



Participation in Physical Activity is Associated with Well-being in European University Students

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Abstract

This study's objective was to analyse the associations between physical activity (PA) and well-being in a representative sample of European university students. This cross-sectional study was based on data from the European Social Survey round 6, 2012, comprising 3,143 European university students (1456 men and 1687 women) from 27 countries, with a mean age of 21.3±2.9 years. Socio-demographic data, PA, health perception, and the six dimensions of well-being were self-reported. Men reported practising PA more often than women did (4.4±2.2 versus 4.1 ± 2.2, $p<0.001$) and had better health perception (4.2±0.7 versus 4.1 ± 0.8, $p<0.001$) and total well-being score (5.5±1.2 versus 5.2 ± 1.3, $p<0.001$). PA frequency was linearly associated with health perception ($p<0.001$) as well as the overall well-being score ($p<0.001$). There is a positive association between PA and the well-being of European university students. This emphasizes the importance of PA in the university students' lifestyle and the need to develop programmes that reduce physical inactivity.

Keywords: exercise, active lifestyle, health, epidemiology, young adults



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Introduction

The regular practice of physical activity (PA) is known to function as a preventive factor for several diseases, such as obesity, diabetes, anxiety, and depression, thus contributing to the improvement of health (Rhodes et al., 2017). However, despite its benefits, a large part of the population does not practice enough PA to impact their health (Baptista et al., 2012; Hallal et al., 2012; Marques et al., 2015). Late

adolescence and the beginning of adulthood are critical age groups concerning participation in PA (Baptista et al., 2012; Hallal et al., 2012; Marques & Gaspar de Matos, 2014). Between the ages of 18 and 24, the prevalence of achieving PA guidelines recommendations decreases rapidly (Grim et al., 2011). Recently, a research study comprising 23 countries showed that 40% of university students were physically inactive (Pengpid et al., 2015).

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The transition from high school to university and the beginning of university life is a defining moment in the student's life and is composed of several changes at different levels, including physical and psychological well-being (Arnett, 2000; Bray & Born, 2004; Deforche et al., 2015; Gall et al., 2000). Although aware of the benefits of PA and the consequences of physical inactivity (Poobalan et al., 2012), university students have significantly high levels of physical inactivity (Pengpid et al., 2015; Poobalan et al., 2012), which seems to indicate that, in most cases, they are not prepared for the transition from a system in which practising PA is mandatory, as in secondary school, to one in which PA participation becomes a voluntary and individual responsibility, as in the university (Poobalan et al., 2012).

For adults, well-being is associated with attaining PA recommendations (Marques et al., 2016). Furthermore, among university students, regular PA is associated with higher levels of happiness and well-being (Dias et al., 2008), and those who are insufficiently active have higher levels of fatigue and lower levels of vigour (Bray & Born, 2004). Even though it is an important aspect of life, well-being has not been consistently explored (Engberg et al., 2015), and little is known about its association with PA in university students. Additionally, monitoring PA trends in younger adults becomes relevant in understanding factors such as attitudes and knowledge about health benefits, which may be associated with significantly low PA levels. Thus, the objective of this study was to analyse the associations between PA and well-being in a representative sample of European university students.

Methods

Participants and Procedures

The sample was obtained from the European Social Survey (ESS) round 6 database, which includes data from 28 European countries (Albania, Germany, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Hungary, Iceland, Ireland, Italy, Kosovo, Lithuania, Norway, Netherlands, Poland, Portugal, Russian Federation, Sweden, Switzerland, United Kingdom) and Israel. The ESS measures the attitudes, beliefs, and behaviours of the European population; its essential purpose is to raise the standards of rigour in transnational research.

The initial sample consisted of 54,673 participants aged 15 years or over. The following were excluded: (1) participants less than 18 and over 65 years of age, since the recommendations were different for these age groups; (2) participants who were not students and were older than 30 years old due to the target population to be studied; residents of Israel, because it is not a European country; (4) participants who did not report information on more than two socio-demographic variables. The final sample consisted of 3,143 participants (1456 men and 1687 women) with a mean age of 21.3 ± 2.9 years old.

ESS uses proportional and representative samples from European countries, and participants were selected by means of postcode, population records, social security record data, or telephone directories. In the sampling procedure, statistical precision was maintained for all countries. Data was collected through a questionnaire, completed during a face-to-face interview lasting approximately one hour, which included items related to health, citizenship,

socio-demographic issues, socioeconomic issues, and PA. The questionnaire was translated by experienced translators into the corresponding language of each country. The study protocol subscribes to the Declaration on Professional Ethics of the International Statistical Institute.

Measures

Well-being

The personal and social well-being model of ESS round 6 uses 32 items that comprise six distinct dimensions, already described elsewhere (ESS, 2015; Michaelson et al., 2009). Using this model, the ESS enables collecting more detailed information on personal and social well-being through a set of response items, which allows for more detailed policy implications to be made within an area that remains relevant in debates throughout Europe (Jeffrey et al., 2015). These items and their response ranges are present in Table 1, and the aggregation of the items is described in the data analysis section.

Physical Activity and health perception

Participation in PA was assessed using the question "On how many of the last 7 days you were physically active continuously for 20 minutes or longer?" Health perception was measured through the question "How does it characterize its current state of health?" Responses were given on a 4-point Likert scale, ranging from 1 (very bad) to 4 (very good).

Socio-demographic characteristics

Participants were asked about their age, sex, marital status, household members, income and living place. Marital status was dichotomized into living with a partner or living without a partner. The household income was determined based on deciles. Using these data and to create three groups, participants were clustered as followed: 1st to 3rd deciles, 4th to 7th deciles and 8th to 10th deciles. To determine the living place, participants were asked to report if they lived in a large city, in the suburbs or surroundings of a large city, a village or small town, a village or a country house. Participants who indicated that they lived in a large city, in the suburbs or surroundings of a large city were grouped into a new category called "urban area"; participants who reported living in a village or country house were grouped into a new category called "rural area".

Data analysis

The aggregation of the well-being items in the six dimensions started with the standardization of the items, as proposed in the ESS (ESS, 2015; Michaelson et al., 2009). Using the standardized items, a principal component analysis was performed, with Varimax rotation, to group the items with the highest correlation among themselves in different domains. The components' saturation did not allow the creation of components according to the literature (ESS, 2015; Michaelson et al., 2009). Therefore, a reliability analysis was performed on the standardized items of each of the components; alphas were from $\alpha = 0.7$ to 0.9 (see Table 1).

Posteriorly, these dimensions were aggregated into a total well-being z-score. To facilitate the interpretation of the well-being dimensions and the total score, a transformation metric was performed, which maps the z-scores for each in-

Table 1. Items from the well-being ESS module grouped by the dimension they are relate to

Dimensions	ESS survey items	Response range	α
Evaluative well-being	How satisfied with life as a whole	0 (extremely dissatisfied) to 10 (extremely satisfied)	0.8
	How happy are you	0 (extremely unhappy) 10 (extremely happy)	
Emotional well-being	Felt sad, how often past week	1 (almost none of the time) to 4 (almost all of the time)*	0.9
	Felt depressed, how often past week	1 (almost none of the time) to 4 (almost all of the time)*	
	Enjoyed life, how often past week	1 (almost none of the time) to 4 (almost all of the time)	
	Were happy, how often past week	1 (almost none of the time) to 4 (almost all of the time)	
	You felt anxious, how often past week	1 (almost none of the time) to 4 (almost all of the time)*	
	You felt calm and peaceful, how often past week	1 (almost none of the time) to 4 (almost all of the time)	
Functioning	Free to decide how to live my life	1 (disagree strongly) to 5 (agree strongly)	0.7
	Little chance to show how capable I am	1 (disagree strongly) to 5 (agree strongly)*	
	Feel accomplishment from what I do	1 (disagree strongly) to 5 (agree strongly)	
	Interested in what you are doing	0 (none of the time) to 10 (all of the time)	
	Absorbed in what you are doing	0 (none of the time) to 10 (all of the time)	
	Enthusiastic about what you are doing	0 (none of the time) to 10 (all of the time)	
	Feel what I do in life is valuable and worthwhile	1 (disagree strongly) to 5 (agree strongly)	
	Have a sense of direction	0 (not at all) to 10 (completely)	
	Always optimistic about my future	0 (none of the time) to 10 (all of the time)	
	There are lots of things I feel I am good at	1 (disagree strongly) to 5 (agree strongly)	
	In general feel very positive about myself	1 (disagree strongly) to 5 (agree strongly)	
	Vitality	Felt everything took effort, how often past week	
Sleep was restless, how often past week		1 (almost none of the time) to 4 (almost of the time)*	
Could not get going, how often past week		1 (almost none of the time) to 4 (almost of the time)*	
Had lot of energy, how often past week		1 (almost none of the time) to 4 (almost of the time)	
Community well-being	Most people can be trusted	0 (can't be too careful) to 10 (most can be trusted)	0.7
	People try to take advantage	0 (most try to take advantage) to 10 (most try to be fair)*	
	Most of the time, people are helpful	0 (mostly don't) to 10 (mostly try to be helpful)	
	Feel people in local area help one another	0 (not at all) to 6 (a great deal)	
	Feel close to the people in local area	1 (disagree strongly) to 5 (agree strongly)	
Supportive well-being	People you can discuss intimate matters	0 (none) to 5 (10 or more)	0.9
	Feel appreciated by those you are close to	0 (not at all) to 10 (completely)	
	Receive help and support	0 (not at all) to 6 (completely)	
	Felt lonely, how often past week	1 (almost none of the time) to 4 (almost all of the time)*	

Note. * Inverted item.

dicator from 0 to 10, where “0” represents the minimum, and “10” represents the maximum, the “5” corresponds to the mean for the sample (Michaelson et al., 2009). This transformation is described in the following formula:

$$t_i = (Z_i \times 5) / (Z_i \times m_i + C_i) + 5$$

$$M_i = (\min_i + \max_i) / (\min_i - \max_i)$$

$$C = (\min_i \times \max_i \times 2) / (\max_i - \min_i)$$

Descriptive statistics (mean, standard deviation and frequencies) were calculated for all variables. The Student's t-test and Chi-square test were performed to analyse differences between the sexes. Due to the significant differences between men and women in several variables, subsequent analyses were stratified by sex. Associations between the frequency of PA in the previous seven days with health perception and well-being were examined with multivariate linear regression models. Analyses were adjusted for all the socio-demographic variables. Statistical analyses were performed using the IBM SPSS Statistics 22 software, and a

significance level was defined at $p < 0.05$.

Results

The participants' characteristics are presented in Table 2. Most European university students lived without a partner (91.5%), had three to four household members (53.3%) and lived in an urban area (40.7%) or in a town or city (31.6%). On average, men practised PA more often than women did (men: 4.4 ± 2.2 , women: 4.1 ± 2.2 ; $p < 0.001$). In addition, men had a slightly better health perception (men: 4.2 ± 0.7 , women: 4.1 ± 0.8 , $p < 0.001$) and total well-being score (men: 5.5 ± 1.2 , women: 5.2 ± 1.3 , $p < 0.001$) than women did.

Table 3 presents the results of multivariate linear regression for the relationship between PA frequency with health perception and well-being. Overall, PA frequency was linearly related to most dimensions of well-being, except for community well-being, to the well-being total score ($\beta = 0.06$, 95%CI: 0.04 to 0.09, $p < 0.001$), and health perception ($\beta = 0.05$,

Table 2. Participants' socio-demographic characteristics

	Total (n=3143)	Men (n=1456)	Women (n=1687)	p
	n (%) or M±SD	n (%) or M±SD	n (%) or M±SD	
Age	21.3±2.9	21.3±2.9	21.3±2.9	0,908 ^a
Partnership status				<0,001 ^b
Living with a partner	267 (8,5)	81 (5,6)	186 (11,0)	
Living without a partner	2875 (91,5)	1361 (93,5)	1482 (87,8)	
Members of household				<0,001 ^b
1 person	397 (12,3)	218 (15,0)	170 (10,1)	
2 people	531 (16,9)	191 (13,1)	339 (20,1)	
3-4 people	1674 (53,3)	814 (55,9)	860 (51,0)	
≥5 people	551 (17,5)	233 (16,0)	318 (18,8)	
Household income				0,790 ^b
1 st to 3 rd decile	660 (21,0)	316 (21,7)	344 (20,4)	
4 th to 7 th decile	861 (27,4)	406 (27,9)	455 (27,0)	
8 th to 10 th decile	579 (18,4)	266 (18,39)	313 (18,5)	
Living Place				0,014 ^b
Urban area	1279 (40,7)	603 (41,4)	676 (40,1)	
Town or small city	993 (31,6)	485 (33,3)	508 (30,1)	
Rural areas	868 (27,6)	367 (25,2)	501 (29,7)	
PA in the past 7 days (≥20 min/day)	4,2±2,2	4,4±2,2	4,1±2,2	<0,001 ^a
Health perception	4,1±0,8	4,2±0,7	4,1±0,8	<0,001 ^a
Well-being dimensions				
Evaluative well-being	5,8±2,0	5,8±1,9	5,8±2,1	0,828 ^a
Emotional well-being	5,5±1,7	5,7±1,6	5,3±1,7	<0,001 ^a
Functioning	5,2±1,3	5,3±1,2	5,1±1,3	<0,001 ^a
Vitality	5,3±1,5	5,5±1,4	5,2±1,5	<0,001 ^a
Community well-being	5,0±1,2	5,0±1,2	4,9±1,2	0,026 ^a
Supportive relationships	5,2±1,0	5,3±1,0	5,2±1,0	0,126 ^a
Well-being total score	5,3±1,3	5,5±1,2	5,2±1,3	<0,001 ^a

Note. M, mean; SD, standard deviation; PA, physical activity; a Tested by Student t-test; b Tested by Chi-square.

95%CI: 0.03 to 0.06, p<0.001). Regarding men, stronger associations were observed for the vitality (β=0.12, 95%CI: 0.08 to 0.16, p <0.001) and functioning (β=0.07, 95%CI: 0.04 to 0.11, p<0.001) dimensions and for the wellbeing total score (β=0.06, 95%CI: 0.03 to 0.10, p<0.01). For women, the strongest associations were found between PA and vitality (β=0.09, 95%CI:

0.05 to 0.12, p<0.001), evaluative wellbeing (β=0.09, 95%CI: 0.04 to 0.14, p<0.01) and the wellbeing total score (β=0.06, 95%CI: 0.03 to 0.10, p <0.01). For both men and women, health perception was linearly associated with PA frequency (men: β=0.05, 95%CI: 0.03 to 0.07, p<0.001; women: β=0.05, 95%CI: 0.03 to 0.06, p<0.001).

Table 3. Linear regression analyses for the relationship between PA with health perception and well-being in European university students

	Physical activity on the last 7 days		
	Total β (95% IC)	Men β (95% IC)	Women β (95% IC)
Health perception	0.05 (0.03, 0.06)***	0.05 (0.03, 0.07)***	0.05 (0.03, 0.06)***
Evaluative wellbeing	0.06 (0.02, 0.10)**	0.04 (-0.01, 0.10)	0.09 (0.04, 0.14)**
Emotional wellbeing	0.05 (0.02, 0.09)**	0.05 (0.01, 0.10)*	0.04 (-0.00, 0.09)
Functioning	0.07 (0.04, 0.09)***	0.07 (0.04, 0.11)***	0.05 (0.02, 0.09)**
Vitality	0.11 (0.08, 0.13)***	0.12 (0.08, 0.16)***	0.09 (0.05, 0.12)***
Community wellbeing	0.00 (-0.02, 0.02)	-0.03 (-0.06, 0.01)	0.03 (-0.01, 0.06)
Supportive relationships	0.03 (0.01, 0.05)**	0.04 (0.01, 0.06)**	0.02 (-0.01, 0.05)
Wellbeing total score	0.06 (0.04, 0.09)***	0.06 (0.03, 0.10)**	0.06 (0.03, 0.10)***

Note. CI, confidence interval; Analyses were adjusted for civil status, members of household, household income, living place; * p<0,05, ** p<0,01, *** p<0,001.

Discussion

This study examined the associations between PA with health perception and the well-being of European university students. Both the total well-being score and health perception were linearly associated with PA frequency. Additionally,

men reported practising PA more often than women and had better health perception and total well-being score.

Among university students, previous findings suggest that men are physically more active than women were (Molina-Garcia et al., 2011). In accordance with that, in this study,

men reported practising PA more often than women did. This finding is not restricted to the university student population as both young and adult men seem to practice more PA than women do.

PA frequency was linearly associated with a health perception and well-being for both sexes. Thus, European university students who practice PA more often seem to have better health perception and well-being. These results are similar to those of previous studies carried out in the adult population and reinforce the idea that practising PA is beneficial to the population's health and well-being (Marques et al., 2016). Furthermore, among university students practising PA more often is associated with benefits in psychological well-being and vitality (Molina-Garcia et al., 2011). This evidence should be viewed as relevant since well-being and health perceptions are important aspects of people's lives (Marques et al., 2016). In addition, well-being is an essential indicator of how people are faring with daily life, and it serves to inform decision-making and policy action in ways that impact people's daily lives (ESS, 2015; Michaelson et al., 2009).

At this stage of life, university students who tend to exhibit low PA and mental health levels (Pengpid et al., 2015; Weitzman, 2004) can be considered an at-risk group. Therefore, it is essential to build PA interventions focused on this population that benefit them physically and psychologically and promote their health and well-being.

The present study has limitations that are important to mention. Data were self-reported rather than objectively measured, which could be subject to bias. The cross-sectional methodology makes it impossible to infer conclusions about causal relations between the studied variables. PA was measured using questionnaires rather than directly (i.e., accelerometer). Despite the limitations, some aspects should be mentioned to highlight the strength of the study. The composition of the sample obtained through the ESS, both in terms of size and variety, is representative of several European countries. Due to the multidimensionality of well-being, the inclusion of various dimensions is recommended and allows the construction of a score that captures more than just life satisfaction (Michaelson et al., 2009).

In conclusion, this study's results suggest the existence of a positive association between PA and the well-being of young European university students. This emphasizes the importance of PA in the university students' lifestyle and the need to develop programmes that reduce physical inactivity.

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