PHYSICAL EXERCISE PRACTICE AND ASSOCIATED FACTORS AMONG UNDERGRADUATE STUDENTS FROM A SOUTHERN REGION OF BRAZIL

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ABSTRACT

Purpose. The aim of the study was to analyse the prevalence and factors associated with not performing physical exercise in undergraduate students. **Methods.** The sample was composed of 2738 undergraduate students of Londrina city, Paraná, Brazil. The dependent variables were: not performing physical exercise of moderate intensity for at least 30 minutes per week; not performing vigorous physical exercise for at least 20 minutes per week; not performing muscular strengthening exercises (8–12 repetitions) in a week. The independent variables were gender, age, skin colour, marital status, housing, study pattern, year of course, paid work, and area of the course. Odds ratio (*OR*) was estimated by multivariate analysis with the use of binary logistic regression. **Results.** The prevalence of undergraduate students not performing physical exercise of moderate intensity, of vigorous intensity, or muscular strengthening exercises was 47.3, 61.0, and 66.2%, respectively. Female sex was associated with a risk of not performing moderate physical exercise (*OR* = 1.23), vigorous physical exercise (*OR* = 1.47), and strengthening exercises (*OR* = 1.22). Undergraduate students of exact sciences (*OR* = 1.40 and 1.52), juridical sciences (*OR* = 1.48 and 1.51), and humanities (*OR* = 1.45 and 1.52) were at risk of not performing physical exercise of moderate or vigorous intensity, respectively. Being a 2nd (*OR* = 0.79), 3rd (*OR* = 0.74), or 4th (*OR* = 0.71) year student was bound with a lower likelihood of not performing physical exercise of moderate intensity. **Conclusions.** Intervention programmes with the aim of promoting physical exercise practice in undergraduate students should consider gender, year, and area of the course.

Key words: young adult, motor activity, life style, health

Introduction

Physical activity is defined as any bodily movement performed with skeletal muscles that results in energy expenditure. Physical exercise consists in performing planned, structured, and repetitive physical activity in order to increase or maintain physical fitness [1]. Thus, along with leisure time, active transport, and formal and domestic work, exercise is one of the components of total physical activity.

It is known that physical inactivity constitutes a major health risk behaviour in different age groups [2]. The amount of physical activity decreases in adolescence as compared with childhood [3], and also at the time of university entrance [4]. In the latter case, a decrease in physical activity could result from a set of new experiences that students are exposed to at this stage of life. For many undergraduate students it is the time they start living without parental supervision; moreover, the environmental, academic, and social demands of a university are different from those of a high school [5]. Despite the autonomy that the student acquires, there is also stress related to new responsibilities [5]. As a con-

sequence, undergraduate students present a high prevalence of cardiovascular risk [6].

Studies conducted in Brazil have demonstrated that physical inactivity is associated with female sex [7, 8], employment [9], studying in the evening class pattern [8–10], being a 1st year student [10–11], longer time spent at the university [10], living with the family [8–10], and the type and area of the course [8, 12, 13]. According to the information available, there is a lack of representative studies of Brazilian undergraduate students with reference to the discussed issue, since many analyse courses, areas, and particular years [7, 9, 10, 13, 14].

Similarly, there is no information about factors associated with physical exercise of moderate and vigorous intensity, as well as strengthening exercises. Studies performed in Brazil so far have focused only on physical activity as an outcome [7–14]. The conceptual differences between the variables prevent narrowing factors associated with physical activity to physical exercise. Furthermore, the effect of vigorous exercise is bigger than that of moderate exercise for some health indicators [15, 16]. For this reason, it is important to investigate factors associated with physical exercise of various intensities.

The results of the study will broaden the knowledge about factors associated with physical exercise, therefore enabling their diagnosis and the development of inter-

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vention programmes to promote physical exercise among university students who present risk characteristics. Thus, the aim of the study was to analyse the prevalence of and factors associated with physical exercise in a representative sample of undergraduate students at a public university in southern Brazil.

Material and methods

The study is part of the research project entitled 'Health risk behaviour in undergraduate students,' implemented in on-site undergraduate courses offered by the Londrina State University, Londrina, Parana, Brazil. Data collection was carried out between March and November 2013.

Sample

The study was approved by the Ethics Committee for Research Involving Human Beings of the Londrina State University (Case No. 73/07 - CAAE - 0107.0.268.000-07) and it abided by the rules of Resolution 196/96 of the National Health Council. All undergraduate students voluntarily participated in the study. The students selected for the sample signed a consent form. The exclusion criteria adopted for the study were: (a) absent on the day scheduled for filling out the questionnaires; (b) being enrolled in a discipline that is not of their course or year on the day of data collection.

The sample size was estimated according to the following parameters: population of 14,096 students enrolled in undergraduate courses at the Londrina State University, 95% confidence interval (*CI*), sampling error of 3%, sample loss of 35%, and the design effect = 2, due to the complex sample used.

Thus, the minimum number of participants estimated was 2832 students. Among the 2832 questionnaires analysed, there was sample loss of 94 questionnaires (3.3%) because of filling errors or incomplete delivery of the questionnaire. The final sample consisted of 2738 undergraduate students. Data collection was stratified according to the centre, course, year, and class pattern in which the student was enrolled.

Procedures

After identifying the courses, locations, and classes, contact was made with the directors of the centres and subsequently with the heads of departments. After acceptance by the directors of the centres, the course boards coordinators and teachers were informed about the aims and procedures to be carried out in the research. The next stage was to list all students, stratified according to the course, year, and study pattern. Data collection had been previously scheduled with the teachers; on the appointed day, researchers visited the class with the list of randomly selected students and administered the questionnaire.

The instrument used was a self-administered questionnaire, managed by 10 researchers previously trained and experienced in the application of the instrument, supervised by the research coordinator. The participants filled in the questionnaire individually and doubts were promptly clarified by the researchers. There was no information in the questionnaire that could identify the participants. During the data collection, the students were allocated in their own room, with only the study participants present. Finally, the questionnaire was stored by each respondent in a ballot box, which was not opened until data tabulation.

Instrument and variables

The instrument used for data collection was the questionnaire of health risk behaviours NCHA II (National College Health Assessment II), developed by the American College Health Association, translated and culturally adapted from the original English language to Brazilian Portuguese [17, 18].

The questionnaire consists of 65 questions, divided according to socio-demographic indicators, as well as the following aspects of risk behaviour: (a) health, health education, and safety; (b) alcohol, tobacco, and other drugs; (c) sexual behaviour and contraception; (d) body weight, nutrition, and physical exercise; (e) mental health; (f) physical health; and (g) difficulties in academic performance.

To meet the aim of the study, we used variables referring to physical exercise practice and socio-demographic variables. The dependent variables were: not performing aerobic exercise of moderate intensity for at least 30 minutes per week, vigorous aerobic exercise for at least 20 minutes per week, and muscular strengthening exercises (8–12 repetitions). The independent variables in the study were: gender, age, skin colour, marital status, housing, paid work, study pattern, study year, and the area to which the course belonged.

The study areas and graduate courses at the university are:

– biological area: agronomy, veterinary medicine, zootechny, biological sciences, biomedicine, psychology, dentistry, medicine, pharmacy, biochemistry, nursing, physiotherapy, and physical education and sports science;

– exact sciences area: computer science, geography, physics, mathematics, chemistry, architecture and urban planning, and civil and electrical engineering;

– human sciences area: archivology, scenic arts, visual arts, library science, communication – journalism, public relations, graphic design, fashion design, pedagogy, music, social sciences, philosophy, history, and foreign, modern, vernacular and classical languages;

– juridical sciences area: accounting, economics, law, management, and executive secretariat and social service.

Statistical analysis

Descriptive statistical analysis was performed by absolute and relative frequency. The bivariate association was assessed with the chi-squared test (χ^2). Variables with $p < 0.20$ in the chi-squared test were employed in the adjusted model. Binary logistic regression was carried out to estimate crude and adjusted odds ratios (*OR*), as well as 95% *CI*. The consistency of the adjusted models was analysed with the use of the Hosmer-Lemeshow test. Variables that presented $p < 0.05$ in the adjusted analysis were considered significant.

Results

The sample characteristics are described in Table 1. Among the 2738 undergraduate students participating in the study, 57.8% were female, 78.7% were between 18 and 23 years of age, 74.3% had white skin colour. Moreover, 90.8% were single, 65.7% lived with their families, and 48.7% reported not having paid work. The frequency of students in each year was similar, being approximately 25%; with respect to the study pattern, 37.9% studied full-time. The distribution of participants according to the course area was the following: 19.4% in

Table 1. Characteristics of the sample

Variable	Female (*n* = 1584) *n* (%)	Male (*n* = 1154) *n* (%)	Total (*n* = 2738) *n* (%)
Age			
18–20 years	765 (48.2)	478 (41.4)	1243 (45.4)
21–23 years	519 (32.8)	395 (34.2)	914 (33.3)
24–26 years	139 (8.8)	150 (13.0)	289 (10.6)
> 26 years	161 (10.2)	131 (11.4)	292 (10.7)
Skin colour			
White	1202 (75.9)	834 (72.3)	2036 (74.3)
Non-white	382 (24.1)	320 (27.7)	702 (25.7)
Marital status			
Single	1433 (90.5)	1054 (91.3)	2487 (90.8)
Married/Living together	117 (7.4)	83 (7.2)	200 (7.3)
Separated/Divorced/Widower	34 (2.3)	17 (1.5)	51 (1.9)
Housing			
Accommodation on Campus	111 (7.0)	84 (7.2)	195 (7.1)
Student republic	228 (14.4)	161 (14.0)	389 (14.2)
With family	1049 (66.2)	750 (65.0)	1799 (65.7)
Alone	196 (12.4)	159 (13.8)	355 (13.0)
Paid work (h/week)			
Do not work	791 (49.9)	544 (47.1)	1335 (48.7)
< 20 hours	387 (24.4)	230 (20.0)	617 (22.5)
20–39 hours	264 (10.2)	203 (17.6)	467 (17.1)
≥ 40 hours	142 (5.5)	177 (15.3)	319 (11.7)
Study year			
1st year	437 (27.6)	321 (27.8)	758 (27.7)
2nd year	396 (25.0)	261 (22.6)	657 (24.0)
3rd year	368 (23.2)	290 (25.2)	658 (24.0)
≥ 4th year	383 (24.2)	282 (24.4)	655 (24.3)
Study pattern			
Diurnal	787 (28.7)	302 (26.2)	485 (30.6)
Evening	883 (32.2)	384 (33.3)	499 (31.5)
Full-time	1068 (39.0)	468 (40.6)	600 (37.9)
Course area			
Biological sciences	245 (15.5)	285 (24.7)	530 (19.4)
Exact sciences	518 (32.7)	334 (28.9)	852 (31.1)
Juridical sciences	343 (21.7)	280 (24.3)	623 (22.8)
Human sciences	478 (30.2)	255 (22.1)	733 (26.8)

Values expressed as absolute frequency (relative frequency)

Table 2. Bivariate analysis of the association between independent variables studied with practising physical exercise of moderate intensity, of vigorous intensity, and muscular strengthening exercises in undergraduate students

Variable	Not performing exercise of moderate intensity for at least 30 minutes per week		Not performing exercise of vigorous intensity for at least 20 minutes per week		Not performing strengthening exercises (8–12 repetitions) in a week	
	%	OR	%	OR	%	OR
Gender	$p = 0.012$		$p < 0.001$		$p = 0.019$	
Female	49.4	1.21	64.6	1.43	68.0	1.21
Male	44.5	1.00	56.0	1.00	63.7	1.00
Age	$p = 0.803$		$p = 0.158$		$p = 0.594$	
18–20 years	47.1	1.00	60.7	1.00	65.3	1.00
21–23 years	48.5	1.05	62.6	1.08	66.7	1.06
24–26 years	45.3	0.93	55.4	0.80	65.1	0.98
> 26 years	46.9	0.99	62.7	1.08	69.2	1.19
Skin colour	$p = 0.880$		$p = 0.800$		$p = 0.589$	
White	47.2	1.00	60.9	1.00	66.5	1.00
Non-white	47.6	1.01	61.4	1.02	65.3	0.95
Marital status	$p = 0.478$		$p = 0.878$		$p = 0.850$	
Single	47.0	1.00	61.1	1.00	66.0	1.00
Married/Living together	49.0	1.08	59.5	0.93	67.5	1.06
Separated/Divorced/Widower	54.9	1.37	62.7	1.07	68.6	1.12
Housing	$p = 0.972$		$p = 0.804$		$p = 0.451$	
Accommodation on Campus	46.7	1.00	59.5	1.00	69.2	1.00
Student republic	47.0	1.01	59.6	1.00	63.2	0.76
With family	47.2	1.02	61.1	1.06	66.2	0.87
Alone	48.5	1.07	62.8	1.15	67.6	0.92
Study pattern	$p = 0.003$		$p = 0.003$		$p = 0.157$	
Diurnal	47.5	1.00	61.6	1.00	66.3	1.00
Evening	51.5	1.17	64.9	1.15	68.4	1.09
Full-time	43.7	0.85	57.3	0.83	64.2	0.91
Study year	$p = 0.457$		$p = 0.029$		$p = 0.330$	
1st year	48.9	1.00	65.4	1.00	67.6	1.00
2nd year	46.9	0.92	60.0	0.63	67.9	1.01
3rd year	48.3	0.97	59.4	0.62	64.0	0.85
≥ 4th year	45.0	0.85	58.5	0.60	65.0	0.88
Paid work (h/week)	$p = 0.683$		$p = 0.889$		$p = 0.475$	
Do not work	46.8	1.00	60.7	1.00	64.7	1.00
< 20 hours	47.3	1.02	61.3	1.02	67.9	1.15
20–39 hours	47.2	1.01	60.5	0.98	67.2	1.11
≥ 40 hours	51.7	1.21	63.6	1.13	67.6	1.13
Study area	$p < 0.001$		$p < 0.001$		$p = 0.162$	
Biological sciences	40.8	1.00	52.4	1.00	63.5	1.00
Exact sciences	48.7	1.37	62.6	1.41	67.0	1.16
Juridical sciences	50.9	1.50	64.0	1.50	69.0	1.28
Human sciences	50.9	1.50	65.1	1.57	66.3	1.12

OR – crude odds ratio
The p value refers to the chi-squared test.

Table 3. Multivariate analysis of the association between independent variables studied with practising physical exercise of moderate intensity, of vigorous intensity, and muscular strengthening exercises in undergraduate students

Variable	Not performing exercise of moderate intensity for at least 30 minutes per week[*]	Not performing exercise of vigorous intensity for at least 20 minutes per week[**]	Not performing strengthening exercises (8–12 repetitions) in a week[***]
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Gender			
Female	1.23 (1.05–1.44)	1.47 (1.25–1.72)	1.22 (1.04–1.44)
Male	Reference	Reference	Reference
Age			
18–20 years	–	Reference	–
21–23 years	–	1.16 (0.97–1.40)	–
24–26 years	–	0.87 (0.66–1.13)	–
> 26 years	–	1.08 (0.83–1.42)	–
Study pattern			
Diurnal	Reference	Reference	Reference
Evening	1.16 (0.95–1.40)	1.13 (0.92–1.39)	1.08 (0.87–1.34)
Full-time	1.05 (0.82–1.35)	1.05 (0.81–1.35)	0.99 (0.76–1.29)
Study year			
1st year	Reference	Reference	Reference
2nd year	1.12 (0.78–1.59)	**0.79 (0.63–0.98)**	1.00 (0.80–1.26)
3rd year	0.75 (0.54–1.06)	**0.74 (0.60–0.93)**	0.82 (0.66–1.03)
≥ 4th year	0.76 (0.54–1.08)	**0.71 (0.57–0.89)**	0.85 (0.68–1.07)
Paid work (h/week)			
Do not work	–	–	Reference
< 20 hours	–	–	1.14 (0.92–1.42)
20–39 hours	–	–	1.08 (0.86–1.37)
≥ 40 hours	–	–	1.06 (0.73–1.53)
Study area			
Biological sciences	Reference	Reference	Reference
Exact sciences	**1.40 (1.12–1.75)**	**1.52 (1.21–1.91)**	1.18 (0.94–1.50)
Juridical sciences	**1.48 (1.16–1.95)**	**1.51 (1.13–2.00)**	1.22 (0.91–1.64)
Human sciences	**1.45 (1.13–1.89)**	**1.52 (1.16–1.99)**	1.04 (0.79–1.37)

OR – odds ratio adjusted for all variables in the model, 95% CI – confidence interval of 95%
The '–' denotes variables that presented $p > 0.20$ on bivariate analysis.
Hosmer-Lemeshow test: * 0.422, ** 0.866, *** 0.230
Bold denotes significant associations ($p < 0.05$).

biological sciences, 31.1% in exact sciences, 22.8% in juridical sciences, and 26.8% in human sciences. The prevalence of not performing moderate intensity exercise, vigorous intensity exercise, and muscular strengthening exercise was 47.3%, 61.0%, and 66.2%, respectively (data not shown in the table).

The bivariate analysis (Table 2) indicated that females, students of the evening class pattern, and those enrolled in juridical sciences or human sciences had a higher prevalence of not performing exercise of moderate intensity ($p < 0.05$). With respect to not performing vigorous intensity exercise, in addition to female students, those enrolled in the evening class pattern, in the 1st year,

and in the human sciences area had a higher prevalence of this outcome ($p < 0.05$). The only variable significantly associated with not performing muscular strengthening exercises was sex, and women presented a higher prevalence ($p < 0.05$).

Multivariate analysis of factors associated with physical exercise are presented in Table 3. Female undergraduate students ($OR = 1.23$ and 1.47) and those enrolled in exact sciences ($OR = 1.40$ and 1.52), juridical sciences ($OR = 1.48$ and 1.51), and human sciences ($OR = 1.45$ and 1.52) presented a risk for not performing physical exercise of moderate or vigorous intensity, respectively ($p < 0.05$). Undergraduate students of the 2nd ($OR = 0.79$),

3rd ($OR = 0.74$), and 4th ($OR = 0.71$) years of study were protected from not performing vigorous exercise as compared with the 1st year students. The only variable that was associated with not performing muscular strengthening exercises was female gender ($OR = 1.22$).

Discussion

The present study provides relevant information about physical exercise, as well as the associated factors in a representative sample of undergraduate students. The lack of information originating from representative studies in Brazilian universities should be highlighted. The prevalence of undergraduate students that reported not performing physical exercise of moderate intensity, of vigorous intensity, or muscular strengthening exercises was 47.3%, 61.0%, and 66.2%, respectively. Surveys that employed the same instrument showed lower values than those found in the present study for not performing physical exercise of moderate intensity (23.4% and 23.5%) and of vigorous intensity (38.4% and 41.9%) in undergraduate students from the United States and Canada, respectively, as well as for not performing muscular strengthening exercises (50.7%) in undergraduate students from the United States [19, 20]. According to our findings, the prevalence of students at risk of being affected by health problems associated with lack of physical exercise is high.

The study demonstrated that female students were at risk because of not performing physical exercise. In Brazilian undergraduate students, it has been reported that the female sex is associated with physical inactivity [7], with various explanations to this result. Female young people present higher physical inactivity as compared with boys since childhood [21], and this can be explained by the barriers that are reported in greater proportion by girls, such as lack of places to practice, inability to perform the exercises, lack of motivation, laziness, lack of company, difficulties bound with the weather, and money [22]. Consequently, female young people are characterised by lower tracking of physical activity from childhood to adulthood [23]. This aspect is important because the sample was principally composed of undergraduate students aged 18–23 years (78.7%), a transition phase from adolescence to adulthood. Another barrier to practice physical exercise in females can be safety perception, a resource-related variable that is associated with physical activity in college students [24]. Once college students usually do not have a typical class schedule (9 a.m. to 5 p.m.) [25], exercising in periods or places with little traffic could prevent unaccompanied female students from choosing outdoor exercise practice owing to the fear of being victims of violence.

In addition to the characteristics that accompany women from adolescence, differences in motivational aspects may also be associated with physical inactivity. Female undergraduate students are motivated to perform physical activities by extrinsic factors, such as disease prevention, weight control, appearance, and stress control, while males have intrinsic motivations, such as fun, challenges, social recognition, affiliation, competition, strength, and endurance [26, 27]. It should be noted that individuals who have higher intrinsic motivation remain active for a longer time [28], which may explain the higher proportion of male students who perform physical exercise described in this study. Although female sex is associated with not performing physical exercise, this is not a behaviour only exhibited by women, given that there is also a high prevalence of men who do not perform moderate intensity exercise (44.5%), vigorous intensity exercise (56.0%), and muscular strengthening exercises (63.7%). Thus, although associated with female sex, lack of physical exercise must be prevented in both sexes in undergraduate students.

Previous studies have shown that Brazilian undergraduate students who attend evening system classes are at risk of being inactive [8–10, 12], as they usually work during the other periods of the day, an aspect that can decrease the time available for physical activity [8, 10]. The lack of available time is one of the barriers to physical activity, as reported by undergraduate students [29]. However, this study found no associations between undertaking physical activity and the study pattern. This can be explained by the fact that the dependent variable analysed was not performing physical exercise, while previous studies examined the achievement of recommended physical activity, which has a higher volume [2]. The lack of time may limit the achievement of recommended physical activity; however, this did not occur in the case of physical exercise practice of lower volume in the present study.

With respect to the year of course, the results showed a lower proportion of students who did not perform vigorous exercise in the 2nd, 3rd, and 4th years as compared with the 1st year. These results partially corroborate previous studies, which showed a higher frequency of physically inactive students in the 1st year of the course as compared with the final year [9, 11]. Although the study design does not identify causality, it is probable that the changes result from the entry into university life [5], interfering with the habit of performing exercise of vigorous intensity in freshmen. However, being in the 1st year of study should not be considered as a risk for all exercises, since associations were not observed for moderate or muscular strengthening exercise. What reinforces this assertion is that the recommendations allow a replacement of vigorous exercise with moderate exercise [2].

Another variable associated with not performing physical exercise was the area of the course. Exact sciences, human sciences, and juridical sciences were bound with a higher proportion of students who did not perform exercise of moderate or vigorous intensity, with the biological area as the reference. These results support a previous study conducted in southern Brazil [8]. The biological

area comprises undergraduate students of physical education, who are more active as compared with other courses [12, 13]. Probably, physical education students perform exercise to a greater extent owing to motivation, familiarity, knowledge about physical exercise, and access to suitable environments and equipment with which to practice in their departments. This is relevant because the lack of adequate facilities is cited as a barrier to physical activity by college students [24].

In addition to physical education, there are other courses related to health in the biological area. It has been widely reported that providing information is an effective intervention to promote physical activity in the population [30]. As they have knowledge about the benefits of physical exercise for health, it is probable that students in the biological area engage in physical exercise to a greater degree than those in other areas. An aspect that reinforces this statement is that disease prevention, physical fitness, and weight control are the three most common reasons reported by Brazilian undergraduate students for practicing physical exercise, all being health-related [31]. However, although the biological area was used as a reference, it also represents a high prevalence of students who do not perform physical exercise, ranging from 40.8% for exercise of moderate intensity to 63.5% for muscular strengthening exercises. Intervention programmes to promote physical exercise should be targeted at students from all areas.

The present study demonstrated relevant results concerning the factors associated with not performing physical exercise in undergraduate students of a representative sample; however, some limitations of the study should be considered. The causality of the observed associations cannot be confirmed because of the cross-sectional design of the study and the lack of variables such as environmental safety [25], barriers [27, 28], motivational aspects, and self-efficacy [24, 25] that the studied sample present in the context of not practicing physical exercise. In addition, the applied instrument used only estimates of physical exercise, which did not identify physical activity patterns of the undergraduate students. Future studies should consider such limitations to identify the determinants of both physical activity and physical exercise in this population.

Conclusions

According to the results presented, it can be concluded that there is a high prevalence of Brazilian undergraduate students who do not perform physical exercise of moderate intensity (47.3%), of vigorous intensity (61.0%), or muscular strengthening exercises (66.2%) in the sample analysed. Female students presented a risk of not performing physical exercise of moderate intensity, of vigorous intensity, and muscular strengthening exercises. The students enrolled in courses in the areas of exact sciences, human sciences, and juridical sciences depicted a risk of not performing moderate or vigorous exercise as compared with students of the biological area. Such characteristics should be considered when implementing intervention programmes to increase exercise practice in undergraduate students, thus preventing the emergence of health problems associated with lack of physical exercise in this population.

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