Physical Activity and its Associations with Socio-demographic Characteristics, Dietary Patterns, and Perceived Academic Stress in Students Attending College in Puerto Rico

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Objective: The academic environment usually generates stress in students. Increasing physical activity (PA) is one of the stress-coping strategies for students; however, students usually reduce their PA while enrolled in college. Objective: To determine the association between PA, self-perceived academic load and stress, and dietary patterns in students attending college in Puerto Rico.

Methods: A proportional stratified sample of 275 students from UPR-MSC completed a self-administered questionnaire on socioeconomic status, academic load and stress, body composition, dietary patterns, and PA. Chi² was used to assess the association between variables.

Results: Most of the participants were female (68%), were aged 21 to 30 years (88%), and had low annual household incomes ($0-$24,999) (43%). Women reported higher levels of stress (p<0.001) than did men. Overweight and obesity was found in 35.4%, while most students reported a light PA level (46.5%), which was higher among women (p<0.001). During periods of greater stress, most students increased sedentary activities (68%), and ~30% reported a decrease in moderate and vigorous activities; however, 60% reported that PA was an effective coping strategy and 66% would use it again. There was a negative association between PA and stress: those with higher levels of stress had lower PA levels (p = 0.06). No significant associations were found between PA and the others variables studied (p>0.05).

Conclusion: Most students reported sedentary lifestyles during periods of greater stress. High level of stress were positively associated with a light PA level. [*P R Health Sci J 2013;1:44-50*]

Key words: Physical activity, Academic stress, Dietary pattern, College students

Academic stress affects the health of the collegiate population and determines long-term psychological, physiological, and behavioral responses (1). Stressful situations lead to a decreased ability to concentrate, a loss of attention and focus, and increased anxiety and tension. College students with high stress levels are more likely than those without such levels of stress to drop out of school, perform poorly in classes, and have greater emotional problems, among other consequences (2). Coping with stress using positive strategies is a health-protective factor (3). Coping strategies can reduce tensions generated by stress (1). Physical activity (PA) is a one such strategy that college students use (1). It helps in the management of emotions, the planning of appropriate responses, the execution of tasks, and the maintenance of appropriate behavior.

College students are at high cognitive, social, physiological, and personal risk for the outcomes mentioned above when their levels of PA intensity decrease (4). Studies in the US and Canada show that college students do not exercise regularly (5). Data from the 2003-2004 National Health and Nutrition Examination Survey (NHANES) showed a dramatic decline in PA between childhood and adolescence, which decline continues with age (6). It also showed that adherence to the recommendation to get 150 minutes per week of PA is less than 5% among adults; according to the CDC guidelines, adults

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(18-64 y) should engage in a minimum of 150 minutes/week of aerobic and muscle-strengthening activities, with the muscle-strengthening activity being performed 2 or more days per week (7). Data from NHANES (2009-2010) found that only 47% of adults met these guidelines in terms of aerobic activity, 22% met the guidelines in terms of muscle-strengthening activity, and 19% adhered completely to the guidelines (8). Another survey, this one in 2010, showed that 33% of adults were inactive, 20% were insufficiently active, and only 47% were sufficiently active (9). In Puerto Rico, the Behavioral Risk Factor Surveillance System (BFRSS) reported in 2009 that 72% of adults engaged in moderate PA for fewer than 30 minutes per week, and 86% did not engage in vigorous PA for 20 minutes three or more days per week (10). Finally, 58% of Puerto Ricans aged from 18 to 24 years did not engage in moderate PA, and 73% did not engage in vigorous PA (10).

PA protects against several chronic diseases, such as cardiovascular disease, as it increases blood flow and oxygenation, which may reduce blood pressure (11-13). It also benefits the central nervous system and overall mood (11, 14), reduces the risk of distress and social impairment (15), and benefits the quality of sleep and cognitive function (16).

Studies have shown the need to implement preventive intervention strategies, such as PA, to reduce the vulnerability of risk-taking behavior among college students (17,18). However, little is known about the use of PA as a coping strategy. Therefore, we conducted a study to determine the associations between the level of PA, self-perceived academic stress and load, and dietary patterns among college students enrolled at the University of Puerto Rico (UPR-MSC) in San Juan, PR.

Methods

Population and sample

This study was a descriptive epidemiological study. A representative stratified sample of students completing the first or second year at UPR-MSC was used. To determine the sample size, we used the enrollment list of each school (School of Nursing, of Pharmacy, of Medicine, of Dental Medicine, of Health Professions, and of Public Health) for the 2010-2011 academic year (6). The stratified procedure was performed by dividing the total population of each school by the overall population of students eligible to participate, thereby obtaining the proportion for each of the 6 schools. This proportion was then multiplied by the population of each school, yielding the sample size of each school and resulting in a total sample of 252 students.

The inclusion criteria called for students to have completed their first or second year in the 2010-2011 academic years. Students in special enrollment programs, those enrolled in joint programs, and those who were pregnant were excluded from participating in the study.

Questionnaire

A questionnaire was specifically developed for this study and validated by experts. The participants were instructed to complete the questionnaire, retrospectively, based on their experience during the academic period covering January to May 2011. It took about 30 minutes for the participants to complete the questionnaire; the data were collected in August of 2011. The questionnaire consisted of the following six (6) sections:

I. *Demographic data*: This section asked the participant to list the specific school in which he/she was enrolled, his/her age in years, his/her gender, and the annual household income (low [$0-$24,999], moderate [$25,000-$74,999], or high [$75,000-≥$100,000]) in his/her home.

II. *Perception of academic load*: This section asked each student to estimate his/her academic load, with the possible response being low, moderate, or high.

III. *Perception of academic stress*: This section included a validated perceived-stress scale adapted from the Systemic Cognitive Model of Academic stress (19); in this section, each student reported how frequently he or she experienced certain physiological, psychological, and/or compartmental responses to academic stress. Each response was scored from 1 to 5; the total score was obtained by combining the scores from all of the statements. Students who scored 67 points or fewer were determined to have low-level stress; students who scored from 68 to 81 points were determined to have moderate stress; and students who scored 82 points or more were determined to have high-level stress.

IV. *Body composition*: This section included self-reported height and weight. Body mass index (BMI) was calculated using the following formula: weight (kg)/[height (m)]2. Students with a BMI below 25 were classified as normal weight; students with BMI equal to or greater than 25 were classified as overweight/obese (20).

V. *Dietary patterns*: Dietary patterns were assessed using an expert-validated semi-quantitative food-frequency questionnaire. This questionnaire asked each student to estimate the following: the frequency of consumption of meals during a typical day; the frequency and size of a serving of grains and starchy vegetables, of fruit, of dairy, of meat (and/or meat substitutes), of oil, and of water; and the frequency of consumption of snacks, soft drinks, and nutritional drinks. The quality of the diet of each subject was determined with a modified Diet Quality Index (based on the 2010 USDA Food Pattern 2010) by calculating total energy expenditure according to gender, age, PA, and body composition. The three elements used to determine diet quality were variety, adequacy, and moderation. Based on the total score of each student, dietary patterns were classified into the following two categories: adequate or inadequate.

VI. *Stress-coping strategies*: These strategies were measured with questions that inquired into the use of prescription drugs and alcohol, the consumption of caffeinated beverages, PA, smoking practices, and sources of social support. The present analysis focused on PA as the primary stress-coping strategy.

A copy of the questionnaire is available from the senior author upon request.

Physical activity

The questionnaire listed a number of activities categorized according to intensity (vigorous, moderate, light, and sedentary type activities), frequency, and duration, as well as the degree to which these characteristics vary with the level of stress being experienced (decreases, increases, or remains the same). We used a modified version of the International Physical Activity Questionnaire (IPAQ), which has been used in studies of prevalence in national populations to obtain internationally comparable information on PA as it relates to health (21).

The level of PA was estimated from the frequencies and durations reported by participants for each type of activity. The frequency was multiplied by the duration (in minutes) to obtain total daily minutes performed for each type of PA. A score was assigned to the total minutes engaged in each type of activity. For vigorous activities, the scores were 15 points for >30 min/day; 12 points for 20 to 29 min/day; 11 points for 10 to 19 min/day; and 10 points for 1 to 9 min/day. For moderate activities, the scores were 10 points for >30 min/day; 5 points for 20 to 29 min/day; 2.5 points for 10 to 19 min/day; and 1 point for 1 to 9 min/day. Light and sedentary-type activities were combined; the scores were 5 points for >30 min/day; 2.5 points for 20 to 29 min/day; 1 point for 10 to 19 min/day; and 0.5 point for 1 to 9 min/day. The points obtained for each type of PA were combined for a total PA score. A total score of ≥20 points was considered to be vigorous level of PA, 10 to 19 points was considered moderate, and ≤9 points was considered light.

Data collection

Subjects were recruited through flyers posted at various strategic locations on campus and through direct contact. Potential participants received an informative letter explaining the study. Those who agreed to participate completed the questionnaire. The study was approved by the IRB of the UPR-MSC.

Statistical analysis

Descriptive statistics (mean and standard deviation) were used for continuous variables and percentages and frequency distributions for categorical variables. The association between variables was assessed using Chi^2 (Fisher test) for categorical variables and Pearson correlations coefficient for continuous variables. Academic stress was analyzed using the 3 levels derived from the established cut-off points and also by tertiles. Significance was set at $p<0.05$. The analyses were performed with the Statistical Package for the Social Sciences (SPSS), version 15.0.

Results

The total sample consisted of 275 students, 10% higher than estimated. Table 1 shows the socio-demographic profile of the sample. The participants' ages ranged from 21 to 53 years, with most being students aged from 21 to 30 years (88%). There was a higher participation of women than there was of men (67.6% vs. 32.4%). Most students (42.7%) had low annual household incomes ($0-$24,999). In addition, 63.9% of the participants were classified as being of normal weight, while 36.1% were classified as overweight/obese (25.9% were overweight and 10.2% were obese). There was a greater proportion of obesity in female students (67.9%) than there was in male students (32.1%).

Table 1. Socio-demographic characteristics of the sample

Socio-demographic characteristics		N	(%)
Gender	Male	89	32.4
	Female	186	67.6
Age	21 to 30 years	242	88.0
	31 y or more	33	12.0
Household income	Low	117	42..7
	Moderate	101	36.8
	High	56	20.5
Total		**275**	**100%**

In relation to perceived academic load, 68.4% of students reported having a heavy load, while 28.8% reported having a moderate load, and 2.8% a light load. Academic stress was perceived as being moderate by 36.7% of the respondents and low or high by 31.6%. Academic load was significantly correlated with stress ($R = 0.25$; $p<0.001$).

In general, most students had a light (46.5%) or moderate PA level (43.6%), with a lower proportion classified as being at the vigorous level (9.8%) (Table 2). More women were classified at the light PA level compared to men, while more men were classified at the moderate and vigorous PA levels ($p<0.001$). There was also a high proportion of subjects in the low-income level whose PA was classified as light while a high proportion of subjects in the highest income level had moderate PA levels, although these differences were not statistically significant ($p>0.05$). No significant associations were found between PA level and age ($p>0.05$).

Table 3 shows the association between PA and self-perceived academic load and level of stress. Light and moderate levels of academic load were grouped into one category to increase power (because of the low number of participants in the "light" category). There was no significant association between PA and

academic load (p>0.05). The analysis was also done without regrouping, and no significant associations were found, either. When we analyzed the levels of perceived stress using the cutoff points, there was no significant association between PA and stress (p>0.05; data not shown). However, when the levels of stress were analyzed using tertiles, those in the highest tertile of stress had lower levels of PA than did those in the lowest tertile (p=0.06).

We also found that 62.1% had inadequate dietary patterns. Table 4 shows the association between PA and dietary patterns and BMI classification in the sample. The "overweight" and "obese" categories were grouped to increase power. No significant associations were observed between PA and dietary patterns or between PA and BMI classification (p>0.05). Similar results were found without regrouping BMI categories (data not shown). Importantly, the majority of students that had inadequate dietary patterns (68.9%) also had light levels of PA. Most participants reported that the main reason for performing PA was that it was part of their routine (34%), while only 14% reported using PA to cope with stress. A small proportion reported using PA for weight control (12%) and other reasons (10%). Although we found that those with greater stress had a significantly lower level of PA, most students considered that PA is an effective stress-coping strategy (62%), and most would reuse it in the future (66%).

When we asked participants whether the level of each type of activity decreased, increased, or did not change in times of great stress, a high proportion of students responded that sedentary types of activity increased during these moments (68%; figure 1). Although most students reported that light and moderate PA remained unchanged, there was a decrease in these types of activities in 31% and 37% of the sample, respectively. Most reported that vigorous activities remained unchanged (63%). It should be noted that very few students reported an increase in moderate and vigorous activities during moments of great stress.

Table 2. Physical activity level by socio-demographic characteristic

Variable	Physical activity level				
	Light N (%)	Moderate N (%)	Vigorous N (%)	Total N (%)	Chi² p-value
Gender					
Male	23 (18.0%)	51 (42.5%)	15 (55.6%)	89 (32.4%)	<0.001
Female	105 (82.0%)	69 (57.5%)	12 (44.4%)	186 (67.6%)	
Age (years)					
21 to 30	112 (40.7%)	106 (38.5%)	24 (8.7%)	242 (88.0%)	0.95
31 or more	16 (5.8%)	14 (5.1%)	3 (1.1%)	33 (12.0%)	
Annual household income					
Low [$0-$24,999]	59 (21.5%)	45 (16.4%)	12 (4.4%)	116 (42.3%)	0.81
Moderate [$25,000-$74,999]	40 (14.6%)	39 (14.2%)	10 (3.6%)	89 (32.5%)	
High [$75,000-≥$100,000]	28 (10.2%)	36 (13.1%)	5 (1.8%)	69 (25.2%)	
Total	**128 (46.5%)**	**120 (43.6%)**	**27 (9.8%)**	**275 (100%)**	

Table 3. Associations between physical activity level and perceived academic load and stress

Physical activity level		Academic load			Perceived stress			
		Light to moderate	Heavy	Chi² p-value	Low	Moderate	High	Chi² p-value
Light	N	36	92		36	40	52	
	%	28.1	71.9		28.1	31.3	40.6	
Moderate	N	41	79	0.485	47	42	31	0.060
	%	34.2	65.8		39.2	35.0	25.8	
Vigorous	N	10	17		12	5	10	
	%	37.0	63.0		44.4	18.5	37.0	
Total	**N**	**87**	**188**		**95**	**87**	**93**	
	%	**31.6**	**68.4**		**34.5**	**31.6**	**33.8**	

Table 4. Associations between PA level and dietary patterns and body weight classification

Physical activity level		Dietary patterns*			Body weight classification		
		Adequate	Inadequate	Chi² p-value	Normal	Overweight/obese	Chi² p-value
Light	N	38	84	0.1	80	45	0.74
	%	31.1	68.9		29.5	16.6	
Moderate	N	49	66		79	40	
	%	42.6	57.4		29.2	14.8	
Vigorous	N	13	14		16	11	
	%	48.1	51.9		5.9	4.1	
Total	**N**	**100**	**164**		**175.0**	**96.0**	
	%	**37.9**	**62.1**		**64.6**	**35.4**	

*9 subjects did not provide enough information for dietary patterns to be calculated, and 4 subjects did not provide enough information for BMI to be calculated; therefore, the data from these individuals were not included in the analysis.

Discussion

The present study shows that college students evaluated had low levels of PA and, simultaneously, moderate levels of stress. Those with greater levels of stress had lower levels of PA. In addition, PA was used as a coping strategy by only 14% of the sample, although most reported that they considered it to be effective as such. No association was found between PA and dietary patterns.

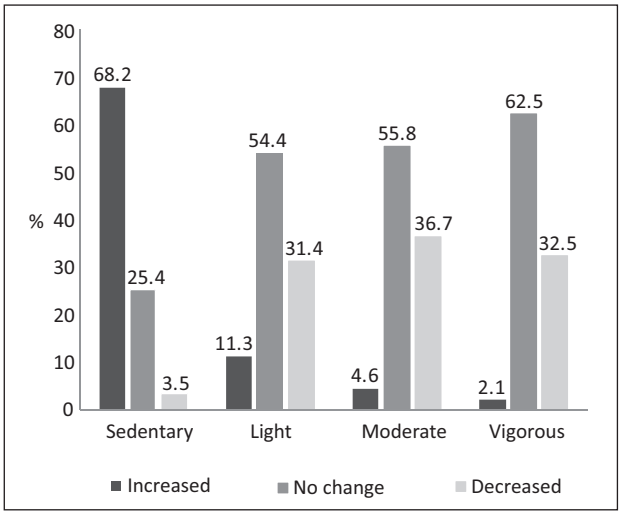

Figure 1. Students' perceptions in the change of the different type of activities performed in moments of greater stress during the semester.

The present study showed that most students had light PA levels, particularly in women. A study in Venezuelan college students also found lower levels of PA among women (23). The most notable decline in PA occurs in the initial period of young adulthood (11, 24). A small study of 37 students from the School of Health Professions at UPR-MSC, using pedometers to document number of steps per day, also reported low PA level in the sample (25). About 19% were sedentary, 41% had low activity levels, 30% were somewhat active, and 5% were highly active. Although we used a different methodology, the present study also showed that most students had light activity levels. There has been very few studies investigating the levels of PA in students of allied health professions. In a study of university students in Spain, those working toward health-related degrees (n = 288) had high levels of sedentary behavior (total, 42%: women, 52%; men, 33%), contrasting with what they considered to be sufficient PA (total, 36%: women, 48%; men, 23%) (26). Another study, this one of 887 first-year pharmacy, medicine, and dentistry students (also in Spain), found that 50% of men and 72% of women referred to themselves as being non-active or as having low physical activity levels (27). Studies in different populations have also observed a high prevalence of light activity in young adults. A study of 314 college-aged students (17 to 29 years of age) in Venezuela showed that 18% of the males and 35% of the females were insufficiently active (23). In 307 college students in Mexico, a study from Ayala et al. found that PA levels were also lower in female students than they were in male students and that ststudents at medium-high socio-economic levels ($p < 0.05$) were more active than were those in the other economic groups (28). In the present analysis, we did not find this to be the case.

We did ascertain, however, that sedentary related activities increased in moments of great stress, while moderate and vigorous PA both decrease. Furthermore, students who reported experiencing great stress also had light PA levels ($p = 0.06$). Although most students considered PA to be an effective strategy for managing academic stress and claimed that they would again use this strategy to deal with stressful situations, only 14% actually reported that their main reason for engaging in PA was to cope with stress. This might be explained by the fact that students require sufficient time for adaptation and integration into a new university system, which has high demands and expectations (29, 30). Stress can be a significant problem for college students who are in the midst of adapting to new schedules, living situations, and roles. These changes in student life tend to lead to greater perceived stress; for this reason we suggest that students engage in PA as means of effective stress management. However, because of a variety of constraining factors and types of stress (not necessarily rooted in academics) they may be experiencing, they often do not do so. Though some investigators have explored the association between stress and PA, to our knowledge, this is the first study of this sort that has been conducted in Puerto Rico. A study of 57 veterinary students attending an Australian university reported that exercising was one of the primary coping strategies that they used to manage stress and feel better (30).

A sedentary lifestyle is considered a risk factor for the development of any number of major chronic conditions. Studies show the benefits of PA in terms of improved socialization, cognitive function, and quality of life, particularly in those suffering from stress (31). A study of 1,125 US college students showed that inactivity, in addition to irregular sleep patterns (which is also common among college students), can lead to cardiovascular and other conditions (32). Furthermore, sleep patterns are determinants of body weight (33). A systematic review of 48 studies showed that prolonged sitting time was related to weight gain from childhood to adulthood as well as to mortality, but inconclusive findings have been observed with cardiometabolic risk factors (34). Therefore, PA programs can increase life satisfaction, mood, and sleep quality by reducing anxiety and/or stress, both of which are barriers to academic achievement and the elimination of which will almost certainly lead to a better quality of life among students (35). Studies show that lack of PA is currently cataloged as one of the major public health problems worldwide (36).

Inadequate nutritional practices and high levels of stress are common features of university life and are strongly linked to weight gain and health problems (5). Although we did not find a significant association between PA and dietary patterns, we found that most students had inadequate dietary patterns (62%), which finding is consistent with those of other studies (37, 38). In 2,051 college students in Spain, those engaging in PA consumed more fruit and adopted healthier lifestyles, while non-active students were more likely to engage in other, unhealthy habits (39). In addition, a Canadian study of 132

college students showed that those with inadequate diets also had reduced PA levels ($p<0.05$) (5). In 693 Hispanic US college students, the ability to cope with stress was associated with obesity-related low-risk behaviors, such as exercising and monitoring food intake (40).

Our study had some limitations. We did not assess changes in PA in moments of great stress. We used a self-administered questionnaire with several sensitive questions. Future studies that use more objective measures (e.g., accelerometers) to describe the PA levels of students are recommended. In addition, we did not include other measures related to stress in the study. One of the strengths of the study was its inclusion of a representative sample of students at UPR-MSC, which allowed information from all segments of the student population to be gathered.

In conclusion, the prevalence of light PA levels in this sample was high, particularly in female students, and having a high academic stress level was significantly associated with engaging in light PA. This study has several implications with respect to the lifestyle of college students. Emphasis should be given to implementing interventions aimed at increasing PA and encouraging healthier diets among students from a multidisciplinary perspective, which would have a positive impact on students' overall health.

Resumen

Objetivo: El entorno académico suele generar estrés en los estudiantes. El aumento en actividad física (AF) es una de las estrategias de afrontamiento para el manejo del estrés, sin embargo, los estudiantes suelen reducir su AF cuando estudian en la universidad. El objetivo de este estudio es determinar la asociación entre AF, carga y estrés académico, composición corporal y hábitos alimentarios en estudiantes universitarios en Puerto Rico. Métodos: Una muestra estratificada proporcional de 275 estudiantes del RCM-UPR completó un cuestionario con información socioeconómica, carga y estrés académica, composición corporal, hábitos alimentarios y AF. Se utilizó Chi^2 para evaluar la asociación entre las variables. Resultados: La mayoría de los participantes fueron mujeres (68%), de 21-30 años (88%) y de bajo ingreso familiar anual ($0-$24,999) (43%). Las mujeres reportaron mayor nivel de estrés ($p<0.001$) que los hombres. El 35.4% presentó sobrepeso/obesidad; la mayoría reportó un nivel de AF ligero (46.5%), particularmente en mujeres ($p<0.001$). En períodos de mayor estrés, las actividades sedentarias aumentaron (68%) y ~30% reportó una disminución en actividades moderadas y vigorosas; aunque el 60% reportó que la AF fue una estrategia de afrontamiento al estrés eficaz y 66% la reutilizarían. Hubo una asociación negativa entre AF y estrés; aquellos con mayor estrés reportaron menor nivel de AF ($p = 0.060$). No se hallaron asociaciones significativas entre AF y las otras variables ($p>0.05$). Conclusión: La mayoría de los estudiantes reportaron un nivel de AF ligero, el cual aumentó en periodos de mayor estrés. Un mayor nivel de estrés se asoció con un nivel de AF ligero.

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