Socio-demographic correlates of physical activity among European older people

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Abstract From a public health perspective, identifying factors related to attaining the physical activity (PA) recommendations is important in order to identify subgroups for intervention programs. The aim of this study is to identify the socio-demographic correlates of attaining the recommended levels of PA in the older European population. Using data from the European Social Survey round 6, PA and socio-demographic characteristics were collected from 10,148 participants (4556 men, 5592 women), aged 65 years and over, from 28 countries in 2012. PA was assessed using the question “On how many of the last

seven days did you walk quickly, do sports, or other PA for 30 min or longer?” and meeting PA guidelines was assessed using World Health Organization criteria. Overall, 59.7% of the participants attained the PA-recommended levels. The likelihood of attaining PA recommendations was higher among older people with higher education levels ($p < 0.05$; $p < 0.01$; $p < 0.001$). Men who lived in a town or small city ($p < 0.05$) and lived in a rural area ($p < 0.001$) were more likely to attain the PA recommendations. Women who lived with a partner were more likely to attain the PA recommendations ($p < 0.001$). Promotion of PA is critical to health among older people; therefore, intervention programs must consider these socio-demographic factors when planning an increase in PA.

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Introduction

The older population is considered as a vulnerable group susceptible to developing multiple medical problems (Wasson 2008). Physical activity (PA) is known to have an inverse association with all-cause mortality, cardiovascular diseases, and cancer mortality among older people (Wu et al. 2015). Furthermore, PA may decelerate the progress of bone loss (Savelle et al. 2015), have a positive effect on cognitive functions (Frederiksen et al. 2015), and have a potentially important positive role in the prevention of depression in the older population (Bhamani et al. 2015). Although regular PA presents multiple benefits for older people, many are not sufficiently active (Berkemeyer et al. 2016; Bohm et al. 2015; Oka and Shibata 2012).

Due to the wide variety of benefits of PA for health, it is recommended that older adults aged 65 and above should engage in at least 150 min of moderate-intensity aerobic PA throughout the week (30 min 5 days per week), or do at least 75 min of vigorous-intensity aerobic PA, to promote health (European Union 2008; WHO 2010).

From a public health perspective, determining the proportion of people attaining the PA recommendations, and identifying factors related to attaining those recommendations, is essential to better understand participation in PA and especially to develop programmes against poor PA participation. To develop intervention programs, it is important to study the socio-demographic characteristics related to PA (e.g. sex, age, education level, living location, partnership status, the presence or absence of children in the home, household size, citizenship, and household income) because this can help to identify subgroups for intervention programs (Bauman et al. 2012; Belanger et al. 2011; Kamphuis et al. 2009; Marques et al. 2014). Therefore, the purpose of this study is to identify the socio-demographic correlates of attaining the recommended levels of PA of the older European population. This study uses a comprehensive sample of 28 European countries, which enables the advancement of the knowledge of the socio-demographic correlates of PA for older adults and provides a European picture of these correlates.

Methods

Study design and participants

The present study is based on data from the European Social Survey (ESS) round 6, 2012, including 28 European countries and Israel (Albania, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Israel, Italy, Kosovo, Lithuania, Netherlands, Norway, Poland, Portugal, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, and the UK). The ESS measures the attitudes, beliefs, and behaviour of European people.

Probability sampling from all residents aged 15 years and older was applied in all countries, comprising 54,673 participants. For this study, only Europeans of ages 65 years old and above were selected (without an upper age limit). Participants under 65 years old ($n = 43,894$), living in Israel (since Israel is not a European country) ($n = 464$), and those who did not report at least four socio-demographic characteristics ($n = 167$) were excluded, resulting in a final sample of 10,148 participants (4556 men, 5592 women) with mean age 73.42 ± 6.48 (men, 73.06 ± 6.23 ; women, 73.72 ± 6.66).

Procedures

The ESS uses a multi-stage probability cluster sampling design to provide national representative samples. The multi-stage probability cluster sampling is a method whereby the sampling is carried out in stages, using smaller sampling units at each stage. In each stage, the sample is divided into groups and a number of participants are selected. The groups formed in each stage are always subgroups of the groups formed in the previous stage. The number of stages used varies from country to country depending on the reliability of the lists of residents that are available for social research and the reliability of the list of buildings or addresses that are available for social research. According to national options, participants were sampled by means of postal code address files, population registers, social security register data, or telephone books. In the sampling procedure, statistical precision was kept the same for all countries, notwithstanding the difference in the method used for a specific country. In each country, information was collected using a questionnaire (European Social Survey 2012) completed through an hour-long face-to-face interview.

Measures

Physical activity PA data were assessed with a single item asking, “On how many of the last seven days did you walk quickly, do sports, or other PA for 30 min or longer?” Even though PA was assessed with a single item, there is evidence that a single question is an acceptable alternative to PA questionnaires (Gill et al. 2012; Milton et al. 2011; Wanner et al. 2014). Participants were classified as having or not having attained the recommended level of PA according to the World Health Organization (WHO 2010) criteria of ≥ 30 min of at least moderate PA on five or more days per week. As the item used to assess PA did not take into account vigorous intensity, the vigorous-intensity part of the recommendations was not assessed.

Socio-demographic characteristics Sex and age were reported by the participants. The ESS data provide two variables of education attainment: the recoded variable that focuses on levels of education achieved and years of full time education. For the analysis, the level of education achieved was chosen because the population can be grouped according to education level (Carlson et al. 2010; Marques et al. 2014). Participants were then classified as: less than high school, high school education, and superior education. In order to determine the living place, participants were asked to report whether they lived in a big city, a suburb/outskirts of a big city, a town or small city, a country village, or a home in the countryside. Those who responded that they lived in a big city, or the suburbs/

Table 1 Participants' socio-demographic characteristics and physical activity

	Total (<i>n</i> = 10,148) <i>n</i> (%)	Men (<i>n</i> = 4556) <i>n</i> (%)	Women (<i>n</i> = 5592) <i>n</i> (%)	<i>p</i>
Education level ^a				<0.001
Less than high school	2738 (27.2)	1084 (24.0)	1654 (29.8)	
High school	5951 (59.1)	2679 (59.3)	3272 (59.0)	
Superior education	1381 (13.7)	757 (16.8)	624 (11.2)	
Living place ^a				0.007
Urban areas	3033 (30.0)	1299 (28.6)	1734 (31.1)	
Town or small city	3199 (31.6)	1429 (31.5)	1770 (31.7)	
Rural areas	3888 (38.4)	1812 (39.9)	2076 (37.2)	
Partnership status ^a				<0.001
Live without partner	3914 (38.7)	999 (22.0)	2915 (52.2)	
Live with partner	6212 (61.3)	3546 (78.0)	2666 (47.8)	
Children living at home ^a				0.002
No	8400 (82.8)	3831 (84.1)	4569 (81.7)	
Yes	1748 (17.2)	724 (15.9)	1023 (18.3)	
Members of household ^a				
1 person	2953 (29.1)	803 (17.6)	2150 (38.5)	
2 people	5576 (55.0)	2998 (65.8)	2578 (46.1)	
3–4 people	1210 (11.9)	571 (12.5)	640 (11.4)	
≥5 people	407 (4.0)	184 (4.0)	224 (4.0)	<0.001
Citizenship status ^a				0.338
National	9924 (97.8)	4449 (97.7)	5475 (98.0)	
Immigrant	220 (2.2)	106 (2.3)	114 (2.0)	
Household income ^a				<0.001
1st to 3rd decile	3945 (46.9)	1463 (37.6)	2482 (55.0)	
4th to 7th decile	3475 (41.3)	1864 (47.9)	1610 (35.7)	
8th to 10th decile	8405 (82.8)	566 (14.5)	418 (9.3)	
PA in the last 7 days (≥30 min/day) ^b				<0.001
None	1379 (13.6)	516 (11.3)	863 (15.4)	
1 day	415 (4.1)	206 (4.5)	209 (3.7)	
2 days	685 (6.7)	323 (7.1)	362 (6.5)	
3 days	857 (8.4)	404 (8.9)	453 (8.1)	
4 days	751 (7.4)	369 (8.1)	382 (6.8)	
5 days	928 (9.1)	446 (9.8)	481 (8.6)	
6 days	696 (6.9)	356 (7.8)	341 (6.1)	
7 days	4437 (43.7)	1936 (42.5)	2500 (44.7)	
PA recommendations ^a				0.489
Not attaining PA-recommended level	4087 (40.3)	1817 (39.9)	2269 (40.6)	
Attaining PA-recommended level	6061 (59.7)	2738 (60.1)	3322 (59.4)	
Health perception ^a				0.001
Very bad	335 (3.3)	116 (2.5)	219 (3.9)	
Bad	1623 (16.0)	593 (13.0)	1030 (18.4)	
Fair	4266 (42.0)	1847 (40.6)	2419 (43.4)	
Good	3072 (30.3)	1556 (34.2)	1515 (27.2)	
Very good	835 (8.2)	439 (9.6)	396 (7.1)	

PA physical activity

Attaining physical activity-recommended level means ≥30 min of at least moderate physical activity, 5 or more days per week

^a Tested by χ^2 ^b Tested by Mann–Whitney test

outskirts of a big city, were grouped into a new category: urban areas. Those who indicated that they lived in a country village, or in a home in the countryside, were grouped into the category rural areas. Respondents were asked to describe whether they live with or without a husband/wife/partner, and their legal status. This variable was dichotomized into live with or without a partner. Participants reported whether they lived with or without children at home, and the number of people living regularly as a member of the household. In each country, participants were questioned about whether they were national citizens or immigrants. Participants were asked to describe their household's total income, after tax and compulsory deductions, from all sources. The response options were ten different cards, each one corresponding to one decile. Using this data, 1st to 3rd decile, 4th to 7th decile, and 8th to 10th were organized to create three groups.

Health perception Health perception was assessed with a single-item question. Participants were asked, "How is your health in general?" The response options were: very bad, bad, fair, good, or very good.

Statistical analysis

Descriptive statistics were calculated for all variables. For men and women, socio-demographic characteristics and PA were compared using the Mann–Whitney test and χ^2 test. Because men and women were significantly different in almost all variables, the subsequent analyses were stratified by sex. Interaction effect between sex and the socio-demographic variables was calculated with the F test. χ^2 test and Fisher's exact test tested bivariate relationships between PA (not attaining the PA-recommended level versus attaining the PA-recommended level) and socio-demographic variables. Binary logistic regression analysis was conducted in order to analyse the effects that socio-demographic variables had on attaining PA-recommended levels. The binary logistic regression analysis was adjusted for age, health perception, and countries. Statistical analysis was performed using IBM SPSS Statistics 22. The significance level was set at $p < 0.05$.

Results

Overall, 59.7% of the participants attained the PA-recommended levels, and 43.7% participated in PA every day of the week (at least 30 min/day) (Table 1).

Table 2 presents the prevalence of attaining PA-recommended levels for men and women by country. The highest prevalence of attaining the PA recommendations was for Albania (77.2%) and the lowest prevalence was for Kosovo (41.9%). Significant differences between men and

Table 2 Prevalence of attaining PA recommendations for men and women by country

	Percentage attaining PA recommendations			p^a
	Total	Men	Women	
Albania	77.2	73.1	85.1	0.084
Belgium	67.0	66.5	67.5	0.914
Bulgaria	65.2	65.4	62.9	0.604
Switzerland	65.0	64.3	64.9	1.000
Cyprus	63.2	65.1	61.4	0.648
Czech Republic	53.9	50.9	59.0	0.200
Germany	65.1	60.3	67.2	0.081
Denmark	62.4	61.6	62.4	0.916
Estonia	61.0	63.8	59.2	0.286
Spain	42.9	51.6	35.8	0.003
Finland	59.3	58.8	59.6	0.860
France	70.0	71.4	70.8	0.915
UK	63.0	64.2	62.7	0.722
Hungary	52.2	44.6	54.5	0.073
Ireland	59.6	65.2	58.2	0.181
Iceland	51.2	50.3	47.6	0.854
Italy	45.2	42.2	47.4	0.555
Lithuania	42.4	38.4	40.2	0.743
Netherlands	66.7	72.8	64.5	0.081
Norway	62.1	65.4	58.9	0.270
Poland	64.7	59.5	67.5	0.138
Portugal	46.5	52.9	43.4	0.040
Russian Federation	47.6	53.0	42.9	0.110
Sweden	65.1	59.8	70.5	0.021
Slovenia	68.3	68.9	67.7	0.893
Slovakia	73.3	70.3	83.9	0.009
Ukraine	58.9	52.0	59.6	0.181
Kosovo	41.9	39.5	25.5	0.124

PA physical activity

^a Tested by Fisher's exact test

women were found for four countries. More men than women attained the PA recommendations for Spain (men: 51.6, women: 35.8, $p = 0.003$) and Portugal (men: 52.9, women: 43.4, $p = 0.040$). The opposite was found for Sweden (men: 59.8, women: 70.5, $p = 0.021$) and Slovakia (men: 70.3, women: 83.9, $p = 0.009$).

The estimated prevalence of attained PA-recommended levels is presented in Table 3. The proportion of people attaining the PA recommendations was higher for higher education levels (men: $\chi^2(2) = 22.732$, $p < 0.001$; women: $\chi^2(2) = 117.117$, $p < 0.001$) and higher household income deciles (men: $\chi^2(2) = 13.235$, $p = 0.001$; women: $\chi^2(2) = 50.588$, $p < 0.001$). Among those living with a partner, a higher percentage of people attained PA-recommended levels than among those living without a

Table 3 Estimated prevalence of attained physical activity-recommended levels, according to World Health Organization, by socio-demographic characteristics

	Men		Women	
	Percentage attaining PA-recommended level (<i>n</i> = 2738)	<i>p</i>	Percentage attaining PA-recommended level (<i>n</i> = 3322)	<i>p</i>
Education level ^a		<0.001		<0.001
Less than high school	54.0		48.5	
High school	61.9		64.0	
Superior education	62.6		64.4	
Living place ^a		<0.001		0.450
Urban areas	56.5		59.7	
Town or small city	59.1		58.2	
Rural areas	63.4		60.2	
Partnership status ^a		0.008		<0.001
Live without partner	56.5		53.8	
Live with partner	61.1		65.5	
Children living at home ^a		0.72		0.172
No	60.2	8	59.8	
Yes	59.5		57.5	
Members of household ^a		0.026		<0.001
1 person	55.6		54.4	
2 people	61.1		63.6	
3–4 people	60.0		59.2	
≥5 people	64.1		59.6	
Citizenship status ^b		0.021		0.334
National	60.4		59.5	
Immigrant	49.1		54.9	
Household income ^a		0.001		<0.001
1st to 3rd decile	57.4		55.3	
4th to 7th decile	61.9		65.0	
8th to 10th decile	65.5		68.0	

PA physical activity

Attaining physical activity-recommended level means ≥30 min of at least moderate physical activity, 5 or more days per week

^a Tested by χ^2 ^b Tested by Fisher's exact test

partner (men: $\chi^2(1) = 7.075$, $p = 0.008$; women: $\chi^2(1) = 78.586$, $p < 0.001$). Women who had two members of the household and men who had five or more members of the household presented a significantly higher percentage of people attaining PA recommendations (men: $\chi^2(3) = 9.233$, $p = 0.026$; women: $\chi^2(3) = 40.742$, $p < 0.001$). The proportion of men attaining the PA recommendations was higher for national citizens than for immigrants ($\chi^2(1) = 5.530$, $p = 0.021$). Also, men who lived in rural areas attained the PA recommendations levels more than those who lived in urban areas and small towns or cities (men: $\chi^2(2) = 15.606$, $p < 0.001$).

Table 4 presents the results from the binary logistic regression analyses predicting the attainment of the PA recommendations. Men who had completed high school (OR 1.31, 95% CI 1.11–1.55, $p < 0.01$) and had superior education (OR 1.27, 95% CI 1.01–1.60, $p < 0.05$) were more likely to attain the PA-recommended levels, when compared with having completed less than high school. Also, men living in a town or small city (OR 1.23, 95% CI 1.04–1.46, $p < 0.05$) and living in a rural area (OR 1.50, 95% CI 1.27–1.77, $p < 0.001$) were more likely to attain the PA-recommended levels, when compared to living in an urban area. Furthermore, men with five or more

Table 4 Binary logistic regression predicting the attainment of the physical activity-recommended level by the European older population and interaction effect between sex and the socio-demographic variables

	Attaining the PA-recommended level OR (95% CI)		Interaction effect with sex ^a F
	Men	Women	
Education level			7.477**
Less than high school	1.00 ref.	1.00 ref.	
High school	1.31 (1.11–1.55)**	1.60 (1.38–1.85)***	
Superior education	1.27 (1.01–1.60)*	1.47 (1.16–1.86)**	
Living place			2.069
Urban areas	1.00 ref.	1.00 ref.	
Town or small city	1.23 (1.04–1.46)*	1.01 (0.86–1.18)	
Rural areas	1.50 (1.27–1.77)***	1.12 (0.96–1.31)	
Partnership status			16.154***
Live without partner	1.00 ref.	1.00 ref.	
Live with partner	0.78 (0.54–1.14)	1.38 (1.06–1.80)*	
Children living at home			4.495*
No	1.00 ref.	1.00 ref.	
Yes	0.71 (0.45–1.10)	1.28 (0.93–1.77)	
Members of household			2.424
1 person	1.00 ref.	1.00 ref.	
2 people	1.35 (0.90–2.03)	0.82 (0.62–1.08)	
3–4 people	1.62 (0.85–3.09)	0.70 (0.45–1.08)	
≥5 people	2.80 (1.34–5.84)**	0.71 (0.41–1.24)	
Citizenship status			0.136
National	1.00 ref.	1.00 ref.	
Immigrant	0.66 (0.43–1.01)	0.74 (0.48–1.13)	
Household income			0.855
1st to 3rd decile	1.00 ref.	1.00 ref.	
4th to 7th decile	1.10 (0.95–1.29)	1.17 (1.00–1.36)*	
8th to 10th decile	1.18 (0.94–1.48)	1.21 (0.95–1.55)	

Analysis was adjusted for age, country, and health perception

PA physical activity, OR odds ratio, CI confidence interval

Attaining the physical activity-recommended level means ≥30 min of at least moderate physical activity, 5 or more days per week

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

^a Tested by F test

household members (OR 2.80, 95% CI 1.34–5.84, $p < 0.01$) were more likely to attain the PA recommendations than men living alone.

Women who completed high school (OR 1.60, 95% CI 1.38–1.85, $p < 0.001$) and had superior education (OR 1.47, 95% CI 1.16–1.86, $p < 0.001$) were also more likely to attain the PA-recommended levels, when compared with having completed less than high school. Additionally, attaining PA recommendations was more likely for women: living with a partner (OR 1.38, 95% CI 1.06–1.80, $p < 0.001$), and with household income from the 4th to the 7th decile (OR 1.17, 95% CI 1.00–1.36, $p < 0.01$), when compared with the reference categories (OR 1.00).

Interaction effects were found between sex and education level ($F(2) = 7.477$, $p = 0.001$), partnership status

($F(1) = 16.154$, $p < 0.001$), and children living at home ($F(1) = 4.495$, $p = 0.034$).

Discussion

This study sought to identify the associations between socio-demographic factors and attaining the PA recommendations for older people among the European population. Overall, 59.7% of the older people attained the PA-recommended levels. Older people with higher educational level, living in rural areas, living with a partner, and higher household income were more likely to attain the PA recommendations.

Previous research shows that the prevalence of attaining PA recommendations among older people is considered low,

only 18.4% (Bohm et al. 2015), 18.7% (Berkemeyer et al. 2016), and 47.4% (Oka and Shibata 2012). However, our findings suggest a much higher prevalence of attaining the PA recommendations (59.7%). These discrepancies could be related to the item used to assess PA and to classify participants into attaining or not attaining the PA recommendations. The item used in this study did not take into account the vigorous-intensity part of the recommendations, allowing only the assessment of the moderate-intensity aspect of the recommendations, while other studies used accelerometers (Berkemeyer et al. 2016), pedometers (Oka and Shibata 2012), and physical activity questionnaires (Bohm et al. 2015) to assess PA. Also, great differences were found between European countries, suggesting different patterns of PA participation across Europe.

Higher education level was positively associated with attaining the PA-recommended levels; women with household income from the 4th to the 7th decile were more likely to attain the PA recommendations than women with lower household income. These findings are similar to other studies that showed that higher educational attainment and higher economic status were associated with greater participation in PA among older adults (Mesters et al. 2014; Saito et al. 2013). It is possible that higher educational and economic levels are related to other factors that could explain the association found, such as access to facilities, knowledge about PA, or transportation. European older people with higher educational and economic levels possibly have better access to exercise facilities, proper transportation to those facilities, and better knowledge about PA health benefits, thereby increasing PA participation. In fact, previous studies found that good access to exercise facilities, owning motor vehicles (Saito et al. 2013), and having more knowledge about PA advantages (Mesters et al. 2014), are associated with higher PA levels. Although these factors were not examined in this study, they should be examined further in future research, as they may be related to PA participation among older adults. Our findings regarding economic level were only significant for women, and the association between attaining the PA recommendations and education level was stronger for women than for men. Because older men engage more in sporting activities than women (Moschny et al. 2011), it is possible that women practice more PA related to health club activities. These activities may have higher costs than sporting activities, making them more accessible for higher economic level women. Also, higher education level could be related to higher income. Therefore, it is plausible that higher education level has a stronger association with PA for women than for men. Conversely, among Swedish middle-aged and older women, the likelihood of engaging in higher total daily PA levels decreased with educational level (Orsini et al. 2007). This finding could be related to

the participation of middle-aged women in the study, which are probably still working and have fewer opportunities to engage in PA. Also, women with higher education levels may have more demanding jobs and thus less time available to participate in PA. The influence of education and economic levels in PA participation among older people is still inconclusive. Nonetheless, we find a trend for a positive association between these variables. Therefore, older people from lower educational and economic levels should be considered as priority group for interventions.

Women who lived with a partner were more likely to attain the PA recommendations than women who lived without a partner. Men with five or more members of the household were more likely to attain the PA recommendations than men living alone; nonetheless, the interaction effect between sex and household members was not significant. Interpersonal relationships may influence PA participation through providing social support and establishing social norms that hamper or facilitate health-promoting behaviours (Silva et al. 2013). In fact, a previous study showed that older people who had the company of family or friends to engage in PA had a higher prevalence of attaining the recommendations of PA in leisure (Bohm et al. 2015). Partnership status was only associated with PA for women, and for men it did not matter whether they lived with or without a partner. This may be related to a greater independence that older men living alone have, in some cultures, when compared to women. Although social factors appear to impact PA, the findings of this study should be considered carefully due to the wide cultural variance existing in Europe.

Men living in a town or small city, and living in a rural area, were more physically active than men living in an urban area; however, for women the effect was weaker and not significant. A previous study found that rural residents had more total PA than urban residents, mainly because of PA in the household (Fan et al. 2014). While for women it is possible that regardless of the living place, they mainly do the household work inside the house. Information regarding the relationship of living place and PA participation is scarce. Therefore, more studies on this subject are needed to advance the knowledge base, in order to better identify specific subgroups for intervention programs.

To our knowledge, while there are few intervention studies for the high-risk subgroups, such as low socioeconomic status and education level (De Bourdeaudhuij et al. 2011; De Coen et al. 2012; Lonsdale et al. 2016), some have yielded positive results. However, none of them focused on older adults. Aside from the great importance of PA participation for health (Bhamani et al. 2015; Fredriksen et al. 2015; Savelle et al. 2015) and the positive associations between PA and several quality-of-life domains (functional capacity; general quality of life;

autonomy; past, present and future activities; death and dying; intimacy; mental health; vitality; and psychological) (Vagetti et al. 2014), among those over 65 years old, PA is also strongly associated with reduced health services use and costs (Woolcott et al. 2010). While, in this study, more than a half of the older people reported the attainment of the PA recommendations, there is still much room for improving the current PA participation levels. Therefore, specific intervention programs that aim to increase the PA participation levels among this population are needed, since improvements can be realized in physical health, cognitive health, and financial costs associated with health.

This study contributes to the knowledge regarding factors related to PA participation among European older people and further advances the development of specific PA intervention programs for older people. The ESS database includes a large and representative sample size of several European countries, as well as several socio-demographic variables to characterize the study sample, thereby making this study representative of the European population.

One of the limitations of this study is that PA was self-reported which could be a subject to bias. Self-reported PA estimates are usually greater than objective measures (Tucker et al. 2011) and may be overestimated because of social desirability (Sallis and Saelens 2000). Notwithstanding, social desirability has been shown to account for only a small variance in PA (Motl et al. 2005), and this particular self-reported single-item measure has been shown to be a valid screening tool to assess PA (Milton et al. 2011). The validity of this measure, however, is better among young people (Wanner et al. 2014). It is recommended that older adults should engage in at least 150 min of moderate-intensity aerobic PA throughout the week or do at least 75 min of vigorous-intensity aerobic PA, to promote health (WHO 2010). In this study, the item used to assess PA, and to classify participants into having or not having attained the recommended level of PA, did not take into account the vigorous-intensity part of the recommendations, allowing only the assessment of the moderate-intensity aspect of the recommendations. The ESS round 6 did not have detailed information regarding health profile, which would be important to adjust the analyses. Also, there was no data regarding the participants' weight status, which would be of importance since weight status is related to PA (Carlson et al. 2010). Another limitation was the cross-sectional design of the study, making it impossible to determine cause and effect.

Conclusion

In summary, men and women present different socio-demographic correlates of PA. Educational level was the only common correlate of PA for men and women, as positive

associations were found between attaining the PA recommendations and higher educational level. This suggests that older adults with low economic level are a risk group regarding PA participation. These findings contribute additional evidence to the literature on the multivariate socio-demographic factors associated with PA behaviour and provide important information for decision makers and intervention program developers.

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Compliance with ethical standards

Conflict of interest The authors declare that there are no conflicts of interest.

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