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Public Health

journal homepage: www.elsevier.com/puhe

Original Research

Physical activity of university students with disabilities: accomplishment of recommendations and differences by age, sex, disability and weight status

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ARTICLE INFO

Article history:
Received 25 June 2018
Received in revised form
19 September 2018
Accepted 6 October 2018
Available online 19 November 2018

Keywords:
Exercise
People with disabilities
Physical activity
Sports
Public health

ABSTRACT

Objectives: This article aims to study physical activity and the achievement of World Health Organization physical activity recommendations in university students with disabilities, and to examine differences by sex, age, disability characteristics and weight status.
Study design: Cross-sectional data from a wider research project conducted at the Spanish universities from Autumn 2016 to Autumn 2017 were analysed.
Methods: The International Physical Activity Questionnaire-Short Form was administered to 1103 Spanish university students with different disabilities. Nonparametric tests were performed to examine the differences in physical activity based on the interest variables.
Results: The mean metabolic equivalent (MET)-minutes/week was 1772.75 (±2161.00) for total physical activity, 642.93 (±1303.08) for vigorous physical activity, 344.31 (±699.53) for moderate physical activity and 785.50 (±1053.31) for walking intensity physical activity. Overall, 72.2% of the participants did not meet the recommendation of 75 min/week of vigorous physical activity, 80.3% did not meet the recommendation of 150 min/week of moderate physical activity and 63.1% did not meet any of these recommendations. Nonparametric tests revealed that students with multiple disabilities, chronic illnesses, acquired disabilities, older students, obese students and women were less active than their counterparts.
Conclusions: A high number of participants did not meet the World Health Organization physical activity recommendations, and some subgroups were especially inactive. Public health policies should implement interventions to encourage people with disabilities to engage in physical activity, paying extra attention to the most inactive subgroups.

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https://doi.org/10.1016/j.puhe.2018.10.006
0033-3506/

Introduction

Physical inactivity has become one of the greatest public health problems of contemporary society and one of the most serious mortality risk factors around the world.[1] People with disabilities are especially inactive as compared with the general population[2,3] and are thus at greater risk of developing hypokinetic diseases and less likely to obtain the psychological and social benefits associated with physical activity.[4,5] Therefore, the promotion of physical activity in this group should be a major public health goal.[6–8] Especially relevant in this respect are the settings in which people with disabilities participate and can be effectively targeted. Potentially, one of the suitable settings to tailor physical activity promotion strategies is the university. However, despite inclusive policies at different levels being widely adapted by these institutions, progresses regarding adapted physical activity have been scarce. University students with disabilities have been found to be less active than their able-bodied peers, either on the campus[9] or in general settings.[10] The benefits of an active lifestyle for people with disabilities are well documented, and sports participation is one of the most important extracurricular activities at the university campuses. Therefore, it is important to study physical activity and their variations by sociodemographic variables in the population of university students with disabilities to identify the groups most in need of interventions.

Some studies have found that gender is an important correlate of physical activity among people with disabilities, because women frequently report less physical activity than men.[10–14] Age also seems to be an important factor affecting physical activity in this population. There is some evidence to show that older individuals are usually less active than younger ones,[14–17] while the type and severity of the disability have been found to be relevant aspects that could influence physical activity engagement. In this respect, Longmuir and Bar-or[18] found that young people with chronic illnesses were more active than those with physical disability, intellectual disability or visual impairment, whereas Lobenius-Palmér et al.[14] reported that the hearing-impaired group had the highest physical activity in a sample of young people with various types of disabilities. Other studies have found an association between higher injury severity and lower physical activity.[16,19,20]

Although research on this topic has increased in recent years, given its relevance to public health policies, more evidence is required, and few of the studies conducted have been on large samples. In the Spanish context, not many studies have focused on physical activity among people with disabilities. The purpose of this article was to help fill both these gaps, therefore two-fold: (a) to study physical activity and the achievement of the World Health Organization physical activity recommendations in a sample of Spanish university students with a variety of disabilities; and (b) to examine differences in physical activity based on sex, age, disability type, congenital/acquired disability, disability grade and weight status.

Methods

Participants and procedure

A sample of 1264 university students with disabilities participated in this cross-sectional survey as part of a wider project aiming to study physical activity, sedentary patterns and the sociodemographic, psychosocial and environmental factors influencing these behaviours. The disability care services of the different Spanish universities were first contacted to discuss ways of achieving the greatest possible number of students. As the universities' data protection policies prevented us from directly assessing the students, they were sent the survey by email by the disability care services. To be included in the sample, the following criteria were considered: (a) enrolled at a Spanish university; and (b) in possession of a disability certificate of at least 33%, which is the minimum level required by the Spanish government to grant social benefits. The digital survey was carried out through LimeSurvey (v. 2.05+), an open-source software which has been widely used in international research.[21,22] An email template explaining the purpose of the study and containing a link to the survey was compiled and submitted to the disability care services, from where it was then passed on to the students who met the inclusion criteria. Based on the data available from the services that agreed to participate in the study, it was estimated that an accessible population of 15,038 students from a population of 20,695 enrolled at Spanish universities during the fieldwork period (Autumn 2016 to Autumn 2017). It was determined that 997 participants were needed for a statistically valid sample size (confidence level = 95%; population proportion = 50%; margin of error = 3%). After excluding 161 respondents, who reported extremely atypical physical activity time or had missing data on physical activity measurement, 1103 participants remained for the analyses (see Fig. 1).

When the students accessed the survey, they were directed to the informed consent form, which explained the participation conditions (e.g. voluntary and anonymous participation, confidentiality, right to refuse or abandon). The participants then gave their written informed consent by clicking on the appropriate box. The procedures and materials used in the study were approved by the Ethics Committee of the University of Valencia.

Variables and instruments

The demographic data collected included information on sex, age, disability type (physical, sensory, mental disorder, chronic illness or multiple disabilities; and congenital or acquired) and disability grade. The Spanish version of the International Physical Activity Questionnaire-Short Form was used to measure physical activity (total physical activity, vigorous physical activity, moderate physical activity and walking intensity physical activity). As in Rosenberg et al.,[23] the questionnaire statements were modified to be also inclusive of activities in which people using a wheelchair engage (e.g, vigorous activities including wheelchair racing or handbiking, moderate

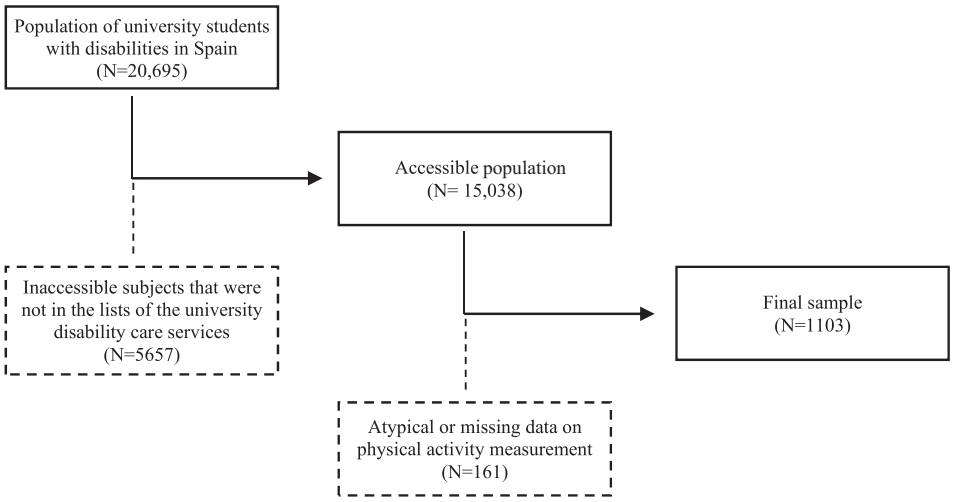

Fig. 1 – A flow diagram of the process for obtaining the final sample of the study.

activities and walking activities including wheeling). Data were coded as specified in the International Physical Activity Questionnaire-Short Form guidelines and reported as a continuous measure in MET-minutes/week. The total number of minutes/week of vigorous and moderate physical activity were used to verify that the World Health Organization physical activity recommendations had been satisfied. Three different age groups were formed using the 33 and 66 percentiles (see Table 1). Body mass index was calculated as weight (kg)/height (m^2) using self-reported data from the participants.

Table 1 – Sample characteristics and accomplishment of recommendations by each characteristic (n = 1103).

Characteristic	N	% total	75 min/week of vigorous PA		150 min/week of moderate PA		Any of the recommendations	
			% met	% not meet	% meet	% not meet	% meet	% not meet
Age in years								
18–35	371	33.6	36.9	63.1	21.6	78.4	44.2	55.8
36–46	364	33.0	26.1	73.9	16.8	83.2	31.9	68.1
>46	366	33.2	20.5	79.5	20.5	79.5	34.4	65.6
Missing	2	0.2						
Sex								
Men	542	49.1	32.7	67.3	23.1	76.9	43.2	56.8
Women	557	50.5	23.3	76.7	16.3	83.7	30.9	69.1
Missing	4	0.4						
Body mass index (Kg/m^2)								
Underweight (<20)	102	9.2	27.5	72.5	22.5	77.5	38.2	61.8
Normal weight (20–24.99)	460	41.7	31.7	68.3	18.0	82.0	38.9	61.1
Overweight (25–29.99)	350	31.7	28.0	72.0	22.0	78.0	38.9	61.1
Obesity (≥30)	182	16.5	17.6	82.4	17.6	82.4	27.5	72.5
Missing	9	0.8						
Disability type								
Physical	469	42.5	31.3	68.7	21.5	78.5	40.3	59.7
Mental disorder	72	6.5	27.8	72.2	36.1	63.9	44.4	55.6
Sensory	142	12.9	41.5	58.5	23.2	76.8	50.7	49.3
Chronic illness	152	13.8	19.1	80.9	12.5	87.5	26.3	73.7
Multiple disabilities	238	21.6	17.6	82.4	14.3	85.7	26.9	73.1
Missing	30	2.7						
Disability grade								
33%–64%	864	78.3	28.7	71.3	18.9	81.1	36.9	63.1
≥65%	237	21.5	24.1	75.9	22.4	77.6	36.3	63.7
Missing	2	0.2						
Congenital/acquired								
Congenital	415	37.6	33.0	67.0	17.6	82.4	39.3	60.7
Acquired	685	62.1	24.8	75.2	21.0	79.0	35.6	64.4
Missing	3	0.3						

PA: physical activity.

Weight status was obtained using the World Health Organization recommended body mass index cut-off points, which have been used in other studies on people with disabilities.[24]

Data analysis

Descriptive statistics of all the sociodemographic variables were obtained and expressed as frequencies and percentages. Homogeneity of variances and normality of all the variables in the analyses were assessed using Levene's test and the Kolmogorov–Smirnov test. Given that the normality assumption was not met, Kruskal-Wallis tests and Mann-Whitney-Wilcoxon tests were used to compare physical activity (total, vigorous, moderate and walking) by age, weight status, disability type, disability grade, sex and congenital/acquired disability. In addition, a Spearman correlation was performed to examine the relationship between the time since disabilities were acquired and total physical activity. The α level was set at $P < 0.05$, and multiple testing was accounted for using the Bonferroni correction. When necessary, pairwise comparisons were conducted for post hoc testing. The mean, standard deviation, median and interquartile ranges of total physical activity, vigorous physical activity, moderate physical activity and walking intensity physical activity were determined for the whole sample and for each compared group. The Statistical Package for the Social Sciences for Windows (version 22.0; SPSS Inc., Chicago, IL) was used for all the analyses.

Results

Table 1 presents the sociodemographic characteristics of the sample and the accomplishment of the World Health Organization physical activity recommendations based on each characteristic.

Overall, 72.2% of the participants did not meet the recommendation of 75 min/week of vigorous physical activity, 80.3% did not meet the recommendation of 150 min/week of moderate physical activity, whereas 63.1% did not meet either of these recommendations. Table 2 presents the descriptive statistics of total, vigorous, moderate and walking intensity physical activity for the whole sample.

Mann-Whitney-Wilcoxon tests revealed differences in physical activity by sex and congenital/acquired disability (Table 3). Men reported more total and vigorous physical activity than women. People with acquired disabilities engaged less in vigorous physical activity than those with congenital disabilities. No significant differences were found based on disability grade. In addition, a significant positive correlation was obtained between the time since disability was acquired and total physical activity (rho = −0.093; $P < 0.05$).

Kruskal-Wallis tests found statistically significant differences in physical activity by the disability type (Table 4). People with multiple disabilities reported less total physical activity than those with a physical or sensory disability. Similarly, those with a chronic illness or physical disability reported less total physical activity than those with a sensory disability. People with multiple disabilities also reported less vigorous physical activity and less moderate physical activity than those with a physical disability, mental disorder or sensory disability. Participants with a chronic illness reported less vigorous physical activity than those with physical or sensory disability, and less moderate physical activity than those with mental disorder.

Significant differences were also obtained in physical activity by weight status (Table 5). Obese students reported less total and less walking intensity physical activity than overweight students, normal weight students and underweight students. The obese students also reported less vigorous physical activity than normal weight students and overweight students.

Kruskal-Wallis tests also revealed significant differences in physical activity by age (Table 6). The youngest group reported more total physical activity than the middle group and more vigorous physical activity than the middle and oldest groups, whereas the middle group reported lower walking intensity physical activity than the oldest group.

Table 2 – Descriptive statistics of physical activity (MET-minutes/week) (n = 1103).

Physical activity domains	M	SD	Med	IQR
Total	1772.75	2161.00	1074.00	2292.00
Vigorous	642.93	1303.08	0.00	840.00
Moderate	344.31	699.53	0.00	480.00
Walking	785.50	1053.31	396.00	1386.00

MET = metabolic equivalent; M = mean; SD = standard deviation; Med = median; IQR = interquartile range.

Discussion

As far as we know, this is the first study to measure physical activity by a group of variables such as age, sex, type of disability and weight status in a nationwide sample of university students with different types of disability. A large number of participants did not meet any of the World Health Organization physical activity recommendations. As international research has found, people with disabilities usually report low physical activity, regardless of the age groups or the type of disability,[15,25,26] and are thus at greater risk of developing certain diseases associated with physical inactivity than the active population. In fact, 31.7% of the students in the present study were overweight and 16.5% were obese. Obese students reported less total physical activity and walking intensity physical activity than overweight students, normal weight students and underweight students. Obese students also reported less vigorous physical activity than normal weight students and overweight students. This is a concerning issue that should be addressed by public health policies all over the world.[3,27,28] As shown by the results of the present study, most Spanish university students with disabilities do not take any advantage at all of the multiple benefits that regular physical activity could bring them.

The differences in physical activity based on variables of interest are of great relevance as far as they identify the specific subgroups most in need of interventions. In general, the results of the present article show that the participants with

Table 3 – Comparison of physical activity (MET-minutes/week) by sex, disability grade and congenital/acquired disability.

Physical activity and sex	Men (N = 542)		Women (N = 557)		MWW
	M(SD)	Med(IQR)	M(SD)	Med(IQR)	P-value
Total	2011.08 (2262.03)	1386.00 (2418.00)	1547.68 (2039.66)	960 (1976.25)	<0.001[a]
Vigorous	793.06 (1437.47)	0.00 (1080.00)	501.47 (1144.53)	0.00 (480.00)	<0.001[a]
Moderate	395.58 (757.83)	0.00 (480.00)	294.76 (636.67)	0.00 (380.00)	0.069
Walking	822.44 (1094.70)	396.00 (1386.00)	751.45 (1011.99)	396.00 (1039.50)	0.648
Physical activity and congenital/acquired	**Congenital (N = 415)**		**Acquired (N = 685)**		**MWW**
	M(SD)	Med(IQR)	M(SD)	Med(IQR)	P-value
Total	1817.87 (2028.65)	1213.00 (2475.00)	1750.27 (2241.76)	990.00 (2129.25)	0.195
Vigorous	715.66 (1314.30)	0.00 (960.00)	601.69 (1297.48)	0.00 (540.00)	0.008[a]
Moderate	304.64 (633.11)	0.00 (480.00)	368.47 (737.58)	0.00 (480.00)	0.552
Walking	797.57 (1030.51)	462.00 (1386.00)	780.11 (1068.97)	396.00 (1155.00)	0.718
Physical activity and disability grade	**33%–64% (N = 864)**		**≥65% (N = 237)**		**MWW**
	M(SD)	Med(IQR)	M(SD)	Med(IQR)	P-value
Total	1718.60 (2089.10)	1021.00 (2099.50)	1954.69 (2400.78)	1386.00 (2614.50)	0.231
Vigorous	644.21 (1274.43)	0.00 (960.00)	632.07 (1408.36)	0.00 (480.00)	0.122
Moderate	330.79 (655.20)	0.00 (480.00)	381.37 (817.17)	0.00 (480.00)	0.528
Walking	743.60 (1019.32)	396.00 (1039.50)	941.25 (1161.34)	577.50 (1386.00)	0.018

MET = metabolic equivalent; MWW = Mann-Whitney-Wilcoxon test; M = mean; SD = standard deviation; Med = median; IQR = interquartile range.
[a] Significant at 0.05/4 = 0.0125 level.

multiple disabilities or chronic illnesses are less active than those with other types of disabilities. This is partially consistent with previous findings in the literature. For instance, Simeonsson et al.[19] also found lower physical activity values in students with multiple disabilities. It seems reasonable to assume that the more disability conditions are experienced, the more barriers appear at every level (e.g. personal, social, environmental), thus hindering physical activity.

However, in disagreement with the present study, Longmuir and Bar-or[18] found that young people with a chronic illness had higher mean physical activity values than those with a physical, intellectual or visual impairment. This could be due to the variability within a specific type of disability, particularly within the wide category of chronic illness and its associated problems. For instance, the chronic illnesses reported by many participants in this study are frequently associated with concomitant pain or fatigue (e.g. fibromyalgia, back pain, osteoarthritis, multiple sclerosis) and usually affect mobility, which could explain the diversity of the results obtained.

In addition, the students with sensory disabilities were the most active group in this study. Lobenius-Palmér et al.[14] also found that the hearing-impaired group was the most active in a sample of young people with a variety of disabilities, whereas Wrzesinska et al.[13] focused on adolescents and young adults with visual impairment and obtained much higher overall physical activity values than those obtained in the general sample of the present study.

The results also show that people with acquired disabilities engage less in vigorous physical activity than those with a congenital disability. There is a lack of studies addressing differences in physical activity by this condition. However, some studies have explored how an acquired disability can affect an individual, considering that it often involves disrupting self-relationship with one's body, which is usually a complex process associated with accepting a 'new normality'.[29] Psychological barriers such as lack of confidence or demotivation can thus appear during this process in a way that leads to reduced physical activity or even stopping it altogether.[30,31] In this respect, the significant positive correlation obtained between the time since disability was acquired and total physical activity could be related to a positive adjustment to life post-injury.

There is some evidence in the literature that higher disability grade is related to less physical activity.[16,19,20] As Martin[5] points out, the difficulties faced by people with disabilities at the environmental level increase when the functional limitations experienced are severe. However, no significant differences in physical activity by disability grade were found in the present study. Therefore, although a severe disability could mean facing more barriers at different levels, it did not seem as a determining factor for the participants of this study. Further research on this question is therefore necessary to assess new evidence.

Sex was found to be another important correlate of physical activity in the present study; men reported more total and vigorous physical activity than women. This is in agreement with other studies conducted on people with disabilities or special needs[10–14] and is probably because of the barriers experienced by women when aiming to be physically active. In this regard, Stapleton and Martin Ginis[32] found that women with spinal cord injuries had less confidence to overcome barriers to physical activity and had less control over their physical activity than men. Similarly, Úbeda-Colomer et al.[33] found that women experienced more intrapersonal barriers to physical activity than men in a sample of university students with physical disabilities. Public health policies should therefore consider these differences and implement physical activity promotion programs addressing the specific barriers faced by women.

Table 4 – Comparison of physical activity (MET-minutes/week) by the disability type.

Physical activity and disability type	N	M	SD	Med	IQR	Kruskal-Wallis P-value
Total						**<0.001**[a]
Physical disability	469	1911.90	2396.84	1200.00	2257.50	
Mental disorder	72	1947.72	1866.40	1300.50	2887.75	
Sensory disability	142	2388.92	2464.12	1440.00	2776.50	
Chronic illness	152	1409.89	1961.85	802.50	1703.00	
Multiple disabilities	238	1302.66	1524.41	693.00	1872.00	
Vigorous						**<0.001**[a]
Physical disability	469	750.96	1487.36	0.00	960.00	
Mental disorder	72	683.89	1076.50	0.00	960.00	
Sensory disability	142	954.65	1512.78	80.00	1230.00	
Chronic illness	152	419.21	1021.19	0.00	300.00	
Multiple disabilities	238	351.43	856.31	0.00	0.00	
Moderate						**<0.001**[a]
Physical disability	469	366.70	728.71	0.00	480.00	
Mental disorder	72	501.39	678.23	220.00	930.00	
Sensory disability	142	425.10	782.74	0.00	480.00	
Chronic illness	152	287.11	721.61	0.00	240.00	
Multiple disabilities	238	242.35	581.32	0.00	240.00	
Walking						0.025
Physical disability	469	794.24	1093.07	396.00	1155.00	
Mental disorder	72	762.44	1079.87	330.00	1357.13	
Sensory disability	142	1009.17	1081.28	693.00	1386.00	
Chronic illness	152	703.57	928.73	363.00	1126.13	
Multiple disabilities	238	708.88	1028.16	239.25	990.00	

Pairwise comparison of disability type in physical activity	P-values based on the Mann-Whitney-Wilcoxon test		
	Total	Vigorous	Moderate
Physical disability–mental disorder	0.349	0.494	0.007
Physical disability–sensory disability	**0.004**[b]	0.022	0.298
Physical disability–chronic illness	0.007	**0.003**[b]	0.036
Physical disability–multiple disabilities	**0.001**[b]	**<0.001**[b]	**0.002**[b]
Mental disorder–sensory disability	0.271	0.361	0.096
Mental disorder–chronic illness	0.010	0.010	**<0.001**[b]
Mental disorder–multiple disabilities	0.006	**0.001**[b]	**<0.001**[b]
Sensory disability–chronic illness	**<0.001**[b]	**<0.001**[b]	0.011
Sensory disability–multiple disabilities	**<0.001**[b]	**<0.001**[b]	**0.001**[b]
Chronic illness–multiple disability	0.982	0.487	0.609

MET = metabolic equivalent; M = mean; SD = standard deviation; Med = median; IQR = interquartile range.
[a] Significant at 0.05/4 = 0.0125 level.
[b] Significant at 0.05/10 = 0.005 level.

Regarding age, the youngest group engaged in more total physical activity than the middle group and in more vigorous physical activity than the middle group and the oldest group. Other studies have also found an association between older age and reduced physical activity in people with disabilities.[14–17] As people get older, they also find more barriers to physical activity. At the intrapersonal level, as a result of reduced physical functioning, psychological barriers such as lack of confidence could appear. Lower physical activity could also be related to more organizational and community barriers, such as lack of adapted programs or more difficulties to navigate the built environment.[34] In addition, the decrease in social support that is frequently reported during adulthood could turn into interpersonal barriers to physical activity.[5,35] This could explain the reduced vigorous physical activity found in the middle and oldest groups. Nevertheless, the results of the present study also show that the middle group engages in less walking intensity physical activity than the oldest group. Moreover, although differences were found between the youngest and oldest groups in vigorous physical activity, there were no differences in total physical activity. These results could be related to physical functioning and the perception of functional autonomy, which are important factors for people with disabilities, as physical functioning and physical activity are reciprocally related. Whereas physical functioning allows the individual to engage in physical activity, physical activity contributes to maintaining and improving physical functioning.[17] A possible explanation could be that, after a more inactive period in the middle age, the participants realize the negative effects of inactivity on their physical functioning. Therefore, they could decide to engage again in some physical activity towards which they still feel confident even though they are older, that is, light physical activity.

The present study examines the physical activity of university students with disabilities and identifies the most

Table 5 – Comparison of physical activity (MET-minutes/week) by weight status.

Physical activity and weight status	N	M	SD	Med	IQR	Kruskal-Wallis P-value
Total						**<0.001**[a]
Underweight	102	1827.56	2278.49	1177.50	2068.13	
Normal weight	460	1892.49	2221.09	1211.50	2283.38	
Overweight	350	1822.23	2148.05	1207.50	2124.00	
Obese	182	1305.94	1822.48	552.25	1920.00	
Vigorous						**<0.001**[a]
Underweight	102	617.65	1477.84	0.00	720.00	
Normal weight	460	740.43	1370.00	0.00	960.00	
Overweight	350	628.80	1240.95	0.00	960.00	
Obese	182	430.11	1106.65	0.00	0.00	
Moderate						0.114
Underweight	102	402.55	782.17	0.00	480.00	
Normal weight	460	326.92	633.44	0.00	400.00	
Overweight	350	376.29	737.07	0.00	480.00	
Obese	182	279.56	628.82	0.00	240.00	
Walking						**0.001**[a]
Underweight	102	807.37	1041.39	429.00	1386.00	
Normal weight	460	825.14	1087.44	495.00	1386.00	
Overweight	350	817.15	1012.09	462.00	1386.00	
Obese	182	596.27	1016.93	0.00	693.00	

Pairwise comparison of weight status groups in physical activity	P-values based on the Mann-Whitney-Wilcoxon test		
	Total	Vigorous	Walking
Underweight–normal weight	0.658	0.487	0.730
Underweight–overweight	0.709	0.900	0.928
Underweight–obese	**0.008**[b]	0.010	**0.004**[b]
Normal weight–overweight	0.928	0.204	0.696
Normal weight–obese	**<0.001**[b]	**<0.001**[b]	**<0.001**[b]
Overweight–obese	**<0.001**[b]	**0.001**[b]	**<0.001**[b]

MET = metabolic equivalent; M = mean; SD = standard deviation; Med = median; IQR = interquartile range.
[a] Significant at 0.05/4 = 0.0125 level.
[b] Significant at 0.05/6 = 0.0083 level.

inactive subgroups within the population. It thus offers useful knowledge to be used by the disability care services and the sport services of the universities as the first step towards physical activity promotion programs in this population. Although providing the content of these programs is not the aim of the present article, it should be considered that the low physical activity reported by the participants could be related to a wide range of barriers that people with disabilities may face at different levels.[6] Specifically, in the Spanish university setting, more than a half (54%) of the university sport services acknowledged the lack of specific training of their sports technicians to provide adapted physical activity.[36] As a result, universities usually have neither a solid strategy towards adapted physical activity promotion nor sufficient offer of specific programs for students with disabilities. Knowledge on barriers to physical activity in people with disabilities is therefore essential to implement effective physical activity promotion programs in this population.

Some potential weaknesses of this study should be considered. First, the cross-sectional design does not allow determining causal relationships. Yet, determining causality is not the aim of the present article and, given the paucity of research on physical activity in university students with disabilities, some important insights have been provided.

Second, nonparametric methods may lack power as compared with more traditional approaches and could lead to nondetection of effects that in fact exist.[37] This is especially concerning when the sample size is small.[38] Nevertheless, this problem is minimized in the present study, as the sample size was large and statistically valid. In addition, the analyses performed do not allow to assess possible interactions among the variables studied. Still, the differences obtained by sociodemographic variables could be of great relevance to know which subgroups are the most inactive within this population.

Regarding the variables included in the present study, it is noteworthy that socioeconomic status was not considered, although it could be a relevant factor associated with physical activity. Furthermore, the use of self-reported measures is not exempt from potential bias. However, the International Physical Activity Questionnaire has been widely used to assess physical activity in all types of populations, including people with mobility impairments,[23] multiple sclerosis,[39] chronic pain[40] or visual impairments[41] and so has proved to be a suitable measure for epidemiological studies. With regard to body mass index, there is evidence to show that it could be underestimated when self-reported weight and height are used. To overcome these limitations, future studies would benefit from using objective measures of physical activity and body mass index, and from including socioeconomic status in the analyses.

Finally, a low response rate was obtained, which is a frequently reported problem in studies using online surveys.[42] Notwithstanding, a large and statistically valid sample of the

Table 6 – Comparison of physical activity (MET-minutes/week) by age.

Physical activity and age in years	N	M	SD	Med	IQR	Kruskal-Wallis P-value
Total						**<0.001**[a]
Youngest group: 18–35	371	2112.29	2442.67	1386.00	2418.00	
Middle group: 36–45	364	1491.76	2005.27	796.00	1894.13	
Oldest group: >45	366	1707.03	1960.49	1070.03	2243.25	
Vigorous						**<0.001**[a]
Youngest group: 18–35	371	893.69	1550.26	0.00	1200.00	
Middle group: 36–45	364	533.63	1132.59	0.00	720.00	
Oldest group: >45	366	479.78	1146.70	0.00	90.00	
Moderate						0.125
Youngest group: 18–35	371	383.67	728.31	0.00	480.00	
Middle group: 36–45	364	291.99	639.84	0.00	400.00	
Oldest group: >45	366	355.41	726.48	0.00	480.00	
Walking						**0.012**[a]
Youngest group: 18–35	371	834.86	1098.74	462.00	1386.00	
Middle group: 36–45	364	646.15	956.13	198.00	924.00	
Oldest group: >45	366	871.84	1085.72	495.00	1386.00	

Pairwise comparison of age groups in physical activity	P-values based on the Mann-Whitney-Wilcoxon test		
	Total	Vigorous	Walking
Youngest group–middle group	**<0.001**[b]	**<0.001**[b]	0.022
Youngest group–oldest group	0.021	**<0.001**[b]	0.620
Middle group–oldest group	0.017	0.037	**0.005**[b]

MET = metabolic equivalent; M = mean; SD = standard deviation; Med = median; IQR = interquartile range.
[a] Significant at 0.05/4 = 0.0125 level.
[b] Significant at 0.05/3 = 0.0167 level.

population of Spanish university students with disabilities was achieved. Because access to large samples of people with disabilities is usually difficult, the present study offers an important contribution to the field of adapted physical activity.

In conclusion, a high number of participants did not meet any of the World Health Organization physical activity recommendations, and the obese students reported less physical activity than the other groups. Students with multiple disabilities, chronic illnesses, acquired disabilities, older students and women reported less physical activity than their counterparts in the different physical activity domains. Public health policies should consider the results obtained and foster interventions to encourage physical activity among people with disabilities, with special attention to the most inactive subgroups.

Author statements

Author contributions

All authors participated in the study design. J.U.-C. collected, analysed and interpreted the data. J.M. and J.D.-D. assisted in the data interpretation process. J.U.-C. drafted the initial and final manuscript. J.M. and J.D.-D. contributed to draft the final manuscript. All authors provided critical comments on the manuscript and approved the final version.

Ethical approval

The procedures and materials used in the study were approved by the Ethics Committee of the University of Valencia. A written informed consent was obtained from all participants.

Funding

This work was supported by the Ministry of Science and Innovation (Spain) (grant number DEP2015-69692-P). The first author's work is supported by the Ministry of Education, Culture and Sport (Spain) through an FPU contract [grant number FPU14/01678]. The second author's work is supported by the Generalitat Valenciana through a VALi+d contract [grant number ACIF/2016/391]. The funders had no role in the study design, data collection and analysis, decision to publish or preparation of the manuscript.

Competing interests

The authors declared no competing interests.

Acknowledgments

The authors thank the disability care services of the Spanish universities their collaboration in this study and specially acknowledge the great implication of the *Centro de Atención a Universitarios con Discapacidad de la UNED* (UNIDIS) and the *Unitat per a la Integració de Persones amb Discapacitat de la Universitat de València* during the recruitment process.

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