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Physical activity among Portuguese university students and its relation to knowledge and perceived barriers

La actividad física entre los universitarios portugueses y su relación con el conocimiento y las barreras percibidas

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Conflicts of interest

The authors declare that there is no conflict of interest.

Ethical consideration approval code

This study was approved by the Ethics Committee for Research in Social and Human Sciences (CEICSH), of the University of Minho Ethics Council, under the protocol CEICSH 009/2019.

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Abstract

University students, regardless of the country, have a very high prevalence of physical inactivity and health habits acquired during this period tend to remain throughout life, including those related to physical exercise. The purpose of this study was to analyse the relationship between knowledge about the recommendations on the practice of physical activity (PA), the perceived barriers towards PA and the practice of PA by higher education students. This cross-sectional study used a self-reported questionnaire with a stratified sample of university students (n = 840) from a university in Portugal. An ordinal logistic regression model was calculated to determine the predictive variables to the practice of PA. The results showed that 35.7% of the students surveyed were sedentary, the level of knowledge about PA was low, correctly answering 2.79 (SD = .090) questions in a total of 6, and lack of time was the most evident perceived barrier. The constructed model predicted that having more barriers to PA (β = -.750, p = .000) and being female decreased the likelihood of practising PA (β = .578, p = .000). The increase of PA levels of university students is a social necessity and, in this context, higher education institutions should undertake a key role in promoting student health, by implementing actions to reduce their students' inactivity, developing the transmission of information about the health benefits related to the practice of PA.

Key Words

Physical exercise; knowledge; perceived barriers; recommendations; university students.

Resumen

Los estudiantes universitarios, independientemente del país, tienen una prevalencia muy alta de inactividad física y los hábitos de salud adquiridos durante este período tienden a permanecer a lo largo de la vida, incluidos los relacionados con el ejercicio físico. El propósito de este estudio fue analizar la relación entre el conocimiento sobre las recomendaciones sobre la práctica de AF, las barreras percibidas hacia AF y la práctica de AF por estudiantes de educación superior. Este estudio transversal utilizó un cuestionario auto informado con una muestra estratificada de estudiantes universitarios (n = 840) de una universidad de Portugal. Se calculó un modelo de regresión logística ordinal para determinar las variables predictivas para la práctica de AF. Los resultados mostraron que el 35,7% de los estudiantes encuestados eran sedentarios, el nivel de conocimiento sobre AF era bajo, respondiendo correctamente 2,79 (DE = .090) preguntas en un total de 6, y la falta de tiempo era la barrera percibida más evidente. El modelo construido predijo que tener más barreras a la AF (β = -.750, p = .000) y ser mujer disminuyó la probabilidad de practicar AF (β = .578, p = .000). El aumento de los niveles de AF de los estudiantes universitarios es una necesidad social y, en este contexto, las instituciones de educación superior deben asumir un papel clave en la promoción de la salud de los estudiantes, mediante la implementación de acciones para reducir la inactividad de sus estudiantes, desarrollando la transmisión de información sobre los beneficios para la salud. relacionados con la práctica de la AF.

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Palabras clave

Ejercicio físico; conocimientos; barreras percibidas; recomendaciones; estudiantes universitarios.

Introduction

The World Health Organization identified physical inactivity as the fourth major risk factor for global mortality (WHO, 2010) and other authors as the greatest public health problem of the 21st Century (Trost, Blair, & Khan, 2014). In contrast, the practice of physical activity (PA) is considered a positive health measure.

Scientific research has shown that the regular practice of PA contributes to physical health (Füzéki, Engeroff, & Banzer, 2017; Lear et al., 2017; Pandey et al., 2017), as well as to the reduction of mortality and cardiovascular and chronic diseases (Ekelund et al., 2016; Lear et al., 2017). In the same way, it contributes to psychological and emotional well-being (Álvarez Rivera, Cuevas Ferrera, Lara Pot, & González Hernández, 2015; Joseph, Royse, Benitez, & Pekmezi, 2014; Wu, Tao, Zhang, Zhang, & Tao, 2015). For example, Wu et al. (2015) found that the daily practice of PA contributed to the reduction of depression, anxiety and sleep problems.

In recent years, several public health guidelines for the PA of the adult population were published, differing in the amount, intensity and frequency of PA (Haskell et al., 2007). The most recent recommends at least 150 minutes of moderate PA per week or 75 minutes of vigorous PA per week, allowing the combination of these two intensities and in episodes of at least 10 minutes (WHO, 2010).

Despite the widespread recommendations and health benefits, in most developed countries there is a high proportion of adults who do not meet these recommendations for PA and show a low level of PA (Guthold, Stevens, Riley, & Bull, 2018), particularly in Portugal (Batista et al., 2012). The level of PA decreases from childhood to adolescence, as well as from adolescence to adulthood. University students, regardless of the country, have a very high prevalence of physical inactivity that is bigger (Arias-Palencia et al., 2015; Haase, Steptoe, Sallis, & Wardle, 2004; Keating, Guan, Piñero, & Bridges, 2005; Moreno-Arrebola, Fernández-Revelles, Linares-Manrique, & Espejo-Garcés, 2018; Pengpid et al., 2015) than

that of others age groups (Guthold et al., 2018). This evidence becomes relevant when stating that the transition to adulthood, matching it with starting higher education, is a critical and the most vulnerable life period. Health habits acquired during this period tend to remain throughout life, including those related to physical exercise (Curry, Jenkins, & Weatherford, 2015; Filla, Hays, Gonzales, & Hakkak, 2013; Rodriguez Rodriguez, Santibañez Miranda, Montupin Rozas, Chávez Ramírez, & Solis Urra, 2016).

Several factors contribute to the decrease or absence of PA, which is why it is interesting to assess how predisposing factors include knowledge and attitudes towards PA (Ennis, 2010; Keating et al., 2009; WHO, 2012).

Given the above, this article aims to analyse the relationship between knowledge on the recommendations for the practice of PA, the perceived barriers towards PA and the practice of PA by students in higher education.

Material & methods

Population and sample

For the 2018/2019 academic year, 5447 students were registered in the 1st and 3rd year of integrated bachelors and masters degrees. Courses related to health sciences, undergraduate or postgraduate masters and those that did not have classes in the 1st or 3rd years were excluded from the sample. The minimum sample size needed for this study was 592 students (margin of error = 5%, confidence level = 99%, and response distribution = 50%). For this purpose, stratified probabilistic sampling of university students was performed according to the year of study and the scientific area. The different undergraduate and master's degrees were divided into scientific areas (as defined by the Foundation for Science and Technology): Human and Social Sciences, Law and Economic Sciences, Exact and Natural Sciences and Engineering Sciences.

In this cross-sectional study with a representative sample of university students (n = 840) in one university in Portugal, data were collected using a validated self-reported questionnaire without biochemical confirmation. The sample consists of 464 students in their first year of study (55.2%) and 376 students in their last year of study (44.8%). In what relates the scientific area, 302 (36.0%) students from Engineering Sciences, 270 (32.1%) students

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from Human and Social Sciences, 136 (16.2%) students from Exact and Natural Sciences and 132 (15.7%) students in the area of Law and Economic Sciences. Most of the students surveyed were female (55.4%, *n* = 465), did not in a love relationship (58.3%, *n* = 486), were displaced from their usual residence (64.9%, *n* = 537), were full-time students (88.8%, *n* = 739) and had a BMI corresponding to a normal weight (73.1%, *n* = 599). The average age of the sample was 20.78 (*SD* = 4.221), ranging from 18 to 54, and only 3% of the students are 30 years old or older.

Instruments

Currently, there are several scientific instruments to monitor the prevalence of PA among young adults. Therefore, the development of the instruments present in this investigation was carried out in three stages: scale construction (1st stage); content validity (2nd stage); psychometric validity (3rd stage), according to the procedures defined by Bowling (1998).

For the scale construction (1st stage), a systematic review of the literature was made to identify the questions and items commonly used to assess knowledge, attitudes and practices of PA in higher education (Alves, 2019). Based on this review, an analytical matrix was created for each of the dimensions to be analysed, and those with the same semantic similarities were eliminated.

For the content validity (2nd stage) 10 PhD researchers from several Portuguese universities with recognised work in the area of Health Education in Higher Education were invited, and the feedback received from 5 of them was considered as well as all the proposed semantic changes. Similarly, the instrument was applied to 12 university students, using the method "thinking aloud" (Bowling, 1998; Keszei, Novak, & Streiner, 2010) to identify items that might be confusing, to exclude less relevant or redundant items, and to verify that pre-coded response options were sufficient. After the suggested redrafting, the preliminary version of the questionnaire survey was presented to a sample of 32 students, not included in the final sample.

The questionnaire included sociodemographic variables (sex, age, scientific area of study, academic year, weight and height (to calculate BMI), being in a love relationship,

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professional situation e current residence) and specific questions to measure the following variables:

- Prevalence of PA: the Godin Leisure-Time Exercise Questionnaire (Godin & Shephard, 1997) was used and one question about sedentary lifestyle ("On a normal day, how many hours do you spend seated?");

- PA knowledge: a 6-item scale with options for the answer - True, False, Don't Know (e.g., "The practice of an intense physical activity is necessary to achieve health benefits.")

- Perceived barriers towards PA: a 5-item scale on a 5-point Likert scale (1 – I strongly disagree, 5 – I totally agree) concerning lack of energy, lack of motivation, lack of resources, lack of support and lack of time.

Procedure and Statistical analysis

The application of the instrument was carried out in classroom context and paper-and-pencil format for all students in the sample, after giving informed consent. All ethical research procedures with humans were fulfilled, and the Ethics Committee for Research in Social and Human Sciences, of the University of Minho Ethics Council, under the protocol CEICSH 009/2019 approved the research.

Data were analysed using the IBM SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, NY, USA). For statistical analysis, frequencies and contingency tables were analysed, Pearson's correlation was carried out, Chi-square test, independent t-test, and one-way variance (ANOVA) and Hochberg's GT2 multiple comparison procedures. Ordinal logistic regression model with logit's function was developed, only including variables with a significant bivariate association with PA, PA knowledge and perceived barriers. The nominal indicator of 'sedentary' was assigned as the reference category, and all covariates were entered into the model simultaneously. Variables that were found not to contribute to the prediction of the dependent variable were excluded from the final model. A significance level of 0.05 was considered.

Activity counts were converted to metabolic equivalents (METS) by multiplying episodes of vigorous activity by 9, moderate activity by 6, and mild activity by 3. Total activity scores were calculated by adding the MET calculations for each PA intensity level

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and were classified in three types: Insufficiently Active/Sedentary; Moderately Active and Active.

For the knowledge scale, the number of correct responses was added to give an overall knowledge score, and the mean was calculated. This means that the higher the scale value, the higher the level of knowledge. The perceived barriers scale was subject to Cronbach's alpha analysis to analyse its reliability (Bowling, 1998), and a good reliability index was obtained (α = .742). In addition, inter-item correlations ranging from .644 to .269. To read the results of this scale, the higher the average of the scale, the more will the barriers be towards PA.

Results

The results show that 35.7% (n = 298) of the students surveyed are sedentary, 17.5% (n = 146) moderately active and 46.8% were classified as active. It was also found that, on average, on a typical day, university students spend 7.44 ± 2,656 hours seated. There were no differences between the practice of PA and the number of hours that the students declared to spend seated (F (2, 798) = 1.617, p = .199).

Table 1 shows that among all the sociodemographic variables analysed the practice of physical exercise was only associated with the sex of the respondents (χ^2 (2) = 22.554, p = .000). This indicates that female students are more sedentary and less active compared to male students.

Table nº 1 – Frequencies and Chi Square test for sociodemographic variables and weekly leisure-time activity

		Weekly leisure-time Activity						Chi Square test	
		Sedentary		Moderately Active		Active			
		n	%	*n*	%	*n*	%	χ^2	*p*
Year of study	1st year	156	52.3	82	56.2	221	56.7	1.364	.506
	3rd year	142	47.7	64	43.8	169	43.3		
Scientific area	Engineering Sciences	93	31.2	50	34.2	159	40.8	7.572	.271
	Exact and Natural Sciences	49	16.4	23	15.8	62	15.9		
	Law and Economic Sciences	51	17.1	24	16.4	56	14.4		
	Human and Social Sciences	105	35.2	49	33.6	113	29.0		
Sex	Male	106	35.6	60	41.1	208	53.3	22.554	**.000**
	Female	192	64.4	86	58.9	182	46.7		
Age	< 20	111	37.2	63	43.2	176	45.1	4.409	.110

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	>= 20	187	62.8	83	56.8	214	54.9		
Love relationship	Yes	126	42.4	56	38.6	163	42.3	.694	.707
	No	171	57.6	89	61.4	222	57.7		
Current residence	Displaced	110	37.5	45	31.3	133	34.5	1.756	.416
	Not displaced	183	62.5	99	68.8	252	65.5		
Professional situation	Full time student	261	88.2	130	90.3	344	88.9	.433	.805
	Worker / Student	35	11.8	14	9.7	43	11.1		
BMI	Low weight	22	7.6	14	9.9	21	5.5	5.175	.270
	Normal weight	212	73.1	95	66.9	289	75.7		
	Overweight	56	19.3	33	23.2	72	18.8		

Regarding the sedentary behaviour declared by the students, it was found that, on average, university students spend 7.44 ± 2.656 hours seated, according to their professional situation (t (795) = 3.693, p = .000) and scientific area (F (3, 799) = 12.380, p = .000). Thus, full-time and engineering students were the ones who declare to spend daily the most hours seated, compared with working students and students of other scientific areas, respectively.

The level of knowledge about PA was low, presenting, on average, 2.79 ± 0.090 correct answers, in a total of 6 possible correct answers. Table 2 shows statistically significant differences between knowledge about PA and the scientific area (F (3,827) = 3.060, p = .028), indicating that students in the Exact and Natural Sciences area have more knowledge compared to students of the Human and Social Sciences area.

Table nª 2 – Mean, one-way ANOVA and t-test for sociodemographic variables and PA knowledge

		PA Knowledge		
		Mean (*SD*)	ANOVA	
			Z	*p*
Scientific area	Engineering Sciences	2.77 (.950)	3.060	**.028**
	Exact and Natural Sciences	2.91 (.740)		
	Law and Economic Sciences	2.78 (.868)		
	Human and Social Sciences	2.63 (.907)		
BMI	Low weight	2.78 (.773)	.040	.961
	Normal weight	2.75 (.901)		
	Overweight	2.74 (.872)		
Weekly leisure-time activity	Insufficiently Active/Sedentary	2.69 (.950)	1.814	.164
	Moderately Active	2.86 (.777)		
	Active	2.75 (.892)		
			t-student	
			t	*p*
Year of study	1st year	2.72 (.871)	-.947	.344
	3rd year	2.78 (.925)		

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Sex	Male Female	2.73 (.940) 2.75 (.859)	-.357	.721
Age	< 20 >= 20	2.75 (.856) 2.74 (.924)	.101	.919
Love relationship	Yes No	2.73 (.839) 2.77 (.922)	-517	.605
Current residence	Displaced Not displaced	2.76 (.901) 2.74 (.888)	.442	.659
Professional situation	Full time student Worker / Student	2.75 (.908) 2.74 (.739)	.093	.926

The scale of perceived barriers to the practice of PA obtained an average of 2.26 ± 0.037, in a range between 1 and 5, with the highest value corresponding to more barriers. The perceived barriers were ordered as follows, depending on the degree of agreement: lack of time (M = 2.78, SD = 1.353); lack of motivation (M = 2.45, SD = 1.230); lack of resources (M = 2.17, SD = 1.226); lack of energy (M = 2.06, SD = 1.092); lack of support (M = 1.86, SD = 1.041).

Through the bivariate analysis, shown in table 3, there were statistically significant differences between perceived barriers and the scientific area (F (3,827) = 2.863, p = .036), BMI (F (2,807) = 3.318, p = .037), the practice of physical exercise (F (2,822) = 48.811, p = .000), sex (t (829) = -3.069, p = .002) and current residence (t (817) = 2.358, p = .019). Thus, it is possible to conclude that students of the Engineering Sciences area revealed fewer barriers to the practice of PA compared to students of the of Exact and Natural Sciences area; inactive students were those who revealed more barriers compared to students who practice PA (moderately and actively), with moderately active students showing more barriers compared to active students; female students and full-time students presented a higher score in the perceived barriers scale compared to male students and working students, respectively. Regarding BMI, Hochberg's GT2 was not significant.

Table nº 3 – Mean, one-way ANOVA and t-test for sociodemographic variables and perceived barriers towards PA

		Perceived barriers		
		Mean (SD)	ANOVA Z	*p*
Scientific area	Engineering Sciences Exact and Natural Sciences	2.18 (.816) 2.43 (.858)	2.863	**.036**

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	Law and Economic Sciences	2.31 (.850)		
	Human and Social Sciences	2.25 (.835)		
BMI	Low weight	2.41 (.750)	3.318	**.037**
	Normal weight	2.21 (.829)		
	Overweight	2.37 (.879)		
Weekly leisure-time activity	Insufficiently Active/Sedentary	2.60 (.760)	48.811	**.000**
	Moderately Active	2.28 (.853)		
	Active	1.99 (.796)		
			t-student	
			t	*p*
Year of Study	1st year	2.27 (.825)	.132	.895
	3rd year	2.26 (.853)		
Sex	Male	2.16 (.820)	-3.069	**.002**
	Female	2.34 (.843)		
Age	< 20	2.27 (.805)	.184	.854
	>= 20	2.26 (.861)		
Love relationship	Yes	2.24 (.832)	-.754	.451
	No	2.28 (.842)		
Current residence	Displaced	2.35 (.805)	2.358	**.019**
	Not displaced	2.21 (.845)		
Professional situation	Full time student	2.28 (.845)	1.434	.152
	Worker / Student	2.14 (.788)		

There were no associations between the level of knowledge about the practice of PA and the perceived barriers (ρ = .023, p = .516).

Table 4 presents the results of the ordinal logistic regression model for PA. The model is statistically significant (G^2 (2) = 107.057, p = .000). According to the model, as the perceived barriers increase, the probability of practising physical exercise decreases ($\beta_{\text{Perceived barriers}}$ = -.750, p = .000). Regarding sex, there is a higher probability of practising PA in male students, compared to female students (β_{Male} = .578, p = .000).

Table 4 – Adjusted odds ratios (OR) and 95% confidence intervals (CI) from ordinal logistic regression model predicting sedentary and moderately active

		β	Error	χ^2 Wald	df	*p*	95% CI	
Limit	Sedentary/Insufficient Active	-2.083	.225	85.522	1	.000	-2.525	-1.642
	Moderately Active	-1.278	.218	34.511	1	.000	-1.705	-.852
Localition	Perceived barriers	-.750	.086	75.573	1	.000	-.919	-.581
	Male	.578	.138	17.560	1	.000	.308	.848
	[DP1=2]	0[a]	.	.	0	.	.	.

OR: odds ratio; 95% CI: 95% confidence interval

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Discussions

The practice of PA by university students was low, considering that 35.7% of respondents were sedentary or insufficiently active. In comparison with a study carried out worldwide, the results of this study show that there is a higher prevalence of inactivity than that seen in European countries in the general population (23.5%) (Guthold et al., 2018). However, when considering the university population, the percentage of inactive students corroborates with other international studies in which physical inactivity varied between 23% and 39% in western countries (Haase et al., 2004) and between 21.9% and 80.6% in non-European countries (Pengpid et al., 2015). Despite the variations recorded, it should be noted that, on average, the prevalence of physical inactivity among university students is lower in European countries compared to other non-European countries.

Scientific research in this area has identified some variations regarding the relationship between PA and the sex of university students. In this study, there was a lower prevalence of PA in female students compared to male students (Rodriguez Rodriguez et al., 2016; Romaguera et al., 2011; Wu et al., 2015). However, other studies have reported that women tend to exercise more than men (Gnanendran, Pyne, Fallon, & Fricker, 2011; Morgan & Elizondo, 2016) or that there were no differences considering the sex variable (Arias-Palencia et al., 2015).

Social representations tend to relate BMI to the practice of PA (Vadeboncoeur, Townsend, & Foster, 2015); however, there is no evidence to prove it, as verified in the present study as well as in other studies (Steptoe et al., 1997).

A possible explanation for the low prevalence of PA could refer to the number of hours that students spend seated (Arias-Palencia et al., 2015); however, in this study, there was no relation between the number of hours that students spend seated daily and the practice of PA. The number of hours that students spend seated per day (about 7 hours), coincides with that shown in other studies (Farinola & Bazán, 2011).

Regarding the knowledge variable, students revealed a low level of knowledge about PA (Abula, Gröpel, Chen, & Beckmann, 2018; Keating et al., 2009; Martins et al., 2019), although the theory of planned behaviour (Ajzen, 1991) shows that knowledge has an impact

on attitudes and that, in turn, it influences intentions in relation to behaviour. And, specifically, knowledge about PA and its health benefits direct people to the practice of PA (Haslem, 2014), as has been empirically verified in international research (Abula et al., 2018). In the present study, the level of knowledge of the students is not correlated with the barriers to the practice of PA; neither was it included in the prediction model of the practice of PA. As in the studies carried out by Keating and collaborators (2009) and Haslem (2014), no significant correlation was found between knowledge about PA and the practice of PA. However, improving and developing PA knowledge could be the first step towards establishing healthy behaviours in PA (Keating et al., 2009).

The perceived barriers were related to the practice of PA. Thus, the students who had a higher score of perceived barriers were those who presented themselves as being less active.

Lack of time is perceived as the main barrier for the practice of PA, both in the present study and in previous studies (Castañeda, Zagalaz, Arufe, & Campos-Mesa, 2018; Deliens, Clarys, Van Hecke, De Bourdeaudhuij, & Deforche, 2013; Martínez-Lemos, Puig-Ribera, & García-García, 2014; Ramírez-Vélez, Triana-Reina, Carrillo, & Ramos-Sepúlveda, 2016; Samara, Nistrup, Al-Rammah, & Aro, 2015). In this sense, the investment in time management training seems to make sense. Moreover, it is considered that betting on intrinsic motivation can be a good way to improve adherence to PA (Chacón Cuberos et al., 2017). This is because the lack of motivation was also a prominent barrier (King, Vidourek, English, & Merianos, 2014).

Lack of energy is also often mentioned as a barrier to the practice of PA (Ramírez-Vélez et al., 2016; Samara et al., 2015), and it was also considered by the students surveyed. Given this item, the students found that lack of energy could constitute a barrier to the practice of PA, preceded as already mentioned by lack of time and lack of motivation.

The support of parents and friends is considered as essential to encourage students to practice PA (King et al., 2014). The present study showed that students perceive that they have the support of family and friends to practice PA. Therefore, this was not considered a barrier for the students surveyed, although other studies reveal lack of social support (Martínez-Lemos et al., 2014).

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University students, in comparison with the population of the same age group, have more access to resources such as gyms or sports complexes (Miller, Noland, Rayens, & Staten, 2008). However, they do not take advantage of these resources to increase the practice of PA (Keating et al., 2005). For this reason, it makes perfect sense that the item 'lack of resources' has not been evidenced by the respondents.

Conclusions

The increase in PA levels of university students is a social necessity, and interventions in this area should focus on female students and develop strategies to break the most frequent barriers.

Time management training, intracurricular PA integration or the creation of accredited programs can be analysed in future interventions. In universities in which PA has been incorporated into curricular study plans, statistically significant improvements have been shown in the level of PA practice and, consequently, an impact on students' health (Warren & Odenheimer Brin, 2017).

Higher education institutions should undertake a key role in promoting student health, by implementing actions to reduce their students' inactivity, developing the transmission of information about the health benefits related to the practice of PA, so that university students have the opportunity to make informed decisions about PA, develop more positive attitudes towards PA and choose a more active lifestyle.

Some limitations should be considered. Firstly, this study included only one university, so constraints should be considered in generalising the results to the entire university population in Portugal. Secondly, it should be noted that the results presented are based on data collected by self-report, so it may be distorted regarding the difficulty in distinguishing the different levels of activity or underestimating or overestimating the PA done. Thirdly, it should not be forgotten that the barriers to the practice of PA may not correspond to all the barriers considered by students and that they can be excuses and not exactly barriers. Finally, considering that social desirability is always present in this type of research methodology. However, the application of a questionnaire in paper-pencil format and in the classroom can

contribute to the reduction of this type of bias. **Conflicts of interest:** The author declare no conflict of interest.

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