

July 2023

## Eating Habits, Health Status, and Emotional Well-being Among an Optometry Student Population

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### Recommended Citation

Rodriguez, Neisha M and Gil, Karen (2023) "Eating Habits, Health Status, and Emotional Well-being Among an Optometry Student Population," *Health Professions Education*: Vol. 9: Iss. 3, Article 3.  
DOI: 10.55890/2452-3011.1044  
Available at: <https://hpe.researchcommons.org/journal/vol9/iss3/3>

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## ORIGINAL RESEARCH REPORTS

# Eating Habits, Health Status, and Emotional Well-Being Among an Optometry Student Population

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### Abstract

**Purpose:** The purpose of the study was to evaluate dietary habits, health-related lifestyle, and anthropometric characteristics among graduate optometry students.

**Method:** A prospective cross-sectional study was performed with the first-year Optometry students entering the classes of 2015 and 2016. Height, weight, and blood pressure were measured at the beginning of August in the fall and the end of May in the spring semester for three consecutive years. Self-reported questionnaires about health-related lifestyles, nutritional habits, and emotional well-being were administered.

**Results:** A total of 116 graduate students with an average age of  $25.3 \pm 3.3$  years participated in the study. Our results revealed increased body mass index, alcohol consumption, smoking, and take-out meals. Their dietary habits of reduced frequency of meals per day, omitting breakfast, snacking, and increasing intake of high-fat products were found. The participants also reported increased symptoms of depression, anxiety, and stress.

**Discussion:** This study provides valuable information to post-secondary academic institutions regarding graduate students' overall health and well-being. It demonstrates the importance of developing strategies to promote a healthy lifestyle among future healthcare professionals.

**Keywords:** Dietary habits, Lifestyle, Well-being, Healthcare students, Graduate students

## 1. Introduction

Students' transition to higher education has been recognized as a period of many challenges [1]. During this transition, multiple factors are associated with physical and mental changes that could affect the student's adaptation to their new life [2,3]. It has been found that graduate and health professional school students are more susceptible to eating disorders and psychological problems because of their high-stress levels, burnout, and academic demands [4,5].

Previous studies reported unhealthy behaviors among college or undergraduate students, such as poor diet, decreased physical activity and sleeping hours, and increased alcohol consumption [6–8]. Transitioning to graduate school can contribute to diet changes, especially for displaced students. Being away from home predisposes students to be

responsible for their decisions regarding the food they eat for the first time [9]. Studies have shown that dietary habit changes occur more commonly in this population, such as the intake of products with elevated sugar and salt content, increased frequency of alcohol use, and take-out meals followed by a reduced intake of fresh fruit, vegetables, and unsaturated fats [6,9]. The emotional and psychological changes, peer pressure, academic demands, and financial situation could contribute to an unhealthy diet [10,11].

Sleep deprivation in graduate students has been previously reported [12,13]. The Center for Disease and Control Prevention recommends that an adult's sleep should be 7 h or more [14]. It has been published that students generally sleep less than 7 h per night [12]. Lack of sleep can be related to their class schedule, lifestyle, and stress and may affect their academic progress [13,15].

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Received 21 December 2022; revised 13 March 2023; accepted 14 March 2023.  
Available online 1 August 2023

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<https://doi.org/10.55890/2452-3011.1044>

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Studies have suggested that obesity and hypertension are prevalent among university students due to reduced physical activity and altered eating habits [16–19]. Obesity has become a global public health concern in the last few decades, significantly related to lifestyle changes [20]. Hypertension is a modifiable risk factor of cardiovascular diseases, and strategies to achieve even a modest lowering of blood pressure are an important public health goal [21].

Several research studies provide evidence that lifestyle factors such as unhealthy diet, excessive use of alcohol, smoking, and sedentary lifestyles contribute to an increase in chronic diseases such as Cardiac Vascular Diseases (CVD), type 2 Diabetes Mellitus (DM), and Cancer, among others, in students [16,18,22]. These diseases are well known and can increase the morbidity and mortality of an individual [16]. School absenteeism is also associated with chronic illness, negatively affecting educational performance [1].

The stress and depression related to the transition from college to graduate studies might contribute to poor health behaviors [8]. As students face multiple life changes, acquiring more responsibilities and adapting to a different environment could cause psychological distress, such as anxiety and depression [23].

The prevalence of anxiety and depression is growing, and it is estimated that depression will be the leading cause of mental illness globally by 2030 [24]. According to Hoying et al., many mental health disorders begin in early adult students due to pressure and responsibilities associated with graduate school. The authors concluded that health science programs, such as optometry, have a higher risk of mental health due to high-stress levels and burnout [5]. Also, depression and anxiety disorders may contribute to weight gain through their association with poor eating habits and sedentary lifestyle changes [16,25,26].

This study aims to explore if optometry students experience changes in their general health situation, lifestyle behaviors, dietary habits, and emotional well-being during the first three years of their professional optometry degree program.

## 2. Methods

### 2.1. Study design and participants

A prospective cross-sectional study explored optometry students' overall health, eating habits, and psychological well-being at the Inter-American University of Puerto Rico School of Optometry.

Institutional Review Board approval from the Inter-American University of Puerto Rico was obtained following the Declaration of Helsinki.

By convenience sampling, students enrolled in August 2015 and 2016 entering classes were included in the study. Each group was monitored for diet behavior, lifestyle, depression, stress, anxiety, and anthropometric measures at the beginning of August in the fall semester and at the end of May during the spring semester for three consecutive years. Students older than 21 years who provided written consent to their participation were included in the study. Students in their fourth year of studies were excluded from participation. During the first three weeks of August and the end of May of each semester, a flyer with the study description and the approved ethics committee consent was placed on the bulletin boards around the school. Interested participants contacted the research team to coordinate an appointment. During that time, the consent form was gathered, the questionnaires were completed, and the anthropometric measures were obtained.

At baseline, the students recruited were 57 in 2015 and 59 in 2016, for a total of 116 participants. Self-administered questionnaires with demographic information, eating habits, stress, anxiety, and mental health were provided, and a trained physician assessed anthropometric measures.

### 2.2. Materials

#### 2.2.1. Instruments

Each participant completed a sociodemographic questionnaire to gather general information, which included age, gender, ethnicity, living arrangements, smoking and alcohol intake habits, physical activity frequency, sleeping patterns, and take-out food frequency. Bodyweight and height were measured with a Graham-Field Physician Mechanical Beam Scale®. The body mass index (BMI = weight/height) was obtained with the BMI calculator for adults from the Centers for Disease Control and Prevention [22]. BMI was further classified using the standard international adult ranges: underweight (BMI <18.5), healthy weight (BMI = 18.5–24.9), overweight (BMI = 25.0–29.9), or obesity (BMI >30) [27]. Systolic and diastolic blood pressure were measured with an adjustable aneroid sphygmomanometer; pre-hypertension was defined as systolic blood pressure from 120 to 129 mmHg and diastolic 80–89 mmHg. Hypertension was classified as a systolic pressure  $\geq 140$  mmHg and a diastolic pressure  $\geq 90$  mmHg [28].

The eating behavior of each student was evaluated with the Eating Habits questionnaire [29]. The instrument consisted of 13 items that measured the daily frequency of meals, regular breakfast, and snacks. It also explored the participant's self-perception of a balanced diet, consideration of caloric intake at home and when eating out, the purchase of processed foods, and frequency of acquiring products with high sugar and fat content. Preferred healthy cooking methods such as grilling or steaming, excessive eating impulses, and salt use at the table behaviors were also explored. The scores range from never (1), rarely (2), occasionally (3), frequently (4), to very frequently (5). The average was calculated for each item, the highest score being a more frequent behavior. The questionnaire was tested before administration for reliability and validity with scores of 0.72 and 0.74, respectively.

The well-being of the students during their first three years of optometric education was assessed with the following validated instruments: The Beck Depression Inventory [30], the Generalized Anxiety Disorder scale [31], and the Perceived Stress Scale [32].

The Beck Depression Inventory (BDI-II) was used to assess depression symptoms among the participants. The instrument consists of 21 items with a self-assessment scale that evaluates depression symptoms in persons older than 13. Each item is scored on a 4-point scale ranging from 0 (no depression) to 3 (severe depression), with a total score ranging from 0 to 63, where higher scores demonstrate more severe depression symptoms. Scores from 0 to 13 indicate minimal depression, 14–19 (mild depression), 20–28 (moderate depression), and 29–63 (severe depression) [30,31]. The reliability score from the test ranges from 0.73 to 0.92, and the validity of 0.9.

The Generalized Anxiety Disorder (GAD)-7 scale is a seven-item instrument developed to screen anxiety symptoms in persons older than 14. The questionnaire has a reliability and validity of 0.89, and it is a tool that discriminates against any anxiety disorder for the past two weeks. The scores of 0–3 are given for experiencing symptoms from 'not at all' to 'nearly every day'. GAD-7 total score for the seven items ranges from 0 to 4 (none), 5–9 (mild), 10–14 (moderate), and 15–21 (severe) anxiety [32].

The Perceived Stress Scale (PSS) was administered to estimate the participants' stress perception. The survey has an internal reliability of 0.78 and consists of 10 items measuring the perception of stress experienced during the past month. The instrument can be used in persons older than 18 years and uses a Likert scale with scores ranging from

0 (never), 1 (almost never), 2 (sometimes), 3 (fairly often), and 4 (very often) to measure participants' stressful situations. A score of 40 is considered higher perceived stress [33].

### 2.2.2. Statistical analysis

Descriptive statistics were used for continuous variables with mean and standard deviations (mean  $\pm$  SD). The means were compared by independent samples t-test and one-way ANOVA, and the proportions were evaluated using the chi-square test when applicable. Linear regression was used to compare changes over three years. Spearman correlation was used for non-parametric variables. All statistical analysis was performed with Statistical Package for the Social Sciences (SPSS) v.27 software, and P-values equal to or less than 0.05 was considered significant.

## 3. Results

### 3.1. Health status

Health status for this study includes analysis of demographic information and anthropometric measures. Demographic information from the two entering classes included in the study for the first three years of their optometric education is shown in Table 1. One hundred sixteen students participated in the study, with an attrition rate of 4% in 2015 and 11% in the 2016 class. There was no difference in the distribution for gender between classes ( $P = 0.80$ ) or age ( $P = 0.90$ ). The anthropometric profile, lifestyle, and well-being results for the participants for each academic semester during the three years of their education are presented in Table 2. The BMI does not change significantly during the semesters when the students are compared over time. Although the BMI means did not change over the three years, the overweight

Table 1. Demographic distribution of the sample at baseline.

Variable	Group (N = 116)
Age (mean $\pm$ SD)	25.3 $\pm$ 3.3
Gender (%)	
Males	37.9 (44)
Females	62.1 (72)
Ethnicity (%)	
Asian/Pacific Islander	32.8 (38)
Hispanic/Latino	31.9 (37)
White/Caucasian	19.8 (23)
Black/African American	2.6 (3)
Other	13.0 (15)
Housing (%)	
School dormitory	72.4 (84)
Other	27.6 (32)

Table 2. Anthropometric profile, lifestyle, and emotional well-being.

	Year 1 F S (n = 107) (n = 11)		P -value	Year 2 F S (n = 82) (n = 73)		P -value	Year 3 F S (n = 63) (n = 44)		P -value
<b>Anthropometric Measures</b>									
BMI (mean ± SD)	26.1 ± 5.4	27.0 ± 5.8	0.23	26.6 ± 5.7	26.9 ± 5.4	0.73	26.5 ± 5.1	26.6 ± 5.3	0.87
<b>BMI Classification (%)</b>									
Underweight	2.8	4.5		2.4	2.7		2.3	1.6	
Normal	43.0	36.9		41.5	38.4		36.4	41.3	
Overweight	31.8	31.5		34.1	31.5		43.2	33.3	
Obesity	22.4	27.0		22.0	27.4		18.2	23.8	
<b>Blood pressure mmHg (mean ± SD)</b>									
Systolic	111.3 ± 11.0	105.8 ± 18.1	0.04	113.8 ± 11.2	109.9 ± 11.2	0.05	108.9 ± 2.3	104.8 ± 19.5	<0.001
Pre-hypertension (%)	34.6	21.6		34.1	21.9		27.0	22.7	
Hypertension (%)	0.9	0.9		2.4	1.4		0	0	
Diastolic	74.9 ± 7.8	72.2 ± 9.3	0.01	75.3 ± 7.0	73.0 ± 8.1	0.29	72.9 ± 8.7	71.4 ± 9.3	0.06
Pre-hypertension (%)	29.9	15.3		35.4	17.8		20.6	22.7	
Hypertension (%)	4.7	7.2		1.2	5.5		4.8	0	
<b>Lifestyle (%)</b>									
Active alcohol drinkers	71.6	74.1	<0.001	76.8	81.9	<0.001	74.6	83.7	<0.001
Frequency (Week)			0.84			0.15			n/a
Less than 2	94.0	96.5		96.8	91.5		100	100	
More than 3	6.0	3.5		3.2	8.5		0	0	
Active smokers	0	8.1	<0.001	3.7	4.2	<0.001	0	4.5	0.03
Any physical activity	69.8	70.3	<0.001	77.1	80.6	<0.001	73.0	81.8	0.01
Frequency (Days)			<0.001			0.04			0.11
Less than 3	49.3	58.4		51.6	50.0		54.3	50.0	
More than 4	50.7	41.6		48.4	50.0		44.7	50.0	
Sleeping pattern (Hours)			n/a			n/a			n/a
Take out meal (Week)			0.97			0.04			0.98
Less than 4	96.2	95.5		92.8	98.6		95.2	97.7	
More than 5	3.8	4.5		7.2	1.4		4.8	2.3	
<b>Well-being (mean ± SD)</b>									
Depression	2.4 ± 2.8	3.6 ± 4.1	<0.001	2.9 ± 3.9	3.2 ± 4.5	<0.001	3.4 ± 3.9	2.0 ± 2.9	<0.001
Anxiety	6.7 ± 5.1	8.8 ± 5.3	0.41	6.8 ± 5.9	8.8 ± 6.8	<0.001	8.1 ± 6.5	5.0 ± 4.2	0.02
Stress	20.3 ± 3.3	21.7 ± 4.7	0.16	19.7 ± 4.7	20.8 ± 4.7	0.04	20.6 ± 4.6	18.9 ± 4.8	0.87

F = Fall Semester, S = Spring Semester.

category was the most common among the participants. Obesity was the only classification that increased during each academic year. When blood pressure was assessed, the students' systolic blood pressure decreased significantly each year (Table 2) and across the three years ( $P = 0.01$ ). Diastolic blood pressure was also lower each year, but it was not significant for the second year of their education. The diastolic pressure decreased significantly over the three years ( $P = 0.05$ ). The proportion of students with pre-hypertension by systolic ( $P = 0.03$ ) and diastolic ( $P = 0.02$ ) blood pressure decreased over time. Hypertension by diastolic pressure increased during the first two years ( $P < 0.001$ ) and ( $P = 0.05$ ), with a decrease in the third year. When comparing a BMI higher than 25 with pre-hypertensive systolic and diastolic blood pressures, no significant relationship was found ( $P = 0.43$ ) ( $P = 0.35$ ), respectively. Nonetheless, the study suggests that a significant relationship exists between BMI over 25 with systolic ( $\rho = 0.33$ ,  $P = 0.05$ ) and diastolic hypertension ( $\rho = 0.20$ ,  $P = 0.04$ ) in the participants.

### 3.2. Lifestyle

In this study, lifestyle included measures of alcohol consumption, physical activity, and obtaining take-out meals. Those students who report alcohol consumption increased yearly over the three years ( $P < 0.001$ ). The 77% (range 68–89%) of the student body consumed alcoholic beverages. The frequency of alcohol consumption does not change over time ( $P = 0.88$ ). Most students drink less than two alcoholic beverages per week. Smoking was not a common habit, but a significantly increased use of tobacco products was revealed ( $P = <0.001$ ). Self-reported physical activity increased significantly over the years

( $P < 0.00$ ). However, during the first two years, there was a change in the frequency of performing physical activities, but there was no difference over the three years' time ( $P = 0.20$ ). Night sleep duration of fewer than 7 h did not reveal substantial change over the three years. The frequency of eating meals outside their residence was less than four times per week and had no significant difference over the three years. Only for the second year was there a significant decrease in purchasing take-out.

### 3.3. Eating habits

Eating habits in this study encompass reported behavior in the frequency of meals, food purchasing behavior, and cooking methods. The pattern of eating habits was compared for each fall and spring semester over the three years and is available in Table 3. Results revealed a significant difference in the frequency of meal regularity intake and skipping breakfast ( $P < 0.001$ ). It also demonstrated a reduction in snacking between meals ( $P = 0.004$ ). Regarding the student's self-perception of a balanced diet, it was reported not have a balanced diet ( $P = 0.019$ ). When considering the calories consumed during mealtime and eating outside their homes, participants reported that they do not give those aspects importance when having a meal ( $P < 0.001$ ). The students had no significant changes in purchasing low-fat products ( $P = 0.06$ ).

Regarding their limiting in consuming high-fat products, there was an increase the purchase of this category of meals ( $P = 0.01$ ). There was also a decrease in the frequency of reading the food labels at the grocery store over the three years ( $P < 0.001$ ). The group showed no change in consuming products with high sugar content ( $P = 0.21$ ). Regarding the behavior toward cooking techniques, they

Table 3. Dietary habits over the three years.

Dietary Habits	Year 1 Mean difference $\pm$ SD	Year 2 Mean difference $\pm$ SD	Year 3 Mean difference $\pm$ SD
Having 3 meals day	- 0.20 (0.16)	- 0.40 (0.37)	- 0.40 (0.21)
Regular breakfast	0.10 (0.25)	- 0.25 (0.21)	0.41 (0.17) <sup>a</sup>
Regular snacking	0.90 (0.13)	- 0.12 (0.16)	0.24 (0.27)
Balanced diet	0.10 (0.12)	0.96 (0.14) <sup>a</sup>	0.74 (0.18) <sup>a</sup>
Calories count in mealtime	- 0.06 (0.15)	- 0.70 (0.20)	- 0.53 (0.24) <sup>a</sup>
Calories count take-out meals	- 0.30 (0.15)	- 0.90 (0.20)	- 0.33 (0.23)
Purchasing low fat dairy products	0.04 (0.17)	- 0.20 (0.20)	- 0.10 (0.27)
Having food high fat content	- 0.07 (0.15)	- 0.10 (0.17)	- 0.12 (0.22)
Having food high sugar content	0.23 (0.13)	0.10 (0.16)	- 0.15 (0.19)
Read nutrition labels	0.12 (0.18)	- 0.17 (0.22)	- 0.38 (0.26)
Healthy cooking methods (steam, grill)	0.12 (0.15)	- 0.13 (0.18)	- 0.11 (0.24)
Intemperate eating	0.60 (0.13)	0.15 (0.14)	- 0.12 (0.18)
Salt added at the table	0.31 (0.15) <sup>a</sup>	0.29 (0.18)	0.20 (0.24)

<sup>a</sup> P significant level at  $\leq 0.05$ .



reported increased adherence to preparing steamed and grilled food ( $P < 0.001$ ). Intemperate eating behavior ( $P = 0.03$ ) and the tendency to season their meals with salt at the table ( $P = <0.001$ ) decreased across the years.

### 3.4. Emotional well-being

The emotional well-being in the study explored the students' self-reported depression symptoms, anxiety, and perceived stress. The Beck's Depression Inventory results revealed increased depression symptoms over the three years ( $P < 0.001$ ); however, the symptoms were minimal. The Generalized Anxiety Disorder scale showed mild anxiety disorder ( $P < 0.001$ ). The Perceived Stress Scale results did not differ over the three years ( $P = 0.49$ ), falling under the category of great concern.

## 4. Discussion

This study aims to provide an overview of optometry students' health status, lifestyle, eating behaviors, and emotional well-being. These results contribute to an understanding of the needs for the transition from college to graduate school. Students from the entering class of 2015 and 2016 were invited to participate in the study. It is essential to address that the student body composition is diverse, with Asian/Pacific islanders having the highest representation, followed by Hispanics/Latinos. An average of 87% (range 85–90%) of the students relocated from the United States and Canada to study in Puerto Rico. This relocation brings some opportunities and challenges into the new transition period in the new graduate program's beliefs, health, social and educational aspects that must be further considered [16].

### 4.1. Health status

This study revealed a mean increase in weight over the three years of  $3.3 \pm 3.5$  (range 0.36–6.53) pounds. Obesity ( $\text{BMI} > 25 \text{ kg/m}^2$ ) was frequently found each year at the end of the spring semester. This increase in weight can be attributed to altered eating behavior, such as the frequency of meals and fat consumption. Students have many academic demands, which may be a determinant factor in preparing healthy meals in a timely manner. These findings are similar to other studies that show that students experience an increase in weight during the end of their college years [11,34]. The distribution of blood pressure measurements was within the expected values in most students. Nonetheless, pre-

hypertension by systolic pressure was detected in 22.1–31.9% and diastolic pressure in 18.6–28.6% of the participants. Interestingly, the frequency of pre-hypertension was not related to the high BMI of the participants. However, a relationship between BMI and hypertension in students was found; these results obtained from both indicators have been associated before, and our results are similar compared to other studies [16,18]. Being overweight and weight gain are associated with hypertension. The mechanisms leading to hypertension in obese people are not completely known; eating behavior, insulin resistance, and metabolic abnormalities have been associated. The causes of hypertension that other researchers have observed are sleep deprivation, diet pattern, and stress. Repeated blood pressure elevations and catecholamines during stress over the years can cause sustained high blood pressure, which is important to be considered and to be studied in health care students [35,36].

It was found that omitting a meal, not having breakfast or snacks between meals, and eating high-fat products were the most common altered eating behaviors. Not having the three

recommended meals suggested for a healthy lifestyle could reduce energy, increase calorie intake at lunch and dinner, and cause weight gain over time [34]. The most common factors for not having a meal in students are suggested to be related to time constraints, living in a dormitory, expenses, sleeping problems, and depressive symptoms [37,38]. Although the behavior reported having an altered eating pattern, there was a change in mindset on considering the type of food and a change in cooking methods over the years in the studied group.

### 4.2. Lifestyle

Alcohol is the most used substance among the students, increasing their consumption toward the end of the spring semester. The frequency of alcohol intake in the studied group was less than three weeks per week. Alcohol use has been found to influence eating habits in college students considerably [39,40]. Have been reported previously that students who drink alcohol have high late-night eating or “drunk munchies”, leading to large consumption of high-fat foods that lead to BMI changes [41,42]. It has been proposed in a previous study that professional students consume alcohol for distraction to improve socialization and relaxation [40]. Regarding smoking habits, it was uncommon among the student body. Just a handful of the participants are active smokers. Nonetheless, there's a tendency found for a higher smoking frequency at

the end of the spring semester; these findings are similar to a previous study performed in multiple colleges where a tendency to increase smoking behavior in college [43].

Physical activity is a critical factor in maintaining good health and general well-being. More than 65% of the participants are engaged in any physical activity with an increment toward the end of the academic year. The majority exercised at least three times per week, which brings health benefits. According to the physical guidelines for adult Americans, performing any physical activity at least twice weekly is recommended to maintain muscle strength and mental health [44]. It has been reported that students from healthcare professions do not perform adequate physical activity due to class schedules, tiredness, and lack of motivation [45].

This study revealed that most students have a sleeping pattern of fewer than 7 h per day; similar findings were found in a previous study on optometry students [13]. Most students reported sleeping an average of 4–6 h daily. It has been reported that irregular sleep patterns could be a risk factor for obesity by encouraging overeating [35]. The lack of sleep also has been associated with increased anxiety and stress, affecting the student's academic performance [46]. It has been suggested that students who have regular sleep achieve better academic performance when compared with those who have reduced sleeping patterns [47]. Sleep patterns are also associated with high alcohol use, smartphone addiction, studying, and watching television in bed [48]. It has been proposed that students must establish a sleep schedule, exercises regularly, understand their study habits, and promote well-being to improve sleep [46–48].

Many students opt for take-outs in restaurants and cafeterias because of the convenience of cost, taste, choices, and fast service. Many universities provide a meal plan to the students, but in our case, the students rely on cooking their meals or ordering take-out meals because an onsite meal plan is unavailable. This study observed a high frequency of eating out, revealing that the participants eat out at least twice a week and that behavior changed at the end of the academic year when take-out meal consumption increased to 3–4 times a week. These findings could be related to many factors, such as lack of cooking skills, time constraints, accessibility to healthy food stores, and economic resources [49–51].

#### 4.3. Emotional well-being

Studies have revealed the pressure of the academic demand on healthcare professionals and the

impact on students' physical and psychological well-being [52–54]. A career in a healthcare profession is associated with complex mastering materials, long study hours, burnout, and reduced time for self-care. All these elements could negatively impact the student's psychological well-being, increasing depression, anxiety, and stress, affecting overall mental health [54].

Our results revealed that depression increased over the years in the students and was more prominent at the end of the academic year. The Becks II has been used widely as an indicator of depression severity. Although the scores were in the minimum depression symptom classification, demonstrating normal ups and downs, monitoring closely for any symptoms is essential. Anxiety symptoms scores revealed a probable disorder as defined in the instrument. Anxiety increased toward the end of the first and second academic years. Interestingly, the scores were lower at the end of the third year, which could be related to the reduced academic program workload and their preparation for the fourth-year clinical externship rotations. It has been established that depression and anxiety can influence their academic performance, demonstrated by low concentration and motivation [54]. Stress is the physiological or psychological response to internal or external stressors.<sup>57</sup> Stress scale results revealed that the students experienced more symptoms during the first year of their education. This increase in symptoms could be related to the changes experienced during the first year of graduate school, such as leaving their home, family, and friends, adapting to an unfamiliar environment, and the new academic demands. Nonetheless, the stress level does not change significantly over the three years. Besides the adaptation process, all students experience stressors differently, and their resilience as individuals is based on their cultural context, gender, age, and values during their academic years. Lack of sleep, inadequate eating habits, and increased alcohol consumption add to their tension and worries, summed to their initial stress, which can be developed later into depression.<sup>58–59</sup>

The strength of this study was that many aspects of the student's lifestyle, health status, and well-being were assessed at different times throughout the three years. The results will provide a general insight into the well-being of students in a graduate program. This study also has some limitations; first, the potential bias was underreporting their actual experiences in the self-administered questionnaires. Second, this study provided information for three of the four years of graduate education. Because the students are on off-campus externship rotations



during their fourth year, future research should also be performed to consider their status.

## 5. Conclusion

In this study, optometry students' lifestyles were impacted, showing increased body weight, alcohol consumption, and utilization of fast-food products. Also, alterations in their eating habits, such as reduced daily meal intake, omitting breakfast and snacks and consuming high-fat products. The practice of physical activity and sleep patterns was also altered during the studied years. A higher frequency of depression, anxiety, and stress was observed across the six years of the study. These results reveal the transition from college to graduate studies could impact many aspects of student life. Although not a direct objective of this study, educating programs regarding good nutrition habits and monitoring the student's nutrition, lifestyle, and well-being may benefit the overall students' health. In summary, graduate students experienced many challenges with their health, lifestyle, eating habits, and general well-being across their three years of education. Our study results provide baseline information that can be used to develop future intervention programs to improve their overall health during graduate school.

## Ethical approval

This research was approved by the Inter American University of Puerto Rico Institutional Review Board (August 2015 IRB #14-15-135-1, 2016 IRB #14-15-135-2, 2017 IRB #1015207–1, 2018 IRB #1015207–2, 2019 IRB #1015207–3, 2020 IRB #1015207–4).

## Funding

None.

## Other disclosures

None.

## Conflict of interest

The authors declare no conflict of interests

## References

- [1] Hussey T, Smith P. Transitions in higher education. *Innovat Educ Teach Int* 2010;47(2):155–64.
- [2] Bryant A, Cook A, Egan H, Wood J, Mantzios M. Help-seeking behaviors for mental health in Higher Education. *J Furth High Educ* 2021;46(4):522–34.
- [3] Thurber CA, Walton EA. Homesickness, and adjustment in university students. *J Am Coll Health* 2012;60(5):415–9.
- [4] Mazurek Melnyk B, Slevin C, Militello L, Hoying J, Teall A, McGovern C. Physical health, lifestyle beliefs and behaviors, and mental health of entering graduate health professional students: evidence to support screening and early intervention. *J Am Assoc Nurse Pract* 2016 Apr;28(4):204–11.
- [5] Hoying J, Melnyk BM, Hutson E, Tan A. Prevalence and correlates of depression, anxiety, stress, healthy beliefs, and lifestyle behaviors in first-year graduate health sciences students. *Worldviews Evidence-Based Nurs* 2020 Feb;17(1): 49–59.
- [6] Deforche B, Van Dyck D, Deliens T, De Bourdeaudhuij I. Changes in weight, physical activity, sedentary behaviour, and dietary intake during the transition to higher education: a prospective study. *Int J Behav Nutr Phys Act* 2015 Feb 15; 12:16.
- [7] Anderson DA, Shapiro JR, Lundgren JD. The freshman year of college as a critical period for weight gain: an initial evaluation. *Eat Behav* 2003 Nov;4(4):363–7. [https://doi.org/10.1016/S1471-0153\(03\)00030-8](https://doi.org/10.1016/S1471-0153(03)00030-8). PMID: 15000962.
- [8] Pelletier JE, Lytle LA, Laska MN. Stress, health risk behaviors, and weight status among community college students. *Health Educ Behav* 2016 Apr;43(2):139–44. <https://doi.org/10.1177/1090198115598983>. Epub 2015 Aug 13. PMID: 26272784; PMCID: PMC4752929.
- [9] Bárbara R, Ferreira-Pêgo C. Changes in eating habits among displaced and non-displaced university students. *Int J Environ Res Publ Health* 2020 Jul 25;17(15):5369.
- [10] Chourdakis M, Tzellos T, Papazisis G, Toulis K, Kouvelas D. Eating habits, health attitudes and obesity indices among medical students in northern Greece. *Appetite* 2010 Dec; 55(3):722–5.
- [11] Bede F, Cumber SN, Nkfusai CN, Venyuy MA, Ijang YP, Wepngong EN, et al. Dietary habits and nutritional status of medical school students: the case of three state universities in Cameroon. *Pan Afr Med J* 2020 Jan 23;35:15.
- [12] Azad MC, Fraser K, Rumana N, Abdullah AF, Shahana N, Hanly PJ, et al. Sleep disturbances among medical students: a global perspective. *J Clin Sleep Med* 2015 Jan 15;11(1): 69–74. <https://doi.org/10.5664/jcsm.4370>. PMID: 25515274; PMCID: PMC4265662.
- [13] Valdez M, Rios D, Rocha A, Rodriguez K. Sleep irregularity and academic performance. *J Opto Ed. Winter-Spring* 2021; 46(2):8–12.
- [14] CDC - how much sleep do I need? - sleep and sleep disorders [Internet]. Centers for Disease Control and Prevention. Centers for Disease Control and Prevention; 2017 [cited 2022Aug22]. Available from: [http://www.cdc.gov/sleep/about\\_sleep/how\\_much\\_sleep.html](http://www.cdc.gov/sleep/about_sleep/how_much_sleep.html).
- [15] Perotta B, Arantes-Costa FM, Enns SC, Figueiro-Filho EA, Paro H, Santos IS, et al. Sleepiness, sleep deprivation, quality of life, mental symptoms, and perception of academic environment in medical students. *BMC Med Educ* 2021;21(1).
- [16] Tayem YI, Yaseen NA, Khader WT, Abu Rajab LO, Ramahi AB, Saleh MH. Prevalence and risk factors of obesity and hypertension among students at a central university in the West Bank. *Libyan J Med* 2012;7.
- [17] Arias-de la Torre J, Fernández-Villa T, Molina AJ, Amezcua-Prieto C, Mateos R, Cancela JM, et al. Psychological distress, family support and employment status in first-year university students in Spain. *Int J Environ Res Publ Health* 2019 Apr 4;16(7):1209.
- [18] Uchiyama A, Shimizu T, Nakagawa T, Tanaka T. Association of hypertension with changes in the body mass index of university students. *Environ Health Prev Med* 2008 Sep;13(5): 271–80.
- [19] Zarrazquin I, Torres J, Ruiz F, Irazusta J, Kortajarena M, Hollos I, et al. Longitudinal study: lifestyle and cardiovascular health in health science students. *Nutr Hosp* 2014 Nov; 30(5):1144–51.
- [20] Lanza HI, Orozco M, Motlagh G. Differential associations between weight status (obesity, overweight, and underweight) and substance use in young adulthood. *Substance Use & Misuse*; 2022. p. 1–10.

- [21] Chobanian AV. Guidelines for the management of hypertension. *Med Clin* 2017;101(1):219–27.
- [22] Center for Disease and Control Prevention. Healthy weight, nutrition, and physical activity. Adult BMI Calculator [Internet]. Atlanta (GA): [cited 2022 Feb 4], Available from: [https://www.cdc.gov/healthyweight/assessing/bmi/adult\\_bmi/english\\_bmi\\_calculator/bmi\\_calculator.html](https://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/english_bmi_calculator/bmi_calculator.html).
- [23] Doo M, Wang C. Associations among sleep quality, changes in eating habits, and overweight or obesity after studying abroad among international students in South Korea. *Nutrients* 2020 Jul 7;12(7):2020.
- [24] Depression [Internet]. World Health Organization. World health organization. 2021 [cited 2022Aug8]. Available from: <https://www.who.int/news-room/fact-sheets/detail/depression>.
- [25] Sahle BW, Breslin M, Sanderson K, Patton G, Dwyer T, Venn A, et al. Association between depression, anxiety, and weight change in young adults. *BMC Psychiatr* 2019 Dec 16; 19(1):398.
- [26] Tran D-MT, Zimmerman LM, Kupzyk KA, Shurmur SW, Pullen CH, Yates BC. Cardiovascular risk factors among college students: knowledge, perception, and risk assessment. *J Am Coll Health* 2016;65(3):158–67.
- [27] Weir CB, Jan A. BMI classification percentile and cut off points. In: StatPearls [internet]. Treasure island (FL): StatPearls publishing; 2022 Jan [Updated 2021 Jun 29; cited 2022 Feb 4] Available from: <https://www.ncbi.nlm.nih.gov/books/NBK541070/>.
- [28] Unger T, Borghi C, Charchar F, Khan NA, Poulter NR, Prabhakaran D, et al. 2020 International society of hypertension global hypertension practice guidelines. *Hypertension* 2020 Jun;75(6):1334–57.
- [29] Shin N, Hyun W, Lee H, Ro M, Song K. A study on dietary habits, health-related lifestyle, blood cadmium and lead levels of college students. *Nutr Res Pract* 2012 Aug;6(4): 340–8. <https://doi.org/10.4162/nrp.2012.6.4.340>.
- [30] Wang YP, Gorenstein C. Psychometric properties of the Beck depression inventory-II: a comprehensive review. *Br J Psychiatry* 2013 Oct-Dec;35(4):416–31.
- [31] Lowe B, Decker O, Muller S, et al. Validation and standardization of the generalized anxiety disorder screener (GAD-7) in the general population. *Med Care* 2008;46: 266–74.
- [32] Cohen S, Williamson G. Perceived stress in a probability sample of the United States. In: Spacapan S, Oskamp S, editors. *The social psychology of health: claremont symposium on applied social psychology*. Newbury Park, CA: Sage; 1988. p. 31–67.
- [33] Lazarevich I, Irigoyen-Camacho ME, Velázquez-Alva M del C. Obesity, eating behaviour and mental health among university students in Mexico City. *Nutr Hosp* 2013 Nov 1; 28(6):1892–9.
- [34] Zeballos E, Todd JE. The effects of skipping a meal on daily energy intake and diet quality. *Publ Health Nutr* 2020;23(18): 3346–55.
- [35] Sun J, Yi H, Liu Z, Wu Y, Bian J, Wu Y, et al. Factors associated with skipping breakfast among Inner Mongolia medical students in China. *BMC Publ Health* 2013 Jan 17;13:42.
- [36] Pendergast FJ, Livingstone KM, Worsley A, McNaughton SA. Correlates of meal skipping in young adults: a systematic review. *Int J Behav Nutr Phys Activ* 2016 Dec 1;13(1):125.
- [37] Krieger H, Young CM, Anthenien AM, Neighbors C. The epidemiology of binge drinking among college-age individuals in the United States. *Alcohol Res* 2018;39(1):23–30. PMID: 30557145; PMCID: PMC6104967.
- [38] Freire BR, Castro PASV, Petroianu A. Alcohol consumption by medical students. *Rev Assoc Med Bras* 2020 Jul;66(7): 943–7. <https://doi.org/10.1590/1806-9282.66.7.943>. Epub 2020 Aug 24. PMID: 32844920.
- [39] Arria AM, Allen HK, Caldeira KM, Vincent KB, O'Grady KE. Excessive drinking and drug use during college: prospective associations with graduate school plans and attendance. *J Am Coll Health* 2019;68(2):132–8.
- [40] Lloyd-Richardson EE, Lucero ML, Dibelio JR, Jacobson AE, Wing RR. The relationship between alcohol use, eating habits and weight change in college freshmen. *Eat Behav* 2008 Dec;9(4):504–8.
- [41] US Department of Health and Human Services. Physical activity guidelines for Americans. 2nd ed.. [Internet]. Washington, DC: US [cited 2022 March 2]. Available from: [https://health.gov/sites/default/files/2019-09/Physical\\_Activity\\_Guidelines\\_2nd\\_edition.pdf#page=56](https://health.gov/sites/default/files/2019-09/Physical_Activity_Guidelines_2nd_edition.pdf#page=56).
- [42] Blake H, Stanulewicz N, McGill F. Predictors of physical activity and barriers to exercise in nursing and medical students. *J Adv Nurs* 2017 Apr;73(4):917–29.
- [43] Howie EK, Cannady N, Messias EL, McNatt A, Walter CS. Associations between physical activity, sleep, and self-reported health with burnout of medical students, faculty and staff in an academic health center. *Sport Sci Health* 2022 Mar 14:1–9. <https://doi.org/10.1007/s11332-022-00902-7>. Epub ahead of print. PMID: 35308038; PMCID: PMC8918895.
- [44] Brick CA, Seely DL, Palermo TM. Association between sleep hygiene and sleep quality in medical students. *Behav Sleep Med* 2010;8(2):113–21.
- [45] Brubaker JR, Swan A, Beverly EA. A brief intervention to reduce burnout and improve sleep quality in medical students. *BMC Med Educ* 2020 Oct 6;20(1):345.
- [46] Kushner RF, Kessler S, McGaghie WC. Using behavior change plans to improve medical student self-care. *Acad Med* 2011 Jul;86(7):901–6.
- [47] Ball S, Bax A. Self-care in medical education: effectiveness of health-habits interventions for first-year medical students. *Acad Med* 2002 Sep;77(9):911–7.
- [48] Morse KL, Driskell JA. Observed sex differences in fast-food consumption and nutrition self-assessments and beliefs of college students. *Nutr Res* 2009 Mar;29(3):173–9.
- [49] Aghajani Liasi G, Mahdi Nejad S, Sami N, Khakpour S, Ghorbani Yekta B. The prevalence of educational burnout, depression, anxiety, and stress among medical students of the Islamic Azad University in Tehran, Iran. *BMC Med Educ* 2021 Sep 5;21(1):471.
- [50] Mosley Jr TH, Perrin SG, Neral SM, Dubbert PM, Grothues CA, Pinto BM. Stress, coping, and well-being among third-year medical students. *Acad Med* 1994 Sep; 69(9):765–7.
- [51] Quek TT, Tam WW, Tran BX, Zhang M, Zhang Z, Ho CS, et al. The global prevalence of anxiety among medical students: a meta-analysis. *Int J Environ Res Publ Health* 2019 Jul 31;16(15):2735. <https://doi.org/10.3390/ijerph16152735>. PMID: 31370266; PMCID: PMC6696211.
- [52] Bremner JD, Moazzami K, Wittbrodt MT, Nye JA, Lima BB, Gillespie CF, et al. Diet, stress and mental health. *Nutrients* 2020 Aug 13;12(8):2428. <https://doi.org/10.3390/nu12082428>. PMID: 32823562; PMCID: PMC7468813.
- [53] Nechita F, Nechita D, Pirlog MC, Rogoveanu I. Stress in medical students. *Rom J Morphol Embryol* 2014;55(3 Suppl): 1263–6.
- [54] Givens JL, Tjia J. Depressed medical students' use of mental health services and barriers to use. *Acad Med* 2002;77(9): 918–21.