

# BMJ Open Comparative analysis of reported physical activity from leisure centres' members versus the general population in Spain

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## ABSTRACT

**Objectives** (1) To describe the physical activity (PA) levels of the members of a Spanish leisure centre operator according to age and gender; (2) to describe the differences in the three PA levels between the members of a Spanish leisure centre operator and the general Spanish population considering the PA Eurobarometer data according to their gender and age and (3) to explore the intensity origin of the PA either in Spanish members of leisure centres or the Spanish population considering their gender.

**Design** Descriptive epidemiology study.

**Participants** Data from 16 Spanish leisure centres (n=3627) and from the 2017 Eurobarometer 472 for Spain (n=1002) were used for this research.

**Primary and secondary outcomes measures** The PA levels were analysed with the International Physical Activity Questionnaire short version, and respondents were grouped into physical inactivity (PIA), moderate-PA and high-PA. Moreover, gender (men or women) and age (18–29 years; 30–44 years; 45–59 years; 60–69 years; ≥70 years) were considered. Total metabolic equivalent (MET)-min/week, as well as total MET-min/week for walking intensity, moderate intensity and vigorous intensity were recorded.

**Results** Leisure centres showed a lower prevalence of PIA and a higher prevalence of high-PA than the general population (p<0.05). Women displayed a higher prevalence of PIA and lower prevalence of high-PA than men (p<0.05). The prevalence of PIA increases with age while the prevalence of high-PA decreases.

**Conclusion** Leisure centres engage most of their members in regular PA, including women and older adults, and these members also perform a higher number of MET in vigorous PA, than the general population.

## INTRODUCTION

Physical inactivity (PIA) is defined as the default of the weekly Global Recommendations on physical activity (PA).<sup>1</sup> It is different to sedentary behaviour which represents those behaviours performed in sitting or lying position with a low level of energy expenditure (≤1.5 metabolic equivalents (METs)).<sup>2</sup>

## Strengths and limitations of this study

- This is the first study that describes the prevalence of different levels of physical activity in members of leisure centres according to their age and gender and analyses how this prevalence differs from the general population.
- It also analyses for the first time the intensity origin of the weekly physical activity performed either by the members of leisure centres and the general population according to age and gender.
- The database representing leisure centres contains 3627 responses from 16 leisure centres that were spread in seven Spanish regions.
- The use of a self-reported instrument to measure the physical activity levels might result in an underestimation of the prevalence of the low-physical activity.

The Global Recommendations of PA differ across different age groups (ie, children and adults). Thus, according to the 2020 guidelines, PIA in adults means failing to accumulate 150 min of moderate-to-vigorous aerobic PA throughout the week (<600 MET min).<sup>3</sup> This situation is one of the main risk factors for developing of non-communicable diseases and premature death in adults, so it has become a global public health issue.<sup>4 5</sup> In Spain, like in other European countries, this issue is not an exception, as the lack of sufficient PA or PIA accounted for 9.3% of coronary heart disease, 10.3% of type 2 diabetes, 13.8% of breast cancer, 14.9% of colon cancer and 13.4% of all-cause mortality during 2012. At the same time, life expectancy would increase by 0.78 years if PIA was eliminated.<sup>4</sup> Moreover, healthcare expenditure attributed by PIA in Spain has been quantified in Int\$2.024 billion of direct cost, Int\$1.425 billion costs for the public sector and Int\$461.6 million costs for households.<sup>6</sup>

Thus, reducing the impact of PIA in people's lives, and in public healthcare systems, will bring considerable public health benefits, but remains one of the current challenges for policymakers.<sup>7,8</sup>

The Global Action Plans in 2013 and 2018 challenges the countries to increase their prevalence of PA by at least 10% of 2010 baseline data by 2025 and 15% of 2016 baseline data by 2030.<sup>8,9</sup> However, the levels of PA has diminished in Europe within the last 15 years,<sup>10,11</sup> the same as Spain, where the levels of PA has decreased significantly between 2013 and 2017 in men and women, thereby nullifying the objectives set by the Global Action Plans.<sup>8-10</sup>

The socioecological approach as well as the Global Action Plan suggest that to effectively address PIA, it is required to promote different domains of PA, that is, occupational, travel, home or leisure-time.<sup>8,12</sup> Within these domains, leisure-time PA (LTPA) has resulted effective to reduce the cardiovascular risk in the general population<sup>13</sup> and to improve other health parameters in older adults (ie, body composition, muscle strength or sarcopenia).<sup>14</sup> Moreover, LTPA reduces the risk of premature death regardless of pre-existing health conditions.<sup>15</sup> Since recreational facilities such as leisure centres are one of the main LTPA providers for adults,<sup>16</sup> it might be a good strategy to promote these places to address PIA,<sup>17,18</sup> and combine this approach with further strategies to promote PA in other domains.<sup>12</sup> This view aligns with the authors of the latest Global Action Plan as they encourage policymakers to strengthen and enhance the fitness sector together with other sectors (Action 1.4 and Action 3.3) and combine them with other domains of PA.<sup>8</sup>

Focusing on leisure centres as a key source to promote PA is advisable, as they are specifically designed to engage people in regular LTPA,<sup>17,18</sup> and enjoyed daily by thousands of people, who start, restart or continue with a PA habit.<sup>19,20</sup> In Spain, for instance, around 5.3 million people ( $\approx 11.4\%$  of the adult population) are enrolled in a leisure centre. In addition, these centres are designed to address many of the contextual factors that affect people's PA plans (eg, safe environments; social relationship with other users, wide schedule, wide exercise opportunities (individual or collective) and so on), what makes them be a sweet spot for large-scale public PA engagement.<sup>20-22</sup>

Despite these factors, the capability of these centres to promote PA is unknown as it is the percentage of members who can be considered active. Thus, care must be taken when suggesting these centres for promoting PA. The common sense and the anecdotal evidence might suggest that most of the leisure centre members are adequately active when analysing self-reported PA,<sup>23,24</sup> and they are more active than non-members counterparts.<sup>24</sup> Nevertheless, the lack of normative values and comparisons with the general population according to the gender and ages do not allow to conclude these facts.

On the other hand, PIA is age-related, with older adults exercising for significantly less time and at lower intensities than younger individuals.<sup>25,26</sup> It is also gender-related as a higher proportion of women do not engage in sufficient

PA and active women accumulate less weekly MET and perform less time of vigorous exercise than men.<sup>10,11,27</sup> Leisure centres seem to reduce this gap because around half of the members of these centres are women.<sup>20,21</sup> Also, they have been proved to be useful in increasing the PA levels and intensity of older adults.<sup>28</sup> However, the prevalence pattern of PA among women and elderly members of leisure centres is still unknown. Thus, the objectives of this study were (1) to describe the PA levels of the members of a Spanish leisure centre operator according to gender and age; (2) to describe the differences in the three PA levels between the members of a Spanish leisure centre operator and the general Spanish population considering the PA Eurobarometer data according to their gender and age; (3) to explore the intensity origin of the PA either in Spanish members of leisure centres or the Spanish population considering their gender.

It is expected that this work provides normative values about the prevalence of PA in leisure centres according to the age and gender what might help to understand the effectiveness of these places for promoting PA. Moreover, since the WHO is encouraging the policymakers to strengthen the leisure centres in order to improve PA levels of modern societies,<sup>8</sup> the findings from this work might help to set the role of leisure centres to address PIA in different populations.

## MATERIALS AND METHODS

### Study design and data sources

This is a descriptive epidemiology study. The data used in this study come from two different databases. The first one is the 2018 GO fit Observatory raw data, which was provided by a Spanish leisure centres operator (GO fit-Ingosport Health & Spa Consulting SA) that periodically survey its customers about their current PA and service satisfaction. This survey was conducted via online between January and June of 2018. The sample inquired comes from 16 fitness and leisure centres (n=3627), which are spread in 7 of the 17 Spanish Regions (Andalucía, Cantabria, Castilla y León, Castilla-La Mancha, Comunidad de Madrid, Gran Canarias and Principado de Asturias). The survey used a stratified random design based on the number of members per centre, their gender and their age. All leisure centres were operated by a private organisation and were equipped by an indoor swimming pool, several spaces for collective classes and a fitness room. All centres offered different sort of exercise services including individualised exercise programmes and collective classes (eg, endurance, dancing, jumping, well-being and so on) and nutritional services. The second database comes from the 2017 Special Eurobarometer 472,<sup>29</sup> a public opinion surveys that the European Commission simultaneously conducts on all the European Union state members to understand the levels of PA and sports participation of each country's population. In this case, data were obtained from the adult Spain population (n=1002) a few months before GO fit-Ingosport conducted their

2018 Observatory survey. The Eurobarometer surveys are conducted under a multistage sampling, random design. In order to cover the whole territory of the country, the number of sampling points is drawn with probability proportional to both population size and population density. To this purpose, the age, gender, region and the size of the locality are introduced in the iteration procedures.<sup>29</sup>

### Measurements

Both data sources used the short form of the International Physical Activity Questionnaire (IPAQ), which is used to inquire about the levels of PA.<sup>30</sup> This instrument measures the intensity, frequency and duration of PA performed within the previous 7 days by examining the number of days performing vigorous, moderate and walking PA and the total minutes during those days.<sup>30</sup> The 2018 GO fit Observatory used an online version of the short form of the IPAQ with the classical open solution as responses were not truncated. On the contrary, the Special Eurobarometer 472 survey used a modified version of the IPAQ with responses truncated to five different fixed possibilities, instead of the classical open solution, to indicate the minutes performed in each activity.<sup>29 30</sup> In order to reduce the bias due to the approach differences between databases both sources, the responses from the GO fit Observatory were truncated according to the methodology used in the Special Eurobarometer 472. Thus, for the case of PA, in both cases a response of '30 min or less' was assumed to mean 15 min, a response of '31 to 60 min' was assumed to mean 45 min, a response of '61 to 90 min' was assumed to mean 75 min, a response of '91 to 120 min' was assumed to mean 105 min and a response of 'more than 120 min' was assumed to mean 120 min.<sup>31</sup>

The data processing and analysis were completed using a modified ad hoc spreadsheet available online<sup>32</sup> according to the instruction for data processing and analysis of the IPAQ short form<sup>30</sup> and the methodology used in recent studies.<sup>10 11</sup> Only individuals with at least one valid intensity and duration of a particular intensity (ie, both variables with a different answer than 'don't know') were analysed. In this regard, 'Moderate-PA' was considered when reporting (a) at least 3 days of vigorous intensity activity of at least 20 min per day; (b) at least 5 days of moderate intensity activities and/or walking for at least 30 min per day or (c) at least 5 days combining the intensities mentioned above achieving at least 600 MET-min/week. 'High-PA' was considered when reporting (d) three or more days of vigorous-intensity activity of at least 20 min per day; or (e) five or more days of moderate-intensity activity and/or walking of at least 30 min per day MET-min/week. 'Low-PA' (inactive or PIA) was considered if not meeting any of these thresholds.<sup>30</sup> Moreover, moderate-PA and high-PA were considered as active. The METs of the respondents were calculated accordingly to the existing guidelines so that walking-intensity, moderate-intensity and vigorous-intensity accounted for 3.3, 4.0 and 8.0 METs, respectively.<sup>30</sup> Thus, walking, moderate and

vigorous MET-min/week were calculated by multiplying the selected MET value by the minutes and days of each intensity. The total PA MET-min/week was obtained by summing up the walking, moderate and vigorous MET-min/week score. On the other hand, in order to explore the origin of the MET-min/week for the three groups of PA analysed (low-PA, moderate-PA and high-PA), the average MET-min/week for walking, moderate and vigorous PA and total average MET-min/week in each group were calculated. Using these values, the proportion (%) of MET-min/week coming from walking, moderate and vigorous activities was also estimated.

### Statistical analysis

For the analysis of PA prevalence levels (low-PA, moderate-PA and high-PA), data were displayed as a proportion (%) with 95% CI. In this regard, analysis between the leisure centres and the Eurobarometer was analysed with a  $\chi^2$  test for the overall sample and separately by gender and age groups (18–29 years, 30–44 years, 45–59 years, 60–69 years and  $\geq 70$  years). Z-score for two population proportions was used for this purpose. A  $\chi^2$  test for the overall sample and separately by the gender and age was also used to compare the origin of the MET-min/week for the three PA groups (low-PA, moderate-PA and high-PA) between members from the leisure centres and people from the Eurobarometer. Once again, Z-score for two population proportions was used for this purpose. These tests were conducted using Microsoft 365 Excel V.2003 (Build 12624.20320; Microsoft Corporation; Redmond, Washington, USA). On the other hand, the differences in total MET-min/week between leisure centres and Eurobarometer, also considering gender, were analysed by a two-way Analysis of Variance (ANOVA). To this purpose, linearity, skewness and asymmetry were considered. These analyses were conducted using the Statistical Package for Social Sciences (V.22.0, SPSS). The level of significance was established at 0.05.

### Patient and public involvement

The authors confirm that patient and public was not involved in the research.

### RESULTS

Demographic data from the participants in both leisure centres' survey and Eurobarometer survey are displayed in [table 1](#). In both databases, slightly more women were recruited than men. Moreover, members of leisure centres were younger than those representing the Spanish population (–8.68 years).

As can be identified in [table 2](#), significant differences were found in the three levels of PA between leisure centres and the general Spanish population. In this regard, the percentage of low-PA population was significantly higher in the general Spanish population either for the whole sample or for women and men separately ( $p < 0.001$ ). The prevalence of moderate-PA was also

**Table 1** Participants' demographic characteristics

Database	# Women	% Women	# Men	% Men	Age*
GO fit-Ingesport operated leisure centre (GO fit Observatory)	1898	52.3	1729	47.7	42.67±12.05
Spanish general population (Special Eurobarometer 472)	555	55.4	447	44.6	51.35±18.20

\*Age: expressed as mean±SD

higher in the general Spanish population either for the whole sample, and women and men separately ( $p < 0.001$ ). On the contrary, the GO fit-Ingesport operated leisure centres showed a higher prevalence of high-PA for the whole sample and for women and men separately. Considering gender, women showed a higher low-PA and a lower high-PA prevalence in comparison with men in both samples ( $p < 0.001$ – $0.015$ , respectively). Considering the age of the samples, similar findings were reported as to the total population in which the low-PA population were descriptively increasing with the age brackets and high-PA levels being reduced with every new age bracket.

Table 3 shows the origin of the MET-min/week for the three PA groups (low-PA, moderate-PA and high-PA). The low-PA population and population with moderate-PA levels from GO fit-Ingesport operated leisure centres showed a higher proportion of METs coming from vigorous-intensity and a lower proportion of METs coming from walking than the Spanish population, despite having similar %METs of moderate intensity. This was confirmed for the whole sample and considering the gender subsamples, except for women in the moderate-PA levels, in which GO fit-Ingesport members also had higher levels of moderate intensity METs than the Spanish population. In high-PA population, there were no differences in the %METs walking between sample. However, GO fit-Ingesport members reported higher %METs of vigorous activity and lower %MET of moderate activity in comparison with the general Spanish population.

Considering gender, there were differences between women and men for all levels and intensities except for the %METs at moderate-intensity in the GO fit-Ingesport sample and for the low-PA group of the Spanish population regarding %MET at moderate-intensity ( $p > 0.05$ ). In this regard, in both samples and in the three levels of intensity, women had a higher percentage of METs coming from walking and a lower percentage of METs coming from vigorous intensity ( $p < 0.005$ ).

Finally, the total MET-min/week achieved by both samples are displayed in figure 1. Despite no interaction effect between gender and sample was found, the total MET-min/week of GO fit-Ingesport centre members were significantly higher than the general Spanish population (3051.59 METs vs 1784.52 METs;  $p < 0.001$ ). The same was reported for both women (2732.16 METs vs 1461.07 METs;  $p < 0.001$ ) and men (3402.26 METs vs 2186.12 METs;  $p < 0.001$ ). On the other hand, women showed

a lower total MET min/week in both the sample from leisure centres and the Spanish population ( $p < 0.001$ ).

## DISCUSSION

The main findings of this study are that: (a) around 80% of the members of a Spanish leisure centre operator self-report to be active; (b) the prevalence of low-PA and moderate-PA in leisure centre members is lower than in the Spanish population, yet the leisure centre members show higher levels of high-PA regardless the age and gender; (c) the prevalence of low-PA is higher in women in both leisure centres and the general population compared with men; (d) members of leisure centres show less low-PA for all age brackets than the general population and (e) the intensity of PA differs according to the total level of individual PA.

The high prevalence of PA in Spanish leisure centres (84.5%) is in line with the prevalence reported in leisure centres from the USA (~88%).<sup>23 24</sup> Gjestvang *et al*,<sup>33</sup> using accelerometers found that new members of leisure centres accounted for a lower prevalence of PIA after 12 months than the prevalence of PIA reported by the Norway population in other studies.<sup>34 35</sup> However, no one has specifically and directly described the difference in prevalence of PIA among members of leisure centres to that of the general population, particularly with respect to gender and age. Therefore, our finding that leisure centres' members to have a lower prevalence of PIA than the general population regardless of gender and age group is novel.

Regarding gender, women showed higher PIA prevalence than men, in agreement with previous studies.<sup>10 27 36</sup> Women also perform less vigorous-PA, which may prevent women from gaining the full benefits of PA.<sup>37</sup> The positive finding is that women from leisure centres reported much higher high-PA (40.0% vs 13.0%), lower levels of PIA (18.6% vs 37.3%) and higher engagement in vigorous-PA than the general population. Therefore, leisure centres seem to be useful to engage women in regular PA and vigorous PA beyond what is typically seen in the general population. Moreover, women represented 52.3% of the sample from leisure centres, showing that leisure centres might be useful places to support women in decreasing PIA and increasing PA.<sup>20</sup> The gender differences in leisure centres, that is, women more engaged in moderate-PA and men in high-PA, may be due to the way

**Table 2** Prevalence (expressed as percentage) of low-PA, moderate-PA and high PA adults between the GO fit-Ingosport operated leisure centre members and the general Spanish population

	GO fit-Ingosport operated leisure centre (GO fit Observatory)												Spanish general population (Special Eurobarometer 472)												GO fit-Ingosport operated leisure centre – Spanish general population						
	Low-PA (PIA)				Moderate-PA				High-PA				Low-PA (PIA)				Moderate-PA				High-PA				Low-PA (PIA)		Moderate-PA		High-PA		
	n	%	95% CI		%	95% CI		n	%	95% CI		n	%	95% CI		%	95% CI		n	%	95% CI		n	%	95% CI		Z-score	P value	Z-score	P value	Z-score
All sample	3627	15.5	14.3 to 16.8	37.4	36.0 to 39.0	47.0	45.4 to 48.7	1002	34.0	31.1 to 36.9	48.3	45.2 to 51.2	17.7	15.3 to 20.1	13.08	<0.001*	6.22	<0.001*	16.75	<0.001†	11.85	<0.001†	13.08	<0.001*	6.22	<0.001*	16.75	<0.001†			
Women	1898	18.6	16.9 to 20.3	41.3	39.2 to 43.6	40.0	37.8 to 42.3	555	37.3	33.2 to 41.3	49.7	45.7 to 54.1	13.0	10.1 to 16.0	9.23	<0.001*	3.50	<0.001*	11.85	<0.001†	9.23	<0.001*	9.23	<0.001*	3.50	<0.001*	11.85	<0.001†			
Men	1729	12.1	10.6 to 13.7	33.1	30.9 to 35.4	54.7	52.5 to 57.2	447	30.0	25.8 to 34.1	46.5	42.0 to 51.3	23.5	19.6 to 27.6	9.21	<0.001*	5.26	<0.001*	11.78	<0.001†	9.21	<0.001*	9.21	<0.001*	5.26	<0.001*	11.78	<0.001†			
Z-score	5.36			5.11		8.84		2.43		0.015‡		1.01		4.34		<0.001†		0.314		<0.001†											
P value	<0.001†			<0.001		<0.001†		0.015‡		0.015‡		0.314		<0.001†		<0.001†		0.314		<0.001†											
Age																															
18–29 years	535	9.5	7.1 to 12.1	30.7	26.6 to 34.6	59.8	55.9 to 64.2	147	19.7	13.2 to 26.1	55.8	48.0 to 64.0	24.5	17.4 to 31.3	3.40	0.001*	5.62	<0.001*	7.59	<0.001†	3.40	<0.001*	3.40	0.001*	5.62	<0.001*	7.59	<0.001†			
30–44 years	1562	15.2	13.6 to 17.0	37.8	35.5 to 40.1	46.9	44.6 to 49.5	234	33.3	27.0 to 39.6	49.1	42.7 to 56.1	17.5	12.8 to 22.4	6.78	<0.001*	3.30	0.001*	8.47	<0.001†	6.78	<0.001*	6.78	<0.001*	3.30	0.001*	8.47	<0.001†			
45–59 years	1188	17.0	14.9 to 19.3	38.6	35.9 to 41.4	44.4	41.7 to 47.0	264	33.3	27.8 to 38.9	47.7	42.0 to 53.8	18.9	14.3 to 23.9	6.00	<0.001*	2.72	0.006*	7.63	<0.001†	6.00	<0.001*	6.00	<0.001*	2.72	0.006*	7.63	<0.001†			
60–69 years	279	20.1	15.8 to 25.3	40.1	34.2 to 46.0	39.8	33.8 to 45.7	159	34.6	27.1 to 41.8	45.9	38.1 to 54.1	19.5	13.6 to 26.1	3.36	0.001*	1.28	0.240	8.49	<0.001†	3.36	0.001*	3.36	0.001*	1.28	0.240	8.49	<0.001†			
≥70 years	63	25.4	14.5 to 36.0	50.8	37.9 to 62.5	23.8	14.0 to 34.8	198	46.0	38.7 to 52.8	44.4	37.9 to 51.3	9.6	5.7 to 13.9	2.89	<0.004*	0.88	0.378	2.92	0.004†	2.89	<0.004*	2.89	<0.004*	0.88	0.378	2.92	0.004†			

Significantly higher prevalence (p<0.05) in men compared with the women.

\*Significantly higher prevalence (p<0.05) in Eurobarometer compared with the leisure centres.

†Significantly higher prevalence (p<0.05) in the leisure centres compared with the Eurobarometer.

‡Significantly higher prevalence (p<0.05) in women compared with the men.

High-PA, high active according to the guidelines of the IPAQ short version questionnaire; Low-PA (PIA), low active according to the guidelines of the IPAQ short version questionnaire. This group is considered as physical inactive (PIA); Moderate-PA, moderate active according to the guidelines of the IPAQ short version questionnaire; PA, physical activity.



**Table 3** Origin of the MET-min/week in the three PA intensity (low-PA, moderate-PA and high-PA) either for leisure centres or Eurobarometer

	GO fit- Ingesport operated leisure centre (GO fit Observatory)				Spanish general population (Special Eurobarometer 472)				GO fit-Ingesport operated leisure centre – Spanish general population					
	%METs walking intensity	%METs moderate intensity	%METs vigorous intensity	%METs walking intensity	%METs moderate intensity	%METs vigorous intensity	%METs walking intensity		%METs moderate intensity		%METs vigorous intensity			
							Z-score	P value	Z-score	P value	Z-score	P value		
Low-PA	All sample	43.7	11.9	44.5	73.2	12.8	14.0	7.88	<0.001*	0.36	0.717	8.61	<0.001†	
	Women	52.5	10.4	37.2	81.6	12.7	5.8	7.43	<0.001*	0.92	0.355	8.74	<0.001†	
	Men	32.1	13.9	54.0	64.7	12.8	22.5	9.81	<0.001*	0.45	0.652	9.49	<0.001†	
	Z-score	7.02	1.81	5.72	4.31	0.05	5.29							
P value	<0.001‡	0.070	<0.001	<0.001‡	0.960	<0.001								
Moderate-PA	All sample	52.0	14.7	33.3	74.0	13.8	12.2	13.02	<0.001*	0.75	0.452	14.29	<0.001 †	
	Men	47.0	15.0	38.0	67.2	16.5	16.3	11.84	<0.001*	1.27	0.205	14.11	>0.001 †	
	Women	55.8	14.6	29.6	79.3	11.7	9.0	14.20	<0.001*	2.41	0.016†	12.49	<0.001 †	
	Z-score	5.26	0.33	5.31	7.60	3.87	6.07							
P value	<0.001‡	0.739	<0.001	<0.001‡	<0.001	<0.001								
High-PA	All sample	25.3	17.2	57.5	25.2	26.0	48.8	0.21	0.837	13.32	<0.001*	29.82	<0.001†	
	Men	23.3	16.6	60.1	24.2	25.0	50.8	1.15	0.255	10.56	<0.001*	9.64	<0.001†	
	Women	28.0	17.9	54.1	26.8	27.8	45.5	1.32	0.188	11.43	>0.001*	8.43	>0.001†	
	Z-score	5.29	1.72	5.98	2.98	3.23	5.44							
P value	<0.001‡	0.085	<0.001	0.003‡	0.001‡	<0.001								

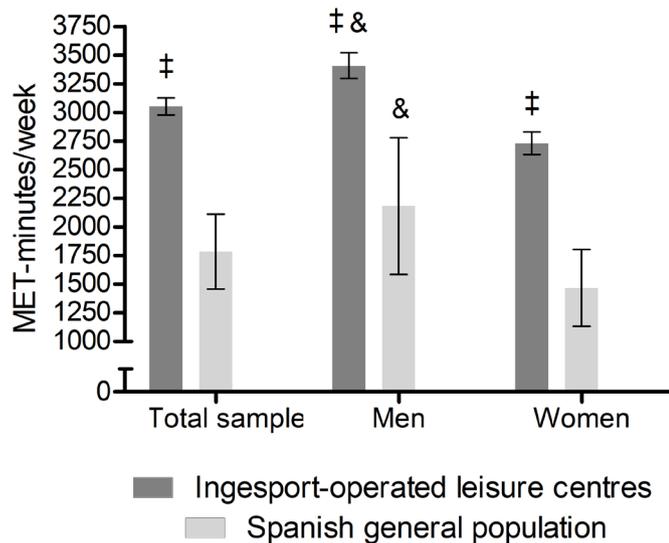
Significantly higher prevalence (p<0.05) in men compared with the women.

\*Significantly higher prevalence (p<0.05) in Eurobarometer compared with the leisure centres.

†Significantly higher prevalence (p<0.05) in the leisure centres compared with the Eurobarometer.

‡Significantly higher prevalence (p<0.05) in women compared with the men.

High PA, high active according to the guidelines of the IPAQ short version questionnaire; Low-PA, low active according to the guidelines of the IPAQ short version questionnaire; PA, physical activity; moderate active according to the guidelines of the IPAQ short version questionnaire; PA, physical activity.



**Figure 1** Average total MET-min/week between the leisure centre and the Eurobarometer for all participants and for men and women separately. ‡ Significantly higher MET-min/week ( $p < 0.05$ ) in the leisure centres regarding the Eurobarometer. & Significantly higher MET-min/week ( $p < 0.05$ ) in men regarding the women. MET: metabolic equivalent.

both genders use these centres, their objectives to achieve by working out in fitness centres, and the existence of sociospatial gendering processes.<sup>38–40</sup>

This manuscript shows that the prevalence of PIA increases with the age both in leisure centres and in the general population, coinciding with previous studies that reported a higher prevalence of PIA in older adults.<sup>25 26</sup> However, the lower prevalence of PIA in all age brackets for leisure centre members enhances the importance of these centres as places of exercise providers.<sup>20 21 24</sup> The prevalence of high-PA decreases with age in both samples, yet high-PA was more than two times as high in leisure centre members regardless of age. Therefore, although levels of regular PA are aged-related, members of leisure centres seem to perform more vigorous-PA than the general population<sup>24</sup> may be due to the characteristics of the exercise that can be performed in these centres.<sup>20 23 41</sup> Among the different age groups studied, older adults ( $\geq 60$  years old) are a significant target group for PA interventions due to the lower overall engagement in PA,<sup>25 26</sup> and also because many older adults have chronic health conditions or disease as a consequence of PIA, or that can be improved by prescribed exercise.<sup>42 43</sup> This study shows that up to 39.8% of adults between 60 and 69 years old and up to 23.8% of adults  $> 69$  years were classified in the high-PA group. Furthermore, contrary to the trend of the general population, the prevalence of moderate-PA in leisure centre members improves as age increases. Thus, as suggested by Watts *et al*,<sup>28</sup> leisure centres seem to play an important role in supporting older people to stay active. Therefore, leisure centres can likely be considered effective environments for promoting and developing active living and healthy ageing interventions.

The origin of the PA level reported is also a new finding, although a previous study suggested that members from leisure centres exercise more intense than non-members.<sup>24</sup> Gerovasili, *et al*,<sup>31</sup> explored the origin of total MET-min/week among the European Union Countries, however, they did not make subgroups according to their PA levels nor consider the gender and age of participants. The literature suggests that meeting PA guidelines reduces the likelihood of developing cardiovascular, metabolic and other non-communicable diseases,<sup>6 44–46</sup> however, performing vigorous-PA seems to produce additional health benefits.<sup>37 47–49</sup> Therefore, even when meeting the PA guidelines there are increased benefits to including additional minutes of vigorous-PA.<sup>37 47–49</sup> Vigorous-intensity PA represented a higher proportion of total MET-min/week in members of leisure centres regardless the PA group (low-PA (44.5% vs 14.0%), moderate-PA (33.3% vs 12.2%) or high-PA (57.5% vs 48.8%)), while walking accounted for more than 70% of MET-min/week in the low-PA and moderate-PA groups of the general population. Thus, members of leisure centres, given the greater proportion of higher intensity PA, may derive additional health benefits compared with the general population.<sup>48</sup>

Previous studies have explored the average MET-min/week in adults,<sup>31 50</sup> however, this has not been done in leisure centre users. GO fit-Ingesport leisure centre members showed an average MET-min/week (3051.59) much higher than the general population of Spain, and comparable to the two most active European countries in 2013 (Latvia=3027; Estonia=2910).<sup>31</sup> On the other hand, the total MET-min/week average in 2013 for Spain<sup>31</sup> are higher than those found in this study (2166 vs 1784.52), suggesting that the PA levels of Spanish households may have decreased in the last years.<sup>10</sup> Regarding gender, the outcomes from total MET-min/week also corroborate that men reporting being more active than women.<sup>10 27 36</sup> However, once again, leisure centre members of both genders show significantly higher PA levels than the general population.

The ability of leisure centres to engage people from all ages, but specially women and older adults, enforces the suggestion that European countries should develop specific strategies to engage leisure centres in the overall mitigation of population-based PIA.<sup>17 18</sup> These centres can also be used for targeting diseases related to PIA.<sup>28 51</sup> We acknowledge that many leisure centre members do not regularly exercise within the centres, and that many members leave the centres within the first 6 months.<sup>52 53</sup> Moreover, a significant proportion of new members report being inactive before enrolling<sup>53</sup> while the cost of the membership fee might be a barrier for some people.<sup>54</sup> Thus, we encourage policymakers and the fitness industry to work together in order to increase the accessibility to these centres to low-income people and to develop effective formulas to reduce the gender and age gaps that exist in PA habits.<sup>10 25 26</sup> Providing PA opportunities according to the gender and age preferences,

eliminating sociospatial gendering barriers and applying behaviour change strategies in these centres might work to improve the effectiveness of leisure centres as PA providers and improve access to these places to disadvantaged groups.<sup>18 38–40 55</sup>

Despite the large sample size used in this study, it is important to consider the following limitations. (a) It is possible that highly motivated members were more willing to respond to the survey compared with those who engaged in mostly low-PA, and that this could bias the results; (b) data from this work were based on self-report questionnaires which may over-report PA levels,<sup>56</sup> so caution should be despite large samples (c) the Eurobarometer truncate the solutions from the IPAQ questionnaire<sup>10</sup> while the sample from the leisure centres used the classical open solutions,<sup>30</sup> so the total minutes in each category of PA were artificially assumed according to the suggestion of Gerovasili *et al.*,<sup>31</sup> (d) It was not possible to manage the sample size of both databases used in this study. Thus, causality cannot be stressed from our data. A particular strength, however, is that all of the centres analysed were spread among 7 of the 17 Regions of Spain, thereby increasing external validity. Based on the main limitation of this study, future studies should combine device-based and self-report PA instruments to investigate differences in PA prevalence in these two populations. This would allow comparison of effects sizes between different instruments capable of assessing distinct PA constructs and identify any potential discrepancies according to age and gender.

## CONCLUSIONS

Members of leisure centres are mostly active as only 15.5% of members of the members of the Spanish GO fit-Ingesport leisure centres reported to be low-PA, while 47.0% reported to be high-PA. Moreover, the members of leisure centres showed lower prevalence of PIA and a higher prevalence of high-PA than the Spanish population regardless gender and age. As a consequence, GO fit members showed higher MET-min/week than the general population. Differences in PA levels between men and women were confirmed either in leisure centres members or the general population. However, both men and women of GO fit-Ingesport leisure centres showed higher MET-min/week than the general population. Vigorous PA represented a higher proportion of total MET-min/week in leisure centres' members than in the general population regardless of the PA group (low-PA; moderate-PA; high-PA). Moreover, more than 70% of METs in the low-PA and moderate-PA of the Spanish population were due to walking.

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**Data availability statement** Data are available in a public, open access repository. Data are available upon reasonable request. The raw data of the Eurobarometer 472 is owned by the European Commission and available online: <https://dbk.gesis.org/dbksearch/sdesc2.asp?no=6939&search=Physicalfitnessandexercise&search2=&field=all&field2=&DB=e&tab=0&notabs=&nf=1&af=&il=10>. The raw data from the Spanish fitness centre operator is owned by GO fit-Ingesport Health & Spa Consulting SA. To request access to this data contact to the corresponding author.

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