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ORIGINAL

SEDTARISM IMPACT ON CARDIO- RESPIRATORY RESPONSE IN COLLEGE STUDENTS

REPERCUSIÓN DEL SEDENTARISMO EN LA RESPUESTA CARDIORRESPIRATORIA EN ESTUDIANTES UNIVERSITARIOS

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ABSTRACT

Higher education is a critical period for the acquisition of healthy habits. The measures to detect the risk of developing diseases in the future are necessary. The objective of this research is to understand the impact of physical inactivity on lung function and cardiorespiratory response, studied through maximal respiratory pressures and 6-minute walk tests. The study was done with the students of Degree of Physiotherapy of Pontevedra faculty in Vigo University throughout the academic courses 2012-2013 and 2013-2014, with a total of 104 subjects. The sample comprised a total of 71 students. The results show low

levels of physical inactivity. Negative relationships between sedentary habits and cardiorespiratory tests and pulmonary function are established, suggesting that habits acquired in youth have implications on the body from an early age.

KEY WORDS: Exercise; Physical therapy modalities; Sedentary lifestyle; Students, Health Occupations

RESUMEN

La vida universitaria constituye una etapa crítica para la adquisición de hábitos saludables, por ello sería conveniente establecer medidas para la detección del riesgo de desarrollar patologías en un futuro. Los objetivos de esta investigación son conocer cuál es el nivel de sedentarismo y la repercusión del mismo en la función pulmonar y en la respuesta cardiorrespiratoria, estudiada a través de las presiones respiratorias máximas en boca y la prueba de 6 minutos marcha. La población de estudio fueron estudiantes del Grado de Fisioterapia de la Universidad de Vigo, durante los cursos académicos 2012-2013 y 2013-2014, un total de 104 sujetos. La muestra la formaron un total de 71 estudiantes. Los resultados muestran un nivel bajo de sedentarismo. Se establecen relaciones negativas entre los hábitos sedentarios y las pruebas de función pulmonar y cardiorrespiratorias, lo cual sugiere que los hábitos adquiridos en la juventud tienen repercusiones sobre el organismo ya desde edades tempranas.

PALABRAS CLAVE: Ejercicio; Fisioterapia; Estilo de vida sedentario; Estudiantes del área de salud.

INTRODUCTION

Physical activity improves physical abilities, reducing morbidity and mortality from many chronic diseases^{1, 2}. The use of methods for the assessment of cardiorespiratory function is necessary for an objective assessment of the physical ability of an individual. The perception of the quality of life increases with the level of sports practice³. Adding to the benefits of physical activity, it would be expected that having an active life was the norm. Unfortunately, some years ago it was forecasted that only slightly more than half of the world's youth will become active⁴. An assessment which later Kilpatrick, Hebert and Bartholomev (2005) would support by observing that levels of physical exercise are actually declining in young people, particularly college students⁵.

Young adults are a particularly vulnerable group to the influence of factors which are characteristic of today's society as technology advances and they search for an optimal use of their time, leading to an accelerated process of change in their lifestyles by providing comfort and minimal effort in all areas, increasing the numbers of sedentarism^{6, 7}. On the other hand, some college students leave their homes, which causes a worsening of their eating habits, either for lack of time to cook, eat, or not knowing how to prepare the healthy

food they were probably accustomed to consuming during their school years at home⁸.

As college is a time of risk for physical inactivity, it would be desirable to establish measures which could detect the risk for development of chronic diseases in the future. Knowing whether lung function and cardiorespiratory function is altered by the levels of physical activity that each individual does constitutes a way to detect such risks. We concur with Garcia-Lanzuela et al (2007)⁹ on the importance of studying health and lifestyles contextualizing research into territorial units, such as a university community.

The test of the 6 minute walking test (6MWT) measures the ability of submaximal exercise and serves to determine the overall condition of a subject, assessing cardiorespiratory fitness¹⁰. In recent years it has gained increasing importance for its easy implementation and reproducibility. It has been widely used in patients with respiratory and cardiovascular diseases; to assess exercise capacity of subjects¹¹⁻¹⁴; in the response of therapeutic interventions^{15, 16}, as a prognosis factor of survival^{14, 17, 18}, and as an index of deterioration in chronic obstructive pulmonary disease (EPOC)¹⁹. Among its advantages, these include not requiring expensive hardware, nor a comprehensive training for the person who runs the tests¹³.

For the assessment of respiratory function we have used the test for determining mouth pressures. Through this test, inspiratory muscle strength, maximal inspiratory pressure (MIP) and expiratory muscle strength, maximal expiratory pressure (MEP) is assessed²⁰.

The goals of this study are to ascertain the level of inactivity in a population of healthy subjects, namely Physiotherapy Degree students of the University of Vigo and study the impact of physical inactivity on lung function and cardiorespiratory response, studied through respiratory mouth pressures and 6MWT.

MATERIAL & METHOD

This research was conducted in compliance with the Declaration of Helsinki and Human Rights.

The study population consisted of students enrolled in Bachelor in Physiotherapy studying the subject "Respiratory Physiotherapy and Massage Therapy Special", given in the third year of their degree. The data collection was carried out during the academic years 2012-2013 and 2013-2014.

To collect information on the level of inactivity, an ad hoc questionnaire on paper personally applied by researchers has been used. In particular it has been a healthy habits questionnaire (Table 1). The data collection was carried out in the field "Respiratory Physiotherapy and Massage Therapy Special",

particularly in practice classes, to try to cover all of the population. The teacher informed the students of the characteristics of the research asking for their collaboration in filling the questionnaire. It was explained that participation in the research was voluntary. Suffering from some respiratory disease or not giving consent in answering the questionnaire was established as an exclusion criterion for participation in the study.

A new variable has been calculated, from the extracted data in the questionnaire, "Hours of Total physical activity." For its calculation we have taken the number of weekly sessions of activity, duration of activity and the time taken in carrying it out. The formula for the new variable is as follows: *Duration of activity (hours) x times per week (days) x weeks they have been performing the activity (years x 52)*. In addition to this new variable we calculated the Body Mass Index (BMI) found from the weight and height, $BMI = \text{weight (kg)} / \text{height}^2 (\text{m}^2)$.

Table 1. Variables analyzed from the ad hoc questionnaire.

ANALYZED VARIABLES	
Gender	Dichotomic (male/female)
Age	Numerical (years)
Size	Numerical (cm)
Weight	Numerical (Kg)
Performance of physical activity	Dichotomic (yes/no)
- Times per week	- Numerical (days)
- Duration of activity	- Numerical (hours)
- Time being performed	- Numerical (years)
Hours of sedestation per day	Numerical (hours)
Daily sleep hours	Numerical (hours)
Smoker	Dichotomic (yes/no)

The 6MWT was conducted in a 30 meters corridor located in the School of Physiotherapy of Pontevedra. The subjects had to travel the greatest possible walking distance for 6 minutes. The performance of the test followed the recommendations proposed by the American Thoracic Society²¹. At baseline oxygen saturation (SaO₂) and heart rate (HR) via a pulse oximeter (Datex Ohmeda, TuffSat[®]), dyspnea and fatigue in lower limbs measured by the modified Borg scale was recorded (Liker scale 0-10). Upon completion of the 6 minutes, SaO₂, HR, dyspnea, fatigue in the lower limbs and walking distance in meters was recorded for each student. During the performance of the test subjects, these were monitored with a pulse oximeter recording SaO₂ and FC every minute.

As an expression of the maximum volunteer force of all respiratory muscles we determined the maximum static pressures in mouth, generated during inspiratory (MIP) and expiratory (MEP) efforts. This required using an occludable mouthpiece, with a small orifice to minimize the involvement of "buccinator muscles" the measurement was performed in standing and wearing nose clips. MIP maneuver was performed from residual volume (RV), while the MEP was performed from total lung capacity (TLC). The mouthpiece was connected to a

pressure gauge (ELKA-ELECTRONIL 6MBH). The maximum value obtained in three valid and reproducible maneuvers (difference <5%) was included.

After obtaining all the data, we entered it into a database in an orderly and systematic way. Statistical analysis was carried out using SPSS.17 Windows. To establish the relationship between quantitative variables, Pearson's correlation was performed. For all of them $p \leq 0.05$ was established to include significance in the results.

RESULTS

Students who make up the sample have an average age of 23 years (standard deviation of 4.4 and variance of 19.9) 80.3% physically inactive (63.2% students and 36.8% girls). For BMI, we obtained an average score of 23 (standard deviation 2.9 and variance 8.45).

Physiotherapy students in the sample sleep an average of 7.5 hours. 81.7% sleeps 7 hours or more. The average number of hours remaining seated is 7.59 (standard deviation and variance 2,674 7,154). Only one of the evaluated subjects smoked (1.4%).

Table 2 shows that students who exercise a greater proportion (total hours) obtained higher values in the MIP (Figure 1), with no significant values in MEP. Those who remain in sedestation for longer hours are associated with lower levels of MEP (Figure 2).

Table 2. Relationship between physical activity and hours of sedestation with MIP and MEP

		MIP	MEP
Total hours of physical activity	Pearson correlation	0,262	0,169
	Significance (p)	0,055	0,221
	N	54	54
Total hours of sedestation	Pearson correlation	-0,211	-0,258
	Significance (p)	0,086	0,035
	N	67	67

Figure 1. Relationship between hours of physical activity and MEP

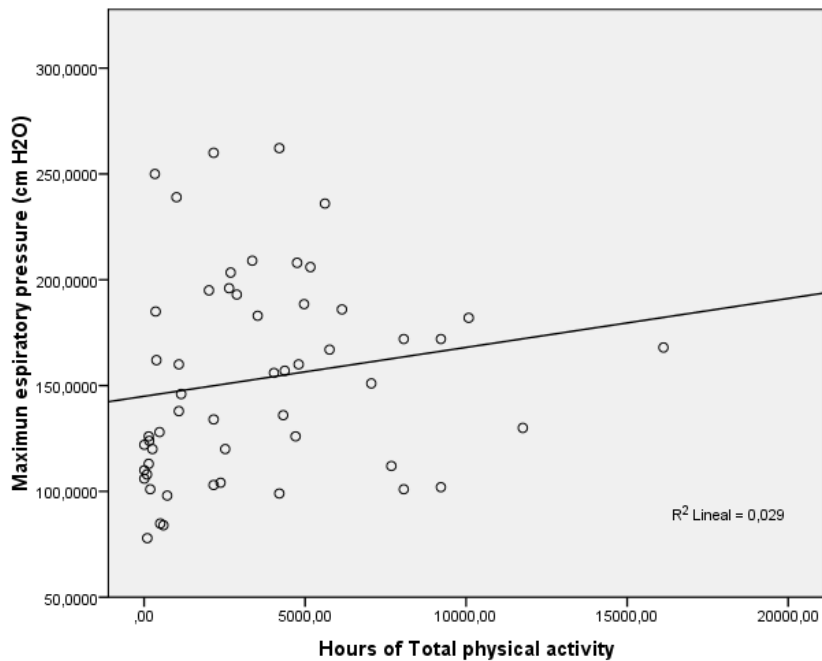
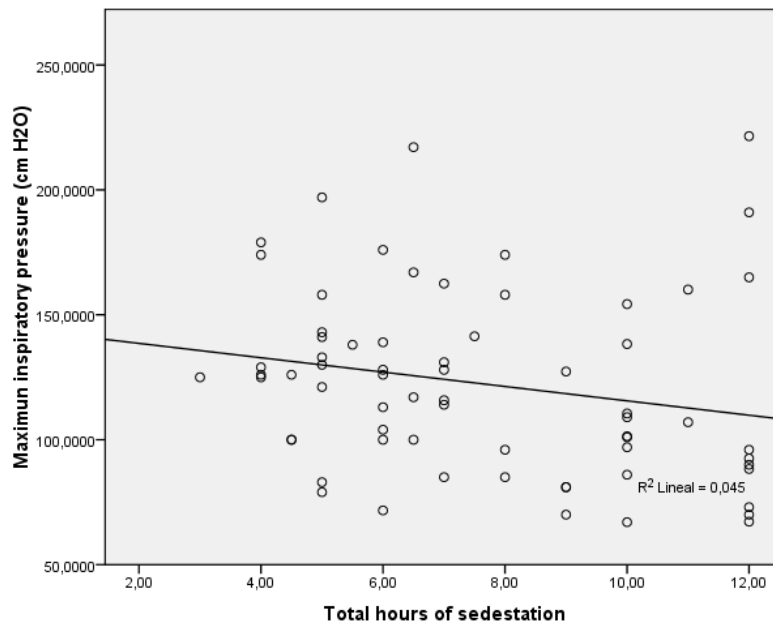


Figure 2. Relationship between hours of sedestation and MIP

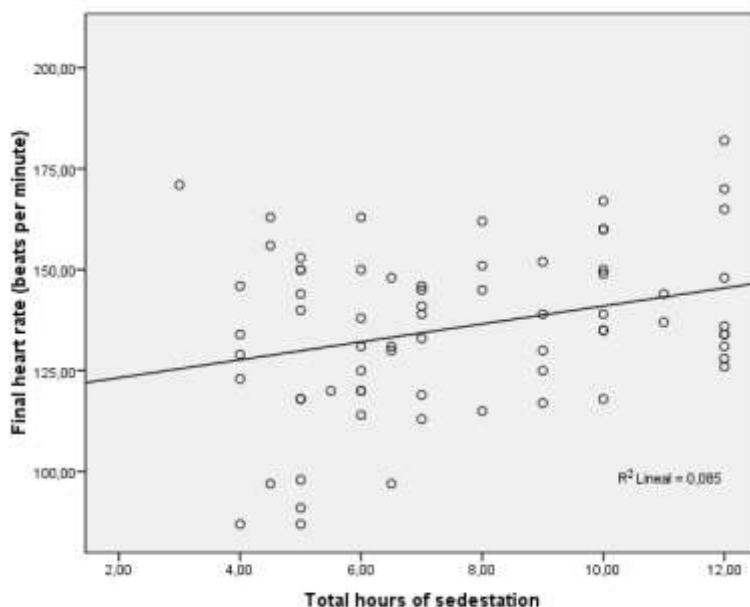


Regarding the 6MWT, we find relations between the final value of FC and daily hours of sedestation, so that the more hours the students sat, the higher the FC values were met (Table 3 and Figure 3). Regarding SaO₂ no values have been reported involving desaturation throughout the test, maintained at all times above 94%.

Table 3. Relationship between the hours of daily sedentation and the parameters evaluated at the end of 6 minute walking test

		FC	SatO2	Dyspnea	Fatigue
Daily sedentation hours	Pearson correlation	0,292	-0,207	0,156	0,001
	Significance (p)	0,015	0,089	0,201	0,995

Figure 3. Relationship between hours of sedentation and final FC

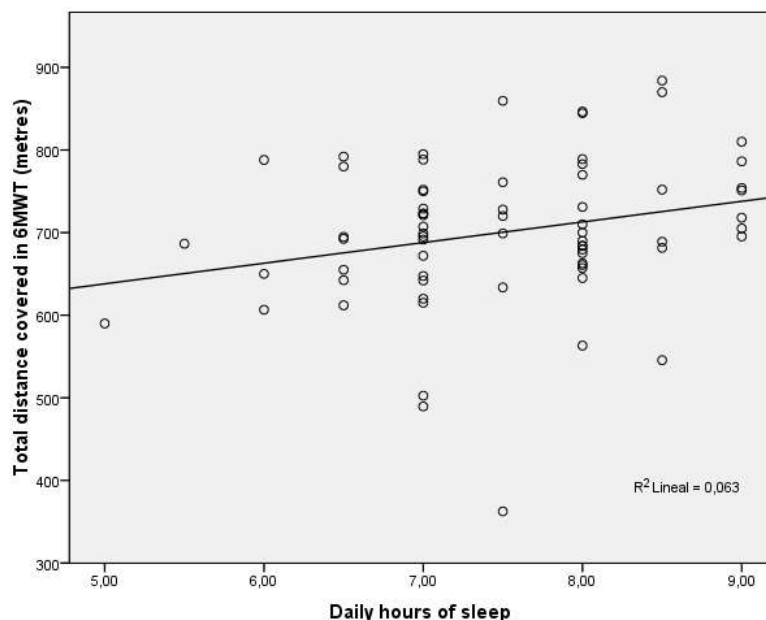


In relation to hours of sleep we observed that those who rest properly walked a greater distance in the 6MWT (Table 4 and Figure 4).

Table 4. Relationship between hours of daily sleep and 6 minute walking

		Total distance covered
Daily hours of sleep	Pearson correlation	0,251
	Significance	0,037

Figure 4. Relationship between sleep and total distance covered



ARGUMENT

The rate of completion of physical activity in physiotherapy students is high (more than three quarters of the sample perform physical activity), which shows a good trend of these future professionals as prevention and health promotion is a must for development of their profession. The realization of physical activity is a good way to promote health and prevent diseases.

The level of achievement of physical activity found in this research outperforms other previous descriptive studies found that in the practice of physical activity in students it does not exceed 70%^{22, 23}. It is worth noting the study by Mantilla-Tolosa et al ²⁴, in Physiotherapy students at the University of Murcia shows a percentage of physical activity of 80%, closer to our results. On a reciprocal basis, the sedentary level is low, being at levels below the European level²⁵.

The low prevalence of smokers found, in contrast to other studies ^{26, 27}, is considered very positive. This could be explained after years of an anti-smoking law (Law 28/2005, of 26 December, which came into force on January 1, 2006) being established, and the fact that it is a degree of health sciences where subjects live and study every day with pathologies and risk factors thereof; so they may be more aware of the harmful effects of tobacco than other populations. We found no relationship between the level of achievement of physical activity and cardiorespiratory response evaluated through the 6MWT. This may be because the sample is not distributed evenly with respect to the variable physical activity, since over 80% of students do perform physical activity. Moreover, although in the questionnaire administered to 20% of the students indicate that they do not perform physically activities; they may not contemplate walking as such. Given that the campus is away from the city center (2-3 km) and there is no public transport to get around, it is possible that many of those who believe

that they do not exercise, are not as sedentary as they believe. By analyzing lung function, assessed through respiratory mouth pressures, we observed a significant association between the occurrence of physical activity and high values in the MEP, which is consistent with other researches²⁸.

Regarding daily hours of sedestation, we did find relationships with cardiorespiratory response. Those who stay longer (more sedentary) hours sitting have a higher heart rate after testing up to 6 minutes. It is also worth noting that there is an inverse relationship between the total hours of physical activity and the hours of daily sedestation which gives more weight to the above statement.

With respect to daily hours of sleep, as shown in the results section, 80% of subjects sleep seven hours or more. According to various studies, the recommended hours of sleep each day are between 6 and 8²⁹⁻³¹. Sleep contributes to health to the extent that, with a slowing of body systems after daily activities, it allows the body to restore the vital energy required. Conversely, lack of sleep affects the ability to concentrate, the intellectual state of mind, reaction time, and physical performance³². In the present study, we found that those who are under 7 hours / day of sleep obtained lower cardiorespiratory performance, because they cover a shorter distance in the 6 minutes walking test.

In existing research, an improvement in sleep quality in university students through a protocol of physical training (Pilates) has been identified^{33, 34}. Therefore, the adequate rest our students hold could be due to the physical activity undertaken, or conversely, a low level of inactivity. The literature recognizes that intervention based on physical intervention improves the hours of sleep. Serotonin levels increase as does the timing of the biological clock and it has indirect effects on thermoregulation³⁵.

CONCLUSIONS

College students of Degree in Physical Therapy from the University of Vigo have a low level of physical inactivity, which is a good indicator for future healthcare professionals.

Negative relationships between sedentary habits and evidence of pulmonary and cardiac function are established, suggesting that habits acquired in youth impact the body from an early age.

This study should be the basis for future research, increasing the number of subjects to study and expanding the branches of knowledge pertaining to college students in order to check for any risk group on which action should be taken.

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