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# Associations between individual and environmental determinants and physical activity levels of an active population during the Spanish lockdown

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## ABSTRACT

Restrictions during the COVID-19 pandemic are likely to decrease physical activity (PA) levels. The purpose of the study was to explore the associations between age, gender, and exercise facilities-type membership and physical activity levels during COVID-19 lockdown among users of exercise facilities from Spain. Participants were recruited among the members of 84 exercise facilities across Spain. Data was collected through an online questionnaire between 5th and 20th of April 2020 during the COVID-19 lockdown. A total of 7062 participants met inclusion criteria and responded correctly to the International Physical Activity Questionnaire. Lower levels of total PA were found in women compared with men ( $\beta = -26$ , 95%CI:  $-40$  to  $-13$ ), and among older adults ( $\beta = -48$ , 95%CI:  $-10$  to  $-85$ ) compared with younger ones. Moreover, users of private facilities showed higher levels of PA ( $\beta = 40$ , 95%CI:  $13$  to  $66$ ) than those from low-cost and public facilities (reference). Lastly, women from private facilities showed greater levels of PA ( $\beta = 63$ , 95%CI:  $29$  to  $96$ ) than low cost and public's users, an increase higher than what was found in men ( $\beta = 7$ , 95%CI:  $-38$  to  $52$ ). Therefore, gender, age and the type of exercise facility's subscription had a relevant influence on PA levels during COVID-19 lockdown in an active population. These findings are useful for public health recommendations, in order to identify subpopulations of previously active people at risk of being physically inactive during and after this pandemic.

## 1. Introduction

Physical activity and exercise are associated with a decrease in all-cause of mortality (Ekelund et al., 2019; Oja et al., 2017) and are crucial in the primary prevention (Booth et al., 2012) and treatment of several chronic diseases (Pedersen and Saltin, 2015). However, available data estimated that 31% of the population worldwide do not achieve physical activity recommendations (2,5 h/week of moderate-intensity physical activity) (Dumith et al., 2011), recognizing physical inactivity as a global pandemic (Hallal et al., 2012). Specifically, the

prevalence of physical inactivity in 2017 in Spain was 34% (Mayo et al., 2019).

The literature has shown that exists a social gradient in physical activity in leisure time (Beenackers et al., 2012). From a socioecological perspective, individual and environmental determinants influence these disparities in the physical activity levels of the people (Cerin et al., 2010). On the individual side, previous evidence has reported that women dedicate more free time to family responsibilities such as household work or childcare (Belza and Warms, 2004). Likewise, exercise facilities are a relevant environmental determinant (Mason et al.,

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2018). However, differences among exercise facilities should be borne in mind: the features of the exercise facilities (such as price, activity programs, equipment or culture) varies by type of management and ownership (Lee et al., 2014; Santacruz et al., 2016). For instance, privately-owned exercise facilities typically invest more in marketing and maintenance than publicly-owned exercise facilities (Martínez Tur et al., 1995). Furthermore, previous studies have shown differences in the socio-spatial distribution of the exercise facilities by type: low-cost and public facilities have a greater presence in low-socioeconomic status (SES) areas than private ones (Cereijo et al., 2019). Thus, beyond individual decisions, a variety of environmental and individual variables determine the physical activity practice of urban populations (Diez Roux et al., 2016; Diez Roux et al., 2010).

In December of 2019, a novel coronavirus (SARS-CoV-2) appears in China and rapidly start to spread across the rest of the world (Johnson, 2020). On March 11th of 2020, with more than 126.000 cases notified in the world, the disease caused by the virus (COVID-19) was classified by the World Health Organization (WHO) as a global pandemic (WHO, 2020). Two days after that, with 5.753 cases, the Spanish Government decreed the state of alarm with several public health measures to mitigate the effect of the pandemic (Real Decreto 463/2020, 2020). These measures focused on the reduction of social contacting and human mobility, such as restricting all means of transport, closing non-essential industry and, the biggest measure adopted by the government, was the confinement of the entire population of the country. For that, all the population was forced to stay in their homes for almost 3 months.

These restrictions are likely to produce a decrease in moderate-to-vigorous physical activity levels (Pecanha et al., 2020). Ammar et al. (2020) revealed an increase in sedentary behaviours and reduced physical activity levels during the COVID-19 pandemic. Although home confinement removes barriers for physical activity (e.g. such as environmental, social, etc.) (Carraça et al., 2018; De Bourdeaudhuij et al., 2003; Humpel et al., 2002), new individual barriers can be generated or exacerbated, even in an active population (Pecanha et al., 2020). Socioeconomic inequities in access to physical activity are exacerbated during the lockdown (e.g. internet access, space at home for exercising, etc.) (Cockerham et al., 2017; Sallis et al., 2020; Van Lancker and Parolin, 2020). Lack of technologies and internet access may also be a burden for elderly people to maintain physically active (Palmer et al., 2020; Pecanha et al., 2020; Pépin et al., 2020; Schrempft et al., 2019). Furthermore, childcare, household responsibilities, working from home or uncertainly about employment loss during the COVID-19 pandemic may also increase individual difficulties for maintain physically active during home-confinement (Bayham and Fenichel, 2020; Crayne, 2020; Van Lancker and Parolin, 2020). Therefore, self-isolation produces a big challenge for remaining physically active (Dwyer et al., 2020) and may cause people to quit physical activity during and after the lockdown (Lippi et al., 2020). Given the detrimental consequences of physical inactivity for general health (Booth et al., 2017) and specially during self-isolation (Sallis et al., 2020), it is important to identify sub-populations of previously active people at risk of being physically inactive during and after this pandemic.

Exercise facilities' membership is associated with higher physical activity levels (Kaufman et al., 2019). Moreover, social determinants may be associated with physical activity levels during the pandemic restrictions. To improve our knowledge on the influence of those social determinants may help to develop stronger public policies to shape the harmful on physical activity behaviour during the lockdown. However, any research has studied before this relationship on exercise facilities' users. Building on this gap in the evidence, the purpose of the present study was to explore the associations between age, gender and exercise facilities-type membership and physical activity levels during COVID-19 lockdown among users of exercise facilities from Spain.

## 2. Methods

### 2.1. Study participants and design

Participants were recruited among the members of 84 exercise facilities from the 17 autonomous regions of Spain. These facilities belong to a non-profit and non-governmental organization called *Fundación España Activa*, with the purpose of promoting sport and physical activity in the society. A total of 8087 responses were received, which represent a 37% response rate of the exercise facilities analysed. Therefore, this study followed a cross-sectional design and used a convenience sample based on people who completed the questionnaire. Participants were 15 years old and under 90, given that 15 years old is the age limit set in Spain for exercising in an exercise facility with parent consent. Furthermore, participants were active users of the exercise facilities at the time of COVID19 lockdown in Spain (15th March 2020). Besides, participants had to respond to the complete International Physical Activity Questionnaire (IPAQ) to be included in the present analyses.

### 2.2. Procedure

Data was collected through an online questionnaire sent by the exercise facilities to all their users that met the inclusion criteria. The survey was built using the abbreviated version of the International Physical Activity Questionnaire (IPAQ), previously used and validated in several studies (Cleland et al., 2018; Lee et al., 2011; Rubio Castañeda et al., 2017). The research team did not have access to the personal data of the participants. Previous studies have shown that the use of online questionnaires in social sciences could have same quality levels than traditional face-to-face surveys (Manfreda et al., 2008). Participants were informed about the research aims before completing the questionnaire. Furthermore, they were also informed of their rights under General Data Protection Regulation, stating that the survey was collecting data under the public service legal basis and only for research purposes. Moreover, data has been collected, stored and treated following the Spanish legislation (*Ley Orgánica de Protección de Datos 3/2018, 2018*); the research followed the ethical guidelines in accordance with the Declaration of Helsinki, and the research ethics framework of the University of Alcalá (Madrid, Spain). Informed consent was obtained from all participants before starting the questionnaire, and all questionnaires were anonymous.

Data was collected between 5th and 20th of April 2020 during the COVID-19 lockdown. At this moment, the "state of alarm" was imposed in Spain since 15th of March. During these two weeks of data collection, there were not any changes in restrictions in any part of Spain. Therefore, participants were confined and were not allowed to leave their homes for physical activity practice. By the moment of data collection participants did not know when the lockdown was going to finish, and participants were in lockdown already between 21 and 36 days.

### 2.3. Outcomes

#### 2.3.1. Measure of physical activity

The abbreviated version of the International Physical Activity Questionnaire (IPAQ) was used to assess physical activity duration, frequency and intensity (Cleland et al., 2018; Lee et al., 2011; Rubio Castañeda et al., 2017). Only participants who responded to the complete questionnaire, were included in the analyses. This questionnaire has been previously used and validated in several studies (Cleland et al., 2018; Lee et al., 2011; Rubio Castañeda et al., 2017). Total physical activity was calculated summing up the moderate physical activity levels (minutes/week) and the vigorous physical activity levels (minutes/week). To facilitate statistical analysis we followed normal and accepted practice in the measurement of PA in adult population (Clemente Remón et al., 2020; Gerovasili et al., 2015; Mayo et al., 2019), and therefore time-related answers were categorised in five

variables, assuming that answering “30 minutes or less” meant 15 min, “31 to 60 minutes” meant 45 min, “61 to 90 minutes” meant 75 min, “91 to 120 minutes” meant 105 min, and answering “more than 120 minutes” meant 120 min.

2.3.2. Covariate measures

Participant’s characteristics, which include information on age and gender were completed in the first part of the questionnaire. Furthermore, exercise facilities types were also collected. Exercise facilities were classified into three types: publicly owned, low-cost and private, as described in previous research (Cereijo et al., 2019).

2.4. Statistical analyses

Linear Regression models were conducted for all the analyses. Age was operationalized in six categories as independent variable, and as continuous variable when it was used as covariate. Physical Activity variables were treated as continuous variables for all the analyses. Type of exercise facilities was treated as categorical variable. Finally, all analyses were stratified by gender. Another stratified analysis was conducted between gender and all types of physical activity, by types of exercise facility. Assumptions of normality were assessed by visual examination of quantile-quantile plots and histograms of the residuals. Analyses were conducted in STATA (version 15.1, College Station, TX: StataCorp LLC).

3. Results

A flowchart of participants contacted for the study is presented in Supplementary Fig. 1. A total of 24,506 participants were invited to complete the online questionnaire. 8087 participants respond the questionnaire, from which 7062 participants completed age and gender information and completed the International Physical Activity Questionnaire (IPAQ). Characteristics of participants are described in Table 1. Briefly, our participants were mostly women (64%), from a publicly owned exercise facility (80%) in between 15 and 90 years old. Mean vigorous physical activity levels during the lockdown in exercise facilities users was 141 ± 164 min/week, 173 ± 172 min/week of moderate physical activity and a total physical activity of 314 ± 284 min/week.

Statistically significant differences between men and women were found in vigorous physical activity and total physical activity (minutes/week). Women reported an average of 27 fewer minutes/week of vigorous physical activity than men (95% CI = -35 to -20). Regarding total physical activity, women reported an average of 26 fewer minutes/week of total physical activity than men (95% CI = -40 to -13). No significant differences were noted between men and women for moderate physical activity, finding that both groups did approximately 174 min/week of moderate physical activity during the lockdown. Results did not change when adjusting by age (Table 2).

Differences in vigorous physical activity and total physical activity levels were found between age categories. Vigorous and total physical

Table 1  
Characteristics of study participants.

	Participants characteristics (n = 7062)	Men (n = 2571)	Women (n = 4491)	P-value between gender <sup>a</sup>
Years, N (%)				
15–24 years old	541 (8%)	170 (7%)	371 (8%)	
25–34 years old	1612 (23%)	491 (19%)	1121 (25%)	
35–44 years old	1851 (26%)	709 (28%)	1142 (26%)	
45–54 years old	1603 (23%)	613 (24%)	990 (22%)	
55–65 years old	1091 (15%)	421 (16%)	670 (15%)	
> 65 years old	364 (5%)	167 (6%)	197 (4%)	<0.001
Exercise facility type, N (%)				
Publicly owned	5675 (80%)	2030 (79%)	3645 (81%)	
Low-cost	923 (13%)	348 (14%)	575 (13%)	
Private	464 (7%)	193 (7%)	271 (6%)	0.029
Physical activity levels (min/week)				
Vigorous physical activity (min/week)	141 ± 164	156 ± 177	132 ± 156	< 0.001
Moderate physical activity (min/week)	173 ± 172	174 ± 184	174 ± 165	0.967
Total physical activity (min/week)	314 ± 284	330 ± 306	306 ± 272	< 0.001

Note: Values are reported as mean with standard deviation and N (%) for continuous and categorical variables, respectively. <sup>a</sup>P-value corresponded to the differences between gender for each variable. Abbreviations: min/week, minutes per week.

Table 2  
Associations between gender and physical activity levels.

	Model 0	Model 1
	Raw β (95% CI)	Adjusted by age β (95% CI)
Vigorous physical activity (min/week)		
Men	Referent	Referent
Women	-24 (-32 to -16) ***	-27 (-35 to -20) ***
Moderate physical activity (min/week)		
Men	Referent	Referent
Women	0 (-9 to 8)	1 (-7 to 9)
Total physical activity (min/week)		
Men	Referent	Referent
Women	-24 (-38 to -10) ***	-26 (-40 to -13) ***

Note: Results represents mean differences between groups with 95% confidence interval (95%CI). \*, P < 0.05; \*\*, P < 0.01; \*\*\*, P < 0.001. Abbreviations: min/week = minutes of physical activity per week.

**Table 3**  
Associations between age categories and physical activity levels.

	Model 0	Model 1	Stratified model	
	Raw	Adjusted by gender	Men	Women
	$\beta$ (95% CI)	$\beta$ (95% CI)	$\beta$ (95% CI)	$\beta$ (95% CI)
<b>Vigorous physical activity (min/week)</b>				
15–24 years old	Referent	Referent	Referent	Referent
25–34 years old	5.00 (–11 to 21)	5 (–11 to 21)	–11 (–42 to 20)	13 (–5 to 31)
35–44 years old	–18 (–34 to –2) *	–20 (–35 to –4) **	–24 (–53 to 6)	–19 (–37 to –0.7) *
45–54 years old	–32 (–48 to –16) ***	–34 (–50 to –18) ***	–45 (–74 to –15) **	–29 (–47 to –10) **
55–65 years old	–52 (–69 to –36) ***	–54 (–71 to –37) ***	–52 (–84 to –21) ***	–56 (–75 to –36) ***
> 65 years old	–88 (–109 to –66) ***	–92 (–114 to –70) ***	–103 (–141 to –65) ***	–85 (–111 to –58) ***
<b>Moderate physical activity (min/week)</b>				
15–24 years old	Referent	Referent	Referent	Referent
25–34 years old	2 (–15 to 18)	2 (–15 to 18)	–21 (–53 to 11)	11 (–8 to 31)
35–44 years old	–11 (–27 to 6)	–11 (–27 to 6)	–19 (–50 to 12)	–7 (–26 to 12)
45–54 years old	–2 (–19 to 14)	–2 (–19 to 14)	–12 (–44 to 19)	3 (–17 to 22)
55–65 years old	15 (–3 to 32)	15 (–3 to 32)	23 (–9 to 56)	8 (–13 to 29)
> 65 years old	44 (21 to 67) ***	44 (21 to 67) ***	48 (9 to 87) **	38 (9 to 66) **
<b>Total physical activity (min/week)</b>				
15–24 years old	Referent	Referent	Referent	Referent
25–34 years old	7 (–21 to 35)	7 (–21 to 35)	–32 (–85 to 21)	24 (–8 to 56)
35–44 years old	–29 (–56 to –2) *	–31 (–58 to –3) *	–43 (–94 to 9)	–26 (–57 to 6)
45–54 years old	–34 (–62 to –7) *	–36 (–64 to –9) **	–57 (–109 to –5) *	–26 (–58 to 6)
55–65 years old	–37 (–67 to –8) *	–39 (–68 to –10) **	–29 (–83 to 25)	–48 (–82 to –14) **
> 65 years old	–44 (–81 to –6) *	–48 (–85 to –10) *	–55 (–120 to 10)	–47 (–93 to 0)

Note: Results represents mean differences between groups with 95% confidence interval (95%CI). \*,  $P < 0.05$ ; \*\*,  $P < 0.01$ ; \*\*\*,  $P < 0.001$ . Abbreviations: min/week = minutes per week.

**Table 4**  
Association between type of exercise facility’s membership and physical activity levels.

	Model 0	Model 1
	Raw	Adjusted by sex and age
	$\beta$ (95% CI)	$\beta$ (95% CI)
<b>Vigorous physical activity (min/week)</b>		
Public facilities	Referent	Referent
Low-cost facilities	18 (7 to 30) **	7 (–4 to 19)
Private facilities	27 (12 to 43) **	28 (13 to 44) ***
<b>Moderate physical activity (min/week)</b>		
Public facilities	Referent	Referent
Low-cost facilities	3 (–9 to 15)	6 (–6 to 18)
Private facilities	12 (–4 to 28)	11 (–5 to 28)
<b>Total physical activity (min/week)</b>		
Public facilities	Referent	Referent
Low-cost facilities	21 (1 to 41) *	13 (–6 to 34)
Private facilities	39 (13 to 66) **	39 (13 to 66) **

Note: Results represents mean differences between groups with 95% confidence interval (95%CI). \*,  $P < 0.05$ ; \*\*,  $P < 0.01$ ; \*\*\*,  $P < 0.001$ . Abbreviations Min/week = minutes per week.

activity levels among participants older than 34 years old were lower than those younger than 25 years old. Participants older than 65 years old reported an average of 44 higher minutes/week (95% CI = 21 to 67) of moderate physical activity levels than those younger than 25 years old (Table 3). Stratified analyses by gender showed that vigorous physical activity levels among men and women older than 34 years old were lower than those younger than 25 years old. Total physical activity was statistically fewer in men in between 45 and 54 years old compared with those younger than 25 years old. Furthermore, women older than 55 years old reported fewer levels of total physical activity than those younger than 25 years old (Table 3).

Findings showed higher levels of physical activity practice among users of low-cost and private exercise facilities in comparison to participants from public facilities, being greater on private facilities users. Participants from private facilities reported an average of 28 higher

minutes/week (95% CI = 13 to 44) of vigorous physical activity than those participants from public facilities, and an average of 39 higher minutes/week (95% CI = 13 to 66) of total physical activity (Table 4).

The stratification model by gender (Table 5) showed that women that are users of private exercise facilities did 44 min/week (95% CI = 25 to 63) of vigorous physical activity and 63 min/week (95% CI = 29 to 96) minutes/week of total physical activity more than those women that are users of public exercise facilities. No statistically significant differences were found for men.

Finally, the model stratified by type of exercise facility showed unequal differences by gender across the exercise facility types (Table 6). Public facilities users showed lower levels for women in all types of physical activity in comparison with men. Specifically, women from public facilities reported an average of 29 fewer minutes/week (95% CI = –38 to –20) and 29 fewer minutes/week (95% CI = –44 to –14) of vigorous and total physical activity, respectively, than men from public facilities. Women from low-cost facilities reported an average of 32

**Table 5**  
Physical activity volume during COVID-19 lockdown among exercise facilities users from Spain by type of facility, stratified by gender and adjusted by age.

	Men	Women
	$\beta$ (95% CI)	$\beta$ (95% CI)
<b>Vigorous physical activity (min/week)</b>		
Public facilities	Referent	Referent
Low-cost facilities	11 (–9 to 31)	5 (–9 to 19)
Private facilities	6 (–20 to 32)	44 (25 to 63) ***
<b>Moderate physical activity (min/week)</b>		
Public facilities	Referent	Referent
Low-cost facilities	6 (–15 to 27)	6 (–9 to 21)
Private facilities	1 (–26 to 28)	19 (–2 to 39)
<b>Total physical activity (min/week)</b>		
Public facilities	Referent	Referent
Low-cost facilities	17 (–18 to 52)	11 (–13 to 35)
Private facilities	7 (–38 to 52)	63 (29 to 96) ***

Note: Results represents mean differences between groups with 95% confidence interval (95%CI). \*,  $P < 0.05$ ; \*\*,  $P < 0.01$ ; \*\*\*,  $P < 0.001$ . Abbreviations Min/week = minutes per week.



**Table 6**

Physical activity volume during COVID-19 lockdown among exercise facilities users from Spain by gender, stratified by type of facility and adjusted by age.

	Public facilities	Low-cost facilities	Private facilities
	$\beta$ (95% CI)	$\beta$ (95% CI)	$\beta$ (95% CI)
Vigorous physical activity (min/week)			
Men	Referent	Referent	Referent
Women	-29 (-38 to -20) ***	-32 (-54 to -9) ***	8 (-25 to 41)
Moderate physical activity (min/week)			
Men	Referent	Referent	Referent
Women	0 (-10 to 9)	3 (-20 to 26)	14 (-20 to 49)
Total physical activity (min/week)			
Men	Referent	Referent	Referent
Women	-29 (-44 to -14) ***	-29 (-68 to 11)	22 (-35 to 79)

Note: Results represents mean differences between groups with 95% confidence interval (95%CI). \*,  $P < 0.05$ ; \*\*,  $P < 0.01$ ; \*\*\*,  $P < 0.001$ . Abbreviations Min/week = minutes per week.

fewer minutes/week (95% CI = -54 to -9) and 29 fewer minutes/week (95% CI = -68 to 11) of vigorous physical activity and total physical activity, respectively, than men. Inverse results were shown on users from private facilities, with higher levels of physical activity in women than men.

#### 4. Discussion

To our knowledge, this is the first study in Spain that analyse the association between individual determinants on physical activity levels in a physically active population during the COVID-19 pandemic lockdown. Our findings showed statistically significant associations between gender and vigorous and total physical activity, with lower physical activity levels found in women compared with men during the lockdown. Also, vigorous and total physical activity levels among participants older than 34 years old were lower than those younger than 25 years old. Moreover, users of public facilities showed lower levels of physical activity practice than those from low-cost and private facilities. Lastly, after stratifying by gender, women that are users of private facilities showed greater levels of vigorous and total physical activity compared with those women that are users of public facilities.

Our study showed lower levels of physical activity in women than in men, consistent with gender differences documented in the literature without a lockdown situation (Guthold et al., 2018; Guthold et al., 2008; Mielke et al., 2018). Other studies conducted in Spain during the lockdown, have explored changes in physical activity levels before and after the lockdown in healthy adults, finding a significant decrease in physical activity levels during the lockdown in both men and women (Castañeda-Babarro et al., 2020; López-Bueno et al., 2020). Though the gender gap in physical activity is attributable to several and complex reasons (The Lancet Public Health, 2019), one of the most important barriers is that women have a higher burden in household and childcare responsibilities (Limbers et al., 2020; Power, 2020), which takes an exceptional relevance during home confinement. This persistent gender inequity -before and during the lockdown- highlighted the need for strategies to promote physical activity practice during future lockdowns with a gender perspective through the design of exercise programs that respond to the women's preferences and the search for family conciliation.

Our results showed an age-related decrease in vigorous and total physical activity levels during the COVID-19 pandemic, with the lower levels of physical activity found in older adults (> 65 years old) of both genders, whereas we found that this population of older adults did higher levels of moderate physical activity compared with younger participants. These results are in line with previous studies conducted during the COVID-19 pandemic that have shown that older adults have reduced their levels of physical activity during the lockdown (López-Bueno et al., 2020; Wang et al., 2020). However, our sample of older adults have performed the highest levels of moderate physical activity

which also produce important benefits into their health (Langhammer et al., 2018). Other studies conducted during the COVID-19 lockdown in older adults showed that higher levels of physical activity were associated with lower levels of depression and higher resilience (Callow et al., 2020; Carriedo et al., 2020). Given the importance of physical activity for general health (Booth et al., 2017), and especially during self-isolation situations (Sallis et al., 2020), there is a need to implement measures that pay special attention to this population of older adults in future lockdowns. There are two relevant challenges to address in this population: during the confinement, the lack of technologies and internet access, which can be a significant burden to maintain active for this population (Palmer et al., 2020; Seifert et al., 2020); and the return to exercise facilities after the restrictions could be problematic, due to the fear of becoming infected (Pinto et al., 2020).

Our work also examined the association between exercise facilities-type membership of the participants and their physical activity levels during home confinement. Private facilities' user showed the greater levels of moderate, vigorous, and total physical activity, than low-cost and public exercise facilities' users. Previous studies have reported a better availability of private facilities in areas with higher socioeconomic status (Cereijo et al., 2019). Likewise, are the most expensive facilities of the present study (See Supplementary Table 1). From that, can be understood that users of private facilities are more likely to have also better living conditions, which are strong determinants of physical activity exacerbated during the lockdown (Sallis et al., 2020). As well, given the better activity programs and exercise supervision of private facilities (Lee et al., 2014), those facilities could develop better online support to its users to keep a better physical activity behaviour than low-cost and public ones.

Gender disparities were also found when differences are analysed stratifying by exercise facilities type. Women showed lower levels than men of vigorous and total physical activity in public and low-cost facilities, whereas there were no differences in moderate physical activity levels. However, women showed better levels of physical activity when they were users of private facilities. Previous studies have shown women being less likely to use exercise facilities than men, preferring facilities with a more diverse range of activities (Coen et al., 2018). Private exercise facilities invest more resources in marketing and consumer satisfaction surveys (Martínez Tur et al., 1995; Santacruz et al., 2016), which may result in better satisfaction for women users, and better adaptability of exercise programs to the preferences of female users.

Delving into the impact of the type of facility on the levels of practice, we have found further differences when the effect was analysed stratifying by gender. Men showed higher amounts of physical activity when are users of low-cost exercise facilities. Men's physical activity behaviour is more independent and use less supervision than women. Taking that into account, low-cost exercise facilities offer lower prizes without individual supervision. Nevertheless, women from private facilities achieved better levels of physical activity, especially vigorous physical activity. The different types of exercise facilities are linked with differences on several factors (e.g. exercise programs, services or training supervision) (Lee et al., 2014; Santacruz et al., 2016), which could cause differences between groups of users by type of exercise facilities.

This is the first study focus on the effects of the COVID-19 pandemic lockdown in Spain that (1) analyse the impact of both individual and environmental determinants on physical activity levels in a large physically active population, and (2) study the influence of exercise facilities-type membership on the physical activity behaviour.

However, our study presents some limitations that should be highlighted. The absence of physical activity data before the lockdown prevents us from knowing the effect of the confinement on the physical activity behaviour during the lockdown. Though the purpose of the study is not to evaluate the change in physical activity levels of the population but to understand how several social and environmental determinants may be associated with physical activity levels during the

pandemic restrictions. Secondly, the use of a convenience sample limits generalizability of our results to the entire active population of the country. However, it is a large sample with a great geographic dispersion (See Supplementary Table 2). Finally, physical activity was self-reported by participants, whereas this questionnaire have been widely validated and used in previous studies (Cleland et al., 2018; Lee et al., 2011; Rubio Castañeda et al., 2017). Absence of individual socioeconomic information of participants is a lack of data to improve the knowledge about individual and environmental effect on the physical activity behaviour during the lockdown.

It is necessary to improve the knowledge about how socioeconomic determinants could influence changes on physical activity levels pre and during lockdown. Longitudinal studies could help us to understand how the lockdown, and pandemic situation, could affect the physical activity levels of the population. Given the differences showed on this study between type of exercise facilities, could be relevant to study how the follow-up of the user's training during the lockdown varies depending of the type of facility.

Our results evidence three central considerations for public policy actions to reduce physical activity inequities during future restrictions: (1) gender perspective should be highlighted in order to reduce the existing gender gap for the use of free time in women and to facilitate exercise practice in this population; (2) given the detrimental effects of age on physical activity, and the special vulnerability of older adults to the effects of COVID-19, public support to this population must be developed (3) a better supervision of public exercise facilities' actions, is needed in order to promote and encourage exercise of the population during times with strong restrictions adopted by the COVID-19 emergency.

## 5. Conclusion

This study showed that age, gender, and exercise facilities-type membership are associated with physical activity levels during COVID-19 lockdown in an active population. These findings are useful for public health recommendations, for both public administrations and fitness companies, paying special attention to specific populations and develop precise strategies to support them to keep, or even improve, their physical activity levels. Even though the lockdowns are subsiding, further restrictions may be adopted following increases in infection rates, which may continue to restrict the ability to engage in physical activity at exercise facilities.

## Credit author statement

**Luis Cereijo** : Conceptualization, Methodology, Investigating, Formal Analysis, Writing - Original Draft, Writing - Review & Editing, Visualization.

**Paola Gonzalo** : Conceptualization, Methodology, Investigating, Formal Analysis, Writing - Original Draft, Writing - Review & Editing, Visualization.

**Ángel L. Clemente**: Conceptualization, Resources, Data Curation, Writing - Review & Editing, Supervision, Project administration.

**Jose A. Santacruz**: Conceptualization, Resources, Data Curation, Writing - Review & Editing, Supervision, Project administration.

**José E. Jiménez**: Writing - Review & Editing, Validation.

**Víctor Jiménez**: Writing - Review & Editing, Validation.

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## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ypmed.2021.106719>.

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