

## Socio-demographic correlates of leisure time physical activity among Portuguese adults

Correlatos sociodemográficos da prática de atividade física de portugueses adultos nos momentos de lazer

Factores sociodemográficos de la actividad física en el tiempo de ocio de los adultos portugueses

Adilson Marques <sup>1</sup>  
João Martins <sup>1,2</sup>  
Hugo Sarmiento <sup>3</sup>  
Madalena Ramos <sup>4</sup>  
José Diniz <sup>1</sup>  
Francisco Carreiro da Costa <sup>1,5</sup>

### Abstract

*This study aimed to identify socio-demographic correlates of leisure time physical activity among Portuguese adults. Subjects aged 31-60 years (1,076 males, 1,383 females) were categorized into two groups according to recommended physical activities ranging from  $\geq 10$  or  $< 10$  MET.hours.week<sup>-1</sup>. Leisure time physical activity data was self-reported, including activities, duration of each session and frequency. Chi-square and logistic regression analyses were applied to the results. Among men, having a high socioeconomic status (OR = 1.89; 95%CI: 1.30-2.76;  $p = 0.001$ ) was associated with attaining the recommended level of physical activity. For women, middle education levels were associated with physical activity (OR = 1.36; 95%CI: 1.01-1.85). Moreover, middle socioeconomic status (OR = 1.45; 95%CI: 0.80-1.91;  $p = 0.009$ ) was also positively associated with meeting physical activities recommendations in the unadjusted analysis. Men and women had different patterns of socio-demographic correlates. An intervention designed to improve the levels of physical activity among Portuguese adults may take these correlates into account.*

*Leisure Activities; Motor Activity; Adult*

### Resumo

*O objetivo do estudo foi identificar os correlatos sociodemográficos associados à atividade física dos adultos portugueses nos momentos de lazer. Sujeitos com idades entre os 31-60 anos (1.076 homens, 1.383 mulheres) foram categorizados como fisicamente ativos ou pouco ativos, de acordo com as recomendações da atividade física ( $\geq 10$  MET.horas/semana ou  $< 10$  MET.horas/semana). A atividade física foi autorreportada. O teste do qui-quadrado e regressões logísticas foram aplicados aos dados. Para os homens, um estatuto socioeconômico elevado estava associado ao cumprimento das recomendações da atividade física (OR = 1,89; IC95%: 1,30-2,76;  $p = 0,001$ ). Para as mulheres, o nível educacional médio (OR = 1,36; IC95%: 1,01-1,85) e um estatuto socioeconômico médio (OR = 1,45; IC95%: 0,80-1,91;  $p = 0,009$ ) estavam associados a cumprir as recomendações da atividade física. Homens e mulheres apresentaram diferentes correlatos associados à prática de atividade física. Intervenções com o objetivo de melhorar os níveis de atividade física devem considerar os diferentes correlatos identificados.*

*Atividades de Lazer; Atividade Motora; Adulto*

<sup>1</sup> Faculdade de Motricidade Humana, Universidade de Lisboa, Lisboa, Portugal.

<sup>2</sup> Unidade de Investigação e Desenvolvimento em Educação e Formação, Universidade de Lisboa, Lisboa, Portugal.

<sup>3</sup> Research Center in Sports Sciences, Health Sciences and Human Development, University Institute of Maia, Maia, Portugal.

<sup>4</sup> Instituto Universitário de Lisboa, Centro de Investigação e Estudos de Sociologia, Lisboa, Portugal.

<sup>5</sup> Faculdade de Educação Física e Desporto, Universidade Lusófona de Humanidades e Tecnologias, Lisboa, Portugal.

#### Correspondence

A. Marques  
Centro Interdisciplinar de Estudo da Performance Humana, Faculdade de Motricidade Humana, Universidade de Lisboa, Estrada da Costa, Cruz Quebrada / Lisboa 1499-002, Portugal.  
[amarques@fmh.ulisboa.pt](mailto:amarques@fmh.ulisboa.pt)

## Introduction

The importance of physical activity (PA) on health is well established. PA can protect against health problems such as cardiovascular disease<sup>1</sup>, diabetes<sup>2</sup>, obesity<sup>3</sup>, osteoarthritis<sup>4</sup>, mortality<sup>5</sup>, cancers<sup>6</sup>, metabolic syndrome<sup>7</sup>, and mental problems<sup>8</sup>. Therefore promoting engagement in regular PA is considered an important step for public health, preventing a wide range of chronic diseases<sup>2,9</sup>.

Despite evidence of the health benefits of PA, many people do not exercise enough to benefit their health<sup>10,11</sup>. Furthermore, PA levels tend to decrease with age<sup>10</sup>, which means that older ages are at risk. Knowing that the percentage of the Portuguese population engaged in regular PA is among the lowest in the European Union<sup>10,11,12</sup>, it is important to understand the related factors of PA. The study of correlates of PA in Portugal is particularly important because in the past decades Portugal has undergone a demographic transition, going from a predominately rural country to one where most of the population lives in urban areas. Therefore, it is important to understand the habits of the people that are now living in urban areas and the correlates of PA participation.

A better understanding of the contributing factors of PA is critical in designing effective intervention programs. Moreover, increasing the PA levels of Portuguese people is also important for the prevention of overweight and obesity, since the rate of overweight and obesity among the Portuguese population is amongst the highest in the European Union<sup>13,14</sup>.

In spite of a growing emphasis on the importance of PA in promoting health, factors related to PA among Portuguese adults remains unclear. PA is a multi-faceted behavior influenced by environmental, psychological, social and demographic variables. The study on non-modifiable socio-demographic variables, such as age and gender, suggest that some groups of adults are more likely to have lower PA levels and are in more need of interventions or that the interventions must be more tailored towards the specific characteristics of these groups<sup>15,16</sup>. Other socio-demographic variables, such as socioeconomic status (SES) have shown mixed findings with regard to PA<sup>17,18,19,20</sup>. Since quantitative research that explores the correlates of PA is still rather limited among Portuguese adults, this study aimed to identify the socio-demographic correlates that explain the recommended PA level among Portuguese adults.

## Methods

### Participants

Participants took part in an on-going study of their lifestyles as parents, teachers and school staff from seven schools in the Lisbon Metropolitan Area. The study was related to schooling, physical education and the promotion of active lifestyles. It was a population-based study investigating factors associated with physical activity in children, adolescents, their parents, teachers, and school staff. Schools were randomly selected. A questionnaire was distributed to 4,687 adults aged 31-60 years. Of the 4,687 adults who received the questionnaire, 2,780 replied (representing a response rate of 59.3%). Among the 2,780 respondents, a number were dropped from the analysis for the following reasons: 120 had missing gender data, 57 reported physical limitations to practicing PA, 69 did not report information related to SES, and 75 had missing data for educational levels. The final sample was made up of 2,459 adults (1,076 male and 1,383 female) aged 31-60 years (43.4±6.1). The study was conducted according to ethical standards in sport and exercise science research<sup>21</sup>, and received approval from both the Ethics Council of the Faculty of Human Kinetics at the University of Lisbon and the Portuguese Data Protection Authority. Informed written consent was obtained from each participant.

### Measures of physical activity

Leisure time PA (LTPA) was assessed by a self-report questionnaire. All participants were asked to report the details of their LTPA, including the activities, duration of each session, and frequency (number of sessions per week). In total, there were 22 activities adapted from Telama et al.<sup>22</sup>. The test-retest reliability of the LTPA activities was carried out within a one-week interval across 100 participants. These participants were recruited from among teachers, staff and students' parents. They were approached after attending a parent meeting at the school and asked to voluntarily fill out the questionnaire. One week later, when they went to school to attend another meeting, they were asked to fill out the same questionnaire again. Using intra-class correlation coefficient (ICC), the reliability was high (ICC = 0.90 to 0.95). A metabolic equivalent (MET) value was assigned to each reported LTPA, as used in previous studies<sup>23,24</sup>. The activities were classified as light (< 3 METs), moderate (3-6 METs) and vigorous (> 6 METs)<sup>25</sup>. Based on the recommendation of Centers for Disease Con-

trol and Prevention (CDC)/American College of Sports Medicine (ACSM) <sup>26</sup>, the participants were considered to have met the recommended PA levels if they reported engaging in moderate PA (MPA)  $\geq 5$  days per week for  $\geq 30$  minutes each day and/or vigorous PA (VPA)  $\geq 3$  days per week for  $\geq 20$  minutes each day, or both, achieving at least 10 MET-minute.hr.wk<sup>-1</sup>. Those participants who reported some activity, but at a lower level than that recommended, were classified as not meeting the recommendation.

### Socio-demographic variables

Socio-demographic variables included gender, age, SES and education levels. Age was classified in age-groups as follows: 31-40, 41-50, and 51-60 years old. SES was based on occupation and educational level. Occupation titles were regrouped in order to classify the subjects as lower, middle, and upper class. The lower class included skilled and unskilled manual workers, farmers, and fishermen; the middle class included service occupations, such as nonprofessional health service workers, office clerks, and salespeople; the upper class comprised business-owners, executives, university-educated specialists and professionals <sup>27</sup>. Education level was based on the Portuguese educational system and grouped into three categories: 9 years of education or less (lower), 10-12 years of education (middle), and more than 12 years (high).

### Procedures

Self-administered questionnaires were completed by school teachers, school staff members and parents. After completing the informed written consent form, teachers and members of staff received an envelope containing a questionnaire and a letter explaining the purpose of the study. They were asked to complete the questionnaire and return it within two days. For the parents, students were asked to take home two envelopes (one for the father and one for the mother) each containing a questionnaire; a letter explaining the objectives of the study, instructions for completing the questionnaire; and an informed written consent form. After completing the informed written consent form and the questionnaire, parents put them inside the envelopes and sealed them. The students then returned their parents' sealed envelopes and gave them to the research team. After receiving the questionnaires, the data was added to a data base for analysis.

### Statistical analysis

Bivariate relationships between PA (meeting PA recommendation vs. not meeting PA recommendation), age, SES, and educational level were tested using the chi-square test. The effects of each independent variable (age groups, SES, and educational level) on the categories of LTPA were assessed by logistic regression. Unadjusted and adjusted odds ratios (OR) with 95% confidence intervals (95%CI) were calculated. For the unadjusted model, PA was tested against each independent variable. Adjustments were then made for all studied variables and the model was also adjusted for body mass index (BMI). The OR was calculated against the reference categories of subjects aged 31-40 years old, lower SES, and those with basic education. An OR greater than one reflects an increased likelihood of the recommended level of PA. The analyses were stratified by gender. All statistical analysis was performed using IBM SPSS Statistics 20.0 (IBM Corp., Armonk, USA). The significance level was set at 0.05.

### Results

The general sample characteristics are presented in Table 1. The proportion of the total subjects who achieved the recommended PA levels in their LT (MPA  $\geq 5 \times 30$  min/wk and/or VPA  $\geq 3 \times 20$  min/wk, or both, achieving at least 10 MET-minute.hr.wk<sup>-1</sup>) was 31.8%. Most of the respondents were 41-50 years of age (52.5%), which is understandable, because many had children attending elementary and secondary schools; 32.2%, 36.8%, and 30.9% were classified as having a lower, middle and high SES, respectively; 55.4% reported lower education levels, 21.6% had graduated from high school, and 23% had a university degree.

Table 2 shows the comparison of socio-demographic characteristics and correlates of LTPA between the two groups with different levels of LTPA according to the PA recommendations. The subjects who met PA recommended guidelines in leisure time accounted for a large percentage in the highest SES for men ( $\chi^2(2) = 13.238$ ,  $p = 0.001$ ) and middle SES for women ( $\chi^2(2) = 8.350$ ,  $p = 0.015$ ). In addition, among women, those who met the PA recommendations were likely to have a lower education level ( $\chi^2(2) = 7.389$ ,  $p = 0.025$ ). There were no significant differences related to age for either genders.

Table 3 shows the results of the unadjusted logistic regression analysis. For men, those with high SES ( $p < 0.001$ ) had a significantly higher

tendency of meeting PA recommendations. For women, middle SES ( $p = 0.009$ ), and middle level of education ( $p = 0.007$ ) had a 45% and a 47% greater chance of meeting PA recommendations during leisure time, respectively.

Table 4 presents the results of the adjusted regression analysis. For men, having a high SES remained significant after adjusting variables, a 93% greater chance of being physically active at the recommended level than those with low SES ( $p = 0.001$ ). For women, those with middle education levels had a 41% greater chance of being physically active at the recommended level than those with lower education levels ( $p = 0.032$ ), and having a middle educational level increased the likelihood of meeting PA guidelines by 34% more than those with lower educational levels.

## Discussion

The current study examined the link between socio-demographic factors and engagement in the recommended PA level for Portuguese adults. From the results, three main findings were identified. First, age was not significantly related with PA, which differed from what was found in previous studies<sup>10,16,17</sup>. High SES for men and middle SES for women were linked to meeting PA recommendations, confirming that SES is a significant correlate of PA<sup>17,19</sup>. Third, educational levels were only related with meeting the PA recommendation for women. Though not related to the main goal of the study, it was also found that 31.8% of the study participants were physically active and achieved the PA recommended levels during leisure time, similar to findings observed

Table 1

General characteristics of the study population by gender.

Characteristic	Total (N = 2,459) n (%) or Mean±SD	Men (n = 1,076) n (%) or Mean±SD	Women (n = 1,383) n (%) or Mean±SD
Age	43.3±6.1	44.2±6.1	42.6±6.0
Age groups (years)			
31-40	858 (34.9)	308 (28.6)	550 (39.8)
41-50	1,291 (52.5)	601 (55.9)	690 (49.9)
51-60	310 (12.6)	167 (15.5)	143 (10.3)
Weight (kg)	70.6±14.2	79.2±13.3	63.9±10.8
Height (m)	1.7±0.1	1.7±0.1	1.6±0.1
BMI	25.5±4.2	26.3±4.0	24.8±4.1
SES			
Lower	794 (32.3)	384 (35.7)	410 (29.6)
Middle	905 (36.8)	345 (32.1)	560 (40.5)
High	760 (30.9)	347 (32.2)	413 (29.9)
Education level			
Lower	1,362 (55.4)	593 (55.2)	769 (55.6)
Middle	532 (21.6)	235 (21.8)	297 (21.5)
High	565 (23.0)	248 (23.0)	317 (22.9)
Physical activity			
Do not meet the recommendations	1,678 (68.2)	734 (68.2)	944 (68.3)
Meet the recommendations	781 (31.8)	342 (31.8)	439 (31.7)

BMI: body mass index; SD: standard deviation; SES: socioeconomic status.

in developed countries<sup>16,28,29</sup>, but higher than in some developing countries<sup>23,24</sup>. This difference may reflect the availability of and accessibility to PA recreational activities in developed countries, since LTPA is not common in developing countries<sup>30</sup>.

From the preliminary analysis of data, men are not more active than women, unlike other

studies which showed that women were less likely to engage in PA that meets the guidelines<sup>16,28,29</sup>. This result is interesting and suggests that the difference between men and women observed in other studies, may be related to PA in the workplace and while commuting.

In contrast to other studies, which found that participation in PA decreases with age<sup>16,17,31</sup>, a

Table 2

Characteristics of subjects according to physical activity classification by gender.

Characteristic	Men		p-value	Women		p-value
	Do not meet the recommendations (%)	Meet the recommendations (%)		Do not meet the recommendations (%)	Meet the recommendations (%)	
Age groups (years)			0.672			0.317
31-40	29.5	26.9		39.7	39.9	
41-50	55.0	57.6		50.7	48.1	
51-60	15.5	15.5		9.5	12.0	
SES			0.001			0.015
Lower	38.8	28.9		31.3	26.2	
Middle	32.0	32.3		37.9	46.0	
High	29.2	38.9		30.8	27.8	
Education level			0.125			0.025
Lower	57.3	50.6		57.7	51.0	
Middle	20.8	24.0		19.6	25.5	
High	21.9	25.4		22.7	23.5	

SES: socioeconomic status.

Table 3

Associations between socio-demographic and physical activity.

Explanatory variables	Meeting physical activity recommendations			
	Men		Women	
	Unadjusted OR (95%CI)	p-value	Unadjusted OR (95%CI)	p-value
Age groups (years)				
31-40	1.00 (reference)		1.00 (reference)	
41-50	1.15 (0.85-1.54)	0.373	0.94 (0.74-1.20)	0.640
51-60	1.09 (0.73-1.64)	0.673	1.26 (0.86-1.85)	0.235
SES				
Lower	1.00 (reference)		1.00 (reference)	
Middle	1.35 (0.98-1.86)	0.067	1.45 (1.10-1.91)	0.009
High	1.79 (1.31-2.45)	< 0.001	1.08 (0.80-1.45)	0.637
Education level				
Lower	1.00 (reference)		1.00 (reference)	
Middle	1.30 (0.94-1.79)	0.108	1.47 (1.11-1.95)	0.007
High	1.31 (0.96-1.79)	0.091	1.17 (0.88-1.55)	0.272

95%CI: 95% confidence interval; OR: odds ratio; SES: socioeconomic status.

significant association was not found between age and recommended PA levels. Knowing that certain age groups could skew the results, those who were over 60 years of age were removed from the sample (since they were more likely to have already retired). This was necessary because there have been mixed reports about the relationship between age and LTPA, with some studies find-

ing an increase of LTPA after the aforementioned age<sup>12,23</sup>, whereas others show a decrease<sup>32,33</sup>. The absence of the association between age and meeting recommended PA levels could reflect the types of employment the subjects had and the context in which they lived. It is known that people who live in urban areas face considerable economic pressure, and have time constraints,

Table 4

Adjusted odds ratio for physical activity among Portuguese adults.

Explanatory variables	Meeting physical activity recommendations			
	Men		Women	
	Adjusted OR (95%CI)	p-value	Adjusted OR (95%CI)	p-value
Age groups (years)				
31-40	1.00 (reference)		1.00 (reference)	
41-50	1.16 (0.84-1.60)	0.377	0.94 (0.72-1.22)	0.462
51-60	1.12 (0.73-1.72)	0.596	1.46 (0.97-2.21)	0.095
SES				
Lower	1.00 (reference)		1.00 (reference)	
Middle	1.22 (0.85-1.75)	0.275	1.41 (1.03-1.79)	0.032
High	1.93 (1.31-2.84)	0.001	1.01 (0.71-1.45)	0.951
Education level				
Lower	1.00 (reference)		1.00 (reference)	
Middle	1.29 (0.90-1.83)	0.162	1.34 (0.97-1.84)	0.044
High	0.86 (0.58-1.28)	0.463	1.17 (0.84-1.63)	0.356

95%CI: 95% confidence interval; OR: odds ratio; SES: socioeconomic status.

Note: analyses were adjusted for body mass index.

regardless of age. Although differences among age groups were not found, some differences could have been noticed due to the fact that age is related to different stages of life. Usually, young adults (31-40) have good biological function and their physical performance is not limited<sup>34</sup>. Therefore, it was expected they would also have higher levels of PA. Most middle age adults are experiencing the demands of a growing family as well as an increase in body fat, and are more focused on their jobs. These facts could lead to a decrease in the levels of PA. Some years later, during later middle-age, women reach the menopause, men reduce their output of sex hormones and, for men and women career opportunities have commonly peaked. This could also lead to a decline of PA.

Data from this study indicates that, among men, low SES respondents were less likely to meet the PA recommendations in leisure time. This finding is consistent with a number of studies that indicated that the highest prevalence of physical inactivity is among lower SES adults<sup>17,19</sup>.

However, this is contrary to findings among young Portuguese individuals, where the influence of SES on adolescents' self-reported PA was not found<sup>18</sup>. Our findings support the hypothesis that higher SES adults are more likely to follow preventive programs and health-promoting behavior, whether due to greater motivation or access to resources. On the other hand, women with middle SES were more likely to meet the rec-

ommendation for PA in leisure time than those from low and high SES. This confirms that people with low SES have a limited ability to control their PA in the face of inaccessible environments<sup>19,35</sup>. With regard to women with high SES, one can only speculate that they generally have high control, high daily demands and long work hours, which might therefore reduce their time available for LTPA.

Educational levels were not associated with meeting PA recommendations for men, but were for women. This result is not consistent with previous investigations which showed that participants who achieved a higher educational level showed lower prevalence of a sedentary lifestyle<sup>12,17</sup>. Nevertheless, results from Japan are similar to this Portuguese study for men and women<sup>29</sup>, despite the variance in cultural practices. Among women, the results showed that the most educated were more likely to attain the recommended PA levels. However, the same is not seen among men. Because this factor has a different effect on men and women, attention should be given to developing intervention programs which aim to increase PA participation. These factors confirm Varo et al.<sup>12</sup>, which stated that the correlation between PA and education level is not entirely understood.

Although environmental correlations were not explored in this study, the literature has shown that factors such as neighborhood crime and safety rates, aesthetics, and accessibility of

recreational facilities are related to LTPA<sup>15,36</sup>. These findings highlight the importance of supportive environments for LTPA and emphasize the need to incorporate factors at multiple levels of influence in interventions to promote PA<sup>37</sup>. It is expected that the intervention would be different in rural and urban areas, however, although environments differ between rural and urban areas, the correlates of LTPA are similar among both urban and rural populations<sup>38</sup>. Furthermore, unfortunately the instrument used for data collection did not allow us to differentiate week day and weekend PA, though the potential for variability does exist. On weekends, men and women spend less time on low-intensity PA, and men spend more time on moderate PA than they do on weekdays<sup>39</sup>. PA patterns on weekends are different than on weekdays and might be related with walking to work, which is associated with overall higher levels of PA among adults<sup>40</sup>.

The current investigation had a number of limitations. The analysis was cross-sectional, thereby making it impossible to determine cause and effect. PA was self-reported rather than objectively measured, which means the results could be subject to bias. In addition, the study focused only on LTPA and did not include activities at work, in the home or while commuting. Individuals who are inactive during leisure time may be more active in other contexts. The use of

only four socio-demographic variables is also a limitation, because there are other variables that could help to characterize the study population, such as, nationality, ethnicity, skin colour, marital status and neighborhood location. Nonetheless, the four variables used are the most important for the Portuguese context. Finally, this study was conducted in an urban area, and thus the results cannot be extrapolated to other populations, particularly adults from rural areas.

## Conclusion

In summary, significant correlates of attaining the recommended levels of PA were observed. For men, having a high SES was associated with meeting the recommended level of PA in leisure time. For women, having a middle SES was related to achieving the recommended PA level during leisure time. Moreover, men and women had different patterns of SES by education level. The findings of this study contribute additional evidence to the literature on the multivariate factors associated with PA behavior. Future studies should require that more correlates be observed in the literature, the potential of PA, and, concomitantly, that specific domains of PA, such as commuting, activity at work and housework be analyzed.

## Resumen

*Este estudio tuvo como objetivo identificar los correlatos sociodemográficos de la actividad física, realizada durante el tiempo libre, en adultos portugueses. Los participantes con edades entre 31 y 60 años (1.079 hombres, 1.383 mujeres) fueron categorizados en dos grupos, de acuerdo con las recomendaciones de actividad física ( $\geq 10$  MET.horas/semana ou  $< 10$  MET.horas/semana). La actividad física fue auto-reportada. Se ha aplicado el análisis de regresión logística y el chi-cuadrado. Los hombres que tienen un alto estatus socioeconómico (OR = 1,89; IC95%: 1,30-2,76;  $p = 0,001$ ) se asociaron con la consecución del nivel recomendado de actividad física. Para las mujeres, el nivel de educación medio (OR = 1,36; IC95%: 1,01-1,85) y el estado socioeconómico medio (OR = 1,45; IC95%: 0,80-1,91;  $p = 0,009$ ) se asoció con la actividad física. Hombres y mujeres tienen diferentes patrones de correlatos socio-demográficos. Una intervención diseñada para mejorar los niveles de actividad física entre los adultos portugueses podrá adoptar dichas correlaciones en cuenta.*

*Actividades Recreativas; Actividad Motora; Adulto*

## Contributors

A. Marques participated in the design, data analysis and drafting the article. J. Martins contributed in the design and drafting the article. H. Sarmiento collaborated on data analysis and writing the article. M. Ramos contributed to the data and statistical analyses and writing the article. J. Diniz and F. C. Costa participated in the acquisition and analysis of the data, drafting the article and critically revising it for important intellectual content.

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## References

1. Hamer M, Chida Y. Active commuting and cardiovascular risk: a meta-analytic review. *Prev Med* 2008; 46:9-13.
2. Zhang X, Geiss LS, Caspersen CJ, Cheng YJ, Engelgau MM, Johnson JA, et al. Physical activity levels and differences in the prevalence of diabetes between the United States and Canada. *Prev Med* 2010; 50:241-5.
3. Chau JY, van der Ploeg HP, Merom D, Chey T, Bauman AE. Cross-sectional associations between occupational and leisure-time sitting, physical activity and obesity in working adults. *Prev Med* 2012; 54:195-200.
4. Egan BA, Menten JC. Benefits of physical activity for knee osteoarthritis: a brief review. *J Gerontol Nurs* 2010; 36:9-14.
5. Manini TM, Everhart JE, Patel KV, Schoeller DA, Colbert LH, Visser M, et al. Daily activity energy expenditure and mortality among older adults. *JAMA* 2006; 296:171-9.
6. Anzuini F, Battistella A, Izzotti A. Physical activity and cancer prevention: a review of current evidence and biological mechanisms. *J Prev Med Hyg* 2011; 52:174-80.
7. LaMonte MJ, Barlow CE, Jurca R, Kampert JB, Church TS, Blair SN. Cardiorespiratory fitness is inversely associated with the incidence of metabolic syndrome: a prospective study of men and women. *Circulation* 2005; 112:505-12.



8. Penedo FJ, Dahn JR. Exercise and well-being: a review of mental and physical health benefits associated with physical activity. *Curr Opin Psychiatry* 2005; 18:189-93.
9. Lee IM, Sesso HD, Oguma Y, Paffenbarger Jr. RS. Relative intensity of physical activity and risk of coronary heart disease. *Circulation* 2003; 107:1110-6.
10. European Commission. Sport and physical activity. Brussels: Directorate-General for Education and Culture, Directorate-General for Communication, European Commission; 2014.
11. Baptista F, Santos DA, Silva AM, Mota J, Santos R, Vale S, et al. Prevalence of the Portuguese population attaining sufficient physical activity. *Med Sci Sports Exerc* 2012; 44:466-73.
12. Varo JJ, Martinez-Gonzalez MA, De Irala-Estevéz J, Kearney J, Gibney M, Martinez JA. Distribution and determinants of sedentary lifestyles in the European Union. *Int J Epidemiol* 2003; 32:138-46.
13. Sardinha LB, Santos DA, Silva AM, Coelho-e-Silva MJ, Raimundo AM, Moreira H, et al. Prevalence of overweight, obesity, and abdominal obesity in a representative sample of Portuguese adults. *PLoS One* 2012; 7:e47883.
14. Organisation for Economic Co-operation and Development. Health at a glance 2013. Paris: OECD Publishing; 2013.
15. Bauman AE, Reis RS, Sallis JF, Wells JC, Loos RJ, Martin BW. Correlates of physical activity: why are some people physically active and others not? *Lancet* 2012; 380:258-71.
16. Belanger M, Townsend N, Foster C. Age-related differences in physical activity profiles of English adults. *Prev Med* 2011; 52:247-9.
17. Dias-da-Costa JS, Hallal PC, Wells JC, Daltoe T, Fuchs SC, Menezes AM, et al. Epidemiology of leisure-time physical activity: a population-based study in southern Brazil. *Cad Saúde Pública* 2005; 21:275-82.
18. Mota J, Silva G. Adolescent's physical activity: association with socio-economic status and parental participation among a Portuguese sample. *Sport, Education and Society* 1999; 4:193-9.
19. Wilson DK, Kirtland KA, Ainsworth BE, Addy CL. Socioeconomic status and perceptions of access and safety for physical activity. *Ann Behav Med* 2004; 28:20-8.
20. Kamphuis CB, van Lenthe FJ, Giskes K, Huisman M, Brug J, Mackenbach JP. Socioeconomic differences in lack of recreational walking among older adults: the role of neighbourhood and individual factors. *Int J Behav Nutr Phys Act* 2009; 6:1.
21. Harriss DJ, Atkinson G. Update: ethical standards in sport and exercise science research. *Int J Sports Med* 2011; 32:819-21.
22. Telama R, Naul R, Nupponen H, Rychtecky A, Vuolle P. Physical fitness, sporting lifestyles, and Olympic ideals: cross-cultural studies on youth sport in Europe. Schorndorf: International Council of Sport Science and Physical Education; 2002.
23. Chen YJ, Huang YH, Lu FH, Wu JS, Lin LL, Chang CJ, et al. The correlates of leisure time physical activity among an adults population from southern Taiwan. *BMC Public Health* 2011; 11:427.
24. Trinh OT, Nguyen ND, Dibley MJ, Phongsavan P, Bauman AE. The prevalence and correlates of physical inactivity among adults in Ho Chi Minh City. *BMC Public Health* 2008; 8:204.
25. Ainsworth BE, Haskell WL, Herrmann SD, Meckes N, Bassett Jr. DR, Tudor-Locke C, et al. 2011 compendium of physical activities: a second update of codes and MET values. *Med Sci Sports Exerc* 2011; 43:1575-81.
26. Haskell WL, Lee IM, Pate RR, Powell KE, Blair SN, Franklin BA, et al. Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Med Sci Sports Exerc* 2007; 39:1423-34.
27. Raudsepp L, Viira R. Sociocultural correlates of physical activity in adolescents. *Pediatr Exerc Sci* 2000; 12:51-60.
28. Burton NW, Turrell G. Occupation, hours worked, and leisure-time physical activity. *Prev Med* 2000; 31:673-81.
29. Shibata A, Oka K, Nakamura Y, Muraoka I. Prevalence and demographic correlates of meeting the physical activity recommendation among Japanese adults. *J Phys Act Health* 2009; 6:24-32.
30. Ku PW, Fox KR, McKenna J, Peng TL. Prevalence of leisure-time physical activity in Taiwanese adults: results of four national surveys, 2000-2004. *Prev Med* 2006; 43:454-7.
31. Santos R, Aires L, Santos P, Ribeiro JC, Mota J. Prevalence of overweight and obesity in a Portuguese sample of adults: results from the Azorean Physical Activity and Health Study. *Am J Hum Biol* 2008; 20:78-85.
32. Lagerros YT, Belloc R, Adami HO, Nyren O. Measures of physical activity and their correlates: the Swedish National March Cohort. *Eur J Epidemiol* 2009; 24:161-9.
33. Martin SB, Morrow Jr. JR, Jackson AW, Dunn AL. Variables related to meeting the CDC/ACSM physical activity guidelines. *Med Sci Sports Exerc* 2000; 32:2087-92.
34. Bongard V, McDermott AY, Dallal GE, Schaefer EJ. Effects of age and gender on physical performance. *Age* 2007; 29:77-85.

35. Estabrooks PA, Lee RE, Gyurcsik NC. Resources for physical activity participation: does availability and accessibility differ by neighborhood socioeconomic status? *Ann Behav Med* 2003; 25:100-4.
36. Rech CR, Reis RS, Hino AA, Hallal PC. Personal, social and environmental correlates of physical activity in adults from Curitiba, Brazil. *Prev Med* 2014; 58:53-7.
37. Sallis JF, Cervero RB, Ascher W, Henderson KA, Kraft MK, Kerr J. An ecological approach to creating active living communities. *Annu Rev Public Health* 2006; 27:297-322.
38. Solomon E, Rees T, Ukoumunne OC, Metcalf B, Hillsdon M. Personal, social, and environmental correlates of physical activity in adults living in rural south-west England: a cross-sectional analysis. *Int J Behav Nutr Phys Act* 2013; 10:129.
39. Buchowski MS, Acra S, Majchrzak KM, Sun M, Chen KY. Patterns of physical activity in free-living adults in the Southern United States. *Eur J Clin Nutr* 2004; 58:828-37.
40. Audrey S, Procter S, Cooper AR. The contribution of walking to work to adult physical activity levels: a cross sectional study. *Int J Behav Nutr Phys Act* 2014; 11:37.

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