were measured using discrete data and data were non-normality distributed (Shapiro-Wilk tests all $P < 0.05$), we used non-parametric tests for all statistical comparisons.

We first compared scores for each individual PMSS question (0-4) and the sum score of all PMSS questions (0-52) across the Pre, Mid, Post-testing times using separate Friedman's tests ($P < 0.05$). Any significant comparisons were then further examined for changes from Pre-to-Mid, Pre-to-Post, and Mid-to-Post using post-hoc Wilcoxon signed-ranks tests with Bonferroni corrections ($P < 0.017 = 0.05/3$).

Results:

Completion rates of the Pre, Mid, and Post-testing questionnaires were 96.8%. At the Pre time point, 32 surveys were distributed and 33 unique identifiers were created. The extra survey yielded only demographic data so it was excluded. For the Mid-test survey, three participants chose more than one response on the Likert scale. For consistency, when two consecutive points on the Likert scale were chosen, the higher of the two selections was recorded for analysis (ie: If 'neutral' and 'agree' were chosen, only 'agree' was recorded for analysis). The Post-test questionnaire setting was changed to only allow for one selection. The Post-test was distributed

to all 32 subjects and only completed by 31. The subject with incomplete data for the Post-test time point was excluded from analysis.

	PA Students (N=31)
Age (yrs)	25.1 ± 2.8
Gender	
Female	26 (84%)
Male	5 (16%)
Race/Ethnicity	
Asian/Pacific Islander	6 (19%)
Black/African American	1 (3%)
Hispanic/Latino	4 (13%)
White/Caucasian	24 (77%)

Table 1 summarizes the demographics of the sample. Most respondents identified as female, with 16% of respondents identifying as male. The average age was 25.1 with ages ranging from 22 to 35. The majority of PA students identified as Caucasian (n=24, 77%).

Table 2: Comparison of Perceived Medical School Stress (PMSS) Scores at Pre, Mid, & Post Tests

	Pre Test	Mid Test	Post Test	Friedman p-value	Pre-to-Mid p-value	Pre-to-Post p-value	Mid-to-Post p-value
PA Curriculum & Environment Questions:							
The attitude of faculty is that students should be subjected to baptism by fire	0.5 ± 0.5	0.8 ± 1.0	0.6 ± 0.6	0.18	–	–	–
Physician assistant programs foster the PA role at the expense of one's personality and interests	0.8 ± 0.8	1.1 ± 0.9	1.3 ± 1.0	0.12	–	–	–
Success in physician assistant school is in spite of the administration rather than because of it	0.6 ± 0.6	0.5 ± 0.6	0.7 ± 0.9	0.31	–	–	–
Physician assistant school is cold, impersonal and needlessly bureaucratized	0.3 ± 0.5	0.4 ± 0.7	0.6 ± 0.6	0.17	–	–	–
Decisions regarding electives and clerkships (rotations) are made on the basis of information obtained from fellow students and not from the faculty	1.5 ± 0.9	1.6 ± 0.8	1.6 ± 1.0	0.71	–	–	–
I do not know what the faculty/administration expect of me	0.7 ± 0.5	0.7 ± 0.6	0.7 ± 0.6	0.78	–	–	–
Physician Assistant School fosters a sense of anonymity and feelings of isolation among students	1.1 ± 0.8	1.3 ± 0.9	1.0 ± 0.9	0.25	–	–	–
Personal Competence & Endurance Questions:							
I am concerned that I will be unable to master the entire pool of medical knowledge	2.5 ± 1.0	1.9 ± 1.0	1.9 ± 1.2	0.01*	0.003*	0.015*	0.74
I am concerned that I will not be able to endure the long hours and responsibilities associated with clinical training and practice	1.9 ± 0.9	1.2 ± 0.9	1.1 ± 0.9	<0.001*	<0.001*	<0.001*	0.53
Physician assistant school is more competitive than I expected	1.4 ± 0.8	1.5 ± 1.1	1.2 ± 1.1	0.21	–	–	–
Physician assistant school is more of a threat than a challenge	0.6 ± 0.5	0.4 ± 0.6	0.4 ± 0.7	0.07	–	–	–
Social & Recreation Life Questions:							
Medical training controls my life and leaves me too little time for other activities	1.7 ± 0.8	2.4 ± 1.2	2.3 ± 1.2	0.02*	0.002*	0.014*	0.47
Finances Questions:							
Personal finances are a source of concern for me	2.7 ± 1.2	1.9 ± 1.3	2.1 ± 1.4	<0.001*	0.001*	0.010*	0.15
PMSS Sum Score (0-52)	16.1 ± 6.0	15.6 ± 6.3	15.1 ± 6.1	0.51	–	–	–

* = Significant difference between testing times

Over the course of the intervention, we observed significant changes in PA students' responses on four of the thirteen PMSS questions: "I am concerned that I will be unable to master the entire pool of medical knowledge", "I am concerned that I will not be able to endure the long hours and responsibilities associated with clinical training and practice", "Medical training controls my life and leaves me too little time for other activities", and "Personal finances are a source of concern for me" (Table 2).

For the question, "I am concerned that I will be unable to master the entire pool of medical knowledge", our findings suggest that PA students' concern significantly decreased from Pre-to-Mid test and from Pre-to-Post test, but there was no significant change from Mid-to-Post test (Table 2).

For the question, "I am concerned that I will not be able to endure the long hours and responsibilities associated with clinical training and practice", our findings suggest that PA students' concern decreased from Pre-to-Mid test and from Pre-to-Post test, but there was no change from Mid-to-Post test (Table 2).

For the question, "Medical training controls my life and leaves me too little time for other activities", our findings suggest that the perception that medical training controls PA students' life and activities significantly increased from Pre-to-Mid test and from Pre-to-Post test, but there was no significant change from Mid-to-Post test (Table 2).

For the question, "Personal finances are a source of concern for me", our findings suggest that PA students' concern significantly decreased from Pre-to-Mid test and from Pre-to-Post test, but there was no significant change from Mid-to-Post test (Table 2).

Over the course of the intervention, we observed no significant changes in any other individual PMSS questions or the PMSS sum score across the Pre, Mid, Post-testing surveys (Table 2).

Discussion

The aim of this study was to examine common perceived stressors of the medical education model and identify maladaptive responses within a cohort of physician assistant students. The PMSS scale has been implemented in numerous studies among medical students but has not been used as a measure within PA cohorts.

Two patterns were evident in our data collection: (1) the observed statistically significant change of four items occurred from the Pre-to-Mid test, then persisted from the Mid-to-Post test and (2)

the perceived stress of the nine remaining items showed no statistically significant change throughout the semester. This suggests that the shift in stress perception occurred during the first weeks of the semester and solidified shortly thereafter. Of the four areas of perceived stress that the PMSS surveys, statistically significant changes were noted in three; two items from the category “Personal Competence and Endurance,” one item from “Social & Recreational Life” and one from “Finances.” It is worth noting that there were no statistically significant changes observed in the category “PA environment & Curriculum.” This observed pattern may be suggestive of external factors having a greater impact on stress levels than curricular components.

Of the four observed changes with statistical significance, one item was maladaptive, while the remaining three were adaptive responses. The maladaptive change was to “Medical training controls my life and leaves me too little time for other activities.” This item was assessing the perceived stress of their social and recreational life. The first semester of JMU’s PA curriculum is the most time intensive, requiring 6 hours of anatomy lecture, 9 hours of cadaver lab, 6 hours of pathophysiology, 8 hours of physical diagnosis, and 1.5 hours of PA profession every week. Therefore, it is not surprising that the reported experienced stress increased as the semester progressed and was reflected in the Pre-to-Mid test comparison. An adaptive change was observed among: “I am concerned that I will be unable to master the entire pool of medical knowledge,” “I am concerned that I will not be able to endure the long hours and responsibilities associated with clinical training and practice,” and “Personal finances are a source of concern for me.” These items were assessing the perceived stress of personal competence & endurance, and finance categories. The wellness intervention did not focus on financial education or management, therefore little can be deduced regarding this adaptive response. However, the adaptive stress scores observed in the personal competence and endurance category may be suggestive of the benefits a wellness intervention produces through repeated emphasis on stress reduction, coping strategies and burnout prevention. Additionally, the cohort pairings and focus groups, and frequent exposure to the upperclassmen whose encouragement and testimonies of shared experiences may have also contributed to the observed positive accommodations. The remaining nine items observed no statistically significant change throughout the semester. This includes seven items in the “PA curriculum and environment” category, as well as two items in the “personal competence and endurance” category. Additionally, these stress scores

remained low (<2) which would categorize them as “resistors” according to Vitaliano et al. Among the stressors that were categorized as resistive, three items had a >1 mean score, which included: “Decisions regarding electives and clerkships (rotations) are made on the basis of information obtained from fellow students and not from the faculty”, “Physician Assistant School fosters a sense of anonymity and feelings of isolation among students” “Physician assistant school is more competitive than I expected.” While the perceived stress scores remained low, these responses may suggest areas that could be addressed further by education programs in providing additional support.

This study observed considerable variability in PMSS sum scores on an individual basis but as a cohort, no significant change from Pre, Mid, to Post testing times were observed. This could be due to the stressful timing of each test; Pre-test was administered after completion of two-day orientation, prior to the first day of school. The second assessment was administered during the week of midterms, and the Post-test was administered one week prior to finals week. These periods of time are considered more stress provoking during the first semester and are experienced with great variability among individuals.

Limitations

Prior to this study, perceived stress among physician assistant students was not examined using the Perceived Medical School Stress scale. The PMSS scale identified areas of higher stress within the PA education model, however, we cannot draw conclusions on how persistent/resistive, adaptive/maladaptive stressors affect coping mechanisms of the average PA student. The wellness initiative focused on the strategies to reduce burnout, but the survey administered did not include a direct way of measuring stress management skills, leaving the degree of impact of the wellness curriculum on stress management and burnout in question. Additionally, with 254 PA programs in the United States, and around 10,000 current students, our sample size of 31 is limited and may not be representative of all students entering their PA medical education. Further, due to the absence of a control group, it is not clear if the adaptive responses were a result of the wellness intervention or the natural progression of adjusting to the demands of the semester.

In regards to the survey, the settings need to be changed to only allow for one choice to be selected for each question. Additionally, the timing of when the survey is administered needs to be addressed to limit the circumstantial stressors that may have influenced responses.

Future Directions

This study reveals potential areas of improvement for physician assistant education programs but may not be representative of all schools with varying cohort sizes, demographics, and different curricula introduced in the first semester. Gathering PMSS data over multiple cohorts at JMU or across programs in Virginia could be more representative of average perceived stress entering PA school. Further, collecting perceived stress scores after the completion of the didactic portion again following the clinical year would be a more thorough evaluation of perceived stress throughout the PA curricula, though high survey dropout rates may be expected. Finally, implementing another measure called the Brief COPE Inventory would allow for future research to examine positive and negative coping mechanisms of physician assistant students with perceived stress scores and infer of how persistive, adaptive, or maladaptive stressors affect the student's ability to cope.^{13,14} By introducing this measure to the research, we would have a way to assess the wellness curriculum's benefit of the seminars promoting healthy coping strategies, the effects of peer focus discussion, and the support provided by the pairing with an upperclassman. Future work may further elucidate the high-level stressors external to or within the physician assistant education model, leading to an advancement in wellness initiatives and promotion of positive coping skills, in an effort to lower physician assistant depression, anxiety, and burnout.

Resources:

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