

Paradoxical increase in frequency of physical activity behavior during SARS-Cov-2 restriction measures in a Greek university community

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Abstract

Problem statement The COVID-19 pandemic has affected physical activity (PA) all over the world. In Greece, all sports activities were closed, and restrictions in public places could lead to a decrease in PA. **Purpose** The purpose of this study was to evaluate how these restriction measures affected the frequency of physical activity, related to gender, age, body weight, and physical condition, in members of a Greek university. **Results** An online survey, which concerned sports activity prior the onset of SARS-CoV-2 virus and during the restriction measures, was conducted during the 2nd lockdown in Greece (November – December 2020). A questionnaire was sent to members of a Greek university. Data analysis was performed using SPSS, version 26. Frequencies, descriptive analysis, and chi square were calculated. The difference between, before, and during the period were accessed by the Wilcoxon signed rank test. There was an increase of frequency in PA behavior during confinements compared with before the restrictions ($p < 0.001$). Females were more likely to participate in individual PA and in online exercise programs ($n = 316$). Most of the responders chose to be involved in more than one form of PA during the confinements. The younger age group (18–25 years old) and older age group (55+) exercised on a daily basis. In total, 41.9% of participants mentioned they intend to integrate exercise into their daily life when the restrictions eliminate. **Conclusions** The results are encouraging for participation in different types of PA, including online fitness programs. Supporting measures to participate in PA, as a way of dealing with the negative effects of the pandemic, are valuable.

Keywords: physical activity, restriction measures, COVID-19, university members

Introduction

Lockdown due to the COVID-19 pandemic has resulted in reduced physical activity (PA). SARS CoV-2 is thought to spread from person-to-person through respiratory droplets; thus, physical distancing recommendations have been established to help slow the spread of the disease (Aman et al., 2020; Lesser & Nienhuis, 2020). Constraints placed upon social interaction and public spaces due to COVID-19 have decreased PA, increased sedentary behavior, and subsequently increased bodyweight. The internment programs, “stay home” restrict leaving the house and leaving only for specific reasons. For PA, gatherings of up to 2 people with 1–2 meters between them are allowed. In most countries, including Greece, all team sports activities have been banned. Additionally, tele-work increases internment. If the sedentary life lasts for much longer, there will be a negative impact for human health (Lippi et al., 2020; Gori et al., 2020). The effects of physical inactivity and the decrease in PA due to confinement may increase the risk of cardiovascular events and mortality (Thompson et al., 2007).

The COVID-19 pandemic has led to multiple challenges for people’s health and well-being. The restrictions and directives against regular PA and exercise inevitably disrupt routine daily activities. Lockdowns and restrictions on mobility have affected our ability to be physically active as a natural part of daily life (Callow et al., 2020). PA and sedentary behavior may be negatively impacted as many fitness and recreational centers have been closed (Tertipi et al., 2020). The WHO guidance contains some easy-to-perform suggestions to maintain the WHO global recommendations of 150 minutes of moderate intensity or 75 minutes of vigorous intensity (or a combination of both) PA per week while exercising in a limited space (WHO, 2020). Physical education teachers were not prepared to face the COVID-19 conditions or provide alternative forms of exercise for student training (Mozolev et al., 2020). Exercise may be helpful for healthy asymptomatic people and should be recommended. Exercise in a home with good ventilation and use of personal equipment is safe (Chen et al., 2020). Electronic platforms, such as YouTube, Facebook, and Twitter, are promising tools to enhance and measure home-based workouts, although specific recommendations on their use and associated goals remain scarce. Several worthwhile digital platforms show how these activities can be introduced into everyday indoor and outdoor routines (Shahidi et al., 2020). The beneficial effects of regular PA on many health outcomes are well established (Redersen & Saltin, 2015; Powell et al., 2011). Mathieu et al. demonstrated specific benefits, such as improved physical and physiological health parameters (Mathieu et al., 2012). Exercise has shown to have clear

health benefits for healthy individuals (Piercy et al., 2020) as well as for patients with various diseases (Luan et al., 2019). In the current study, we evaluated how the students and staff of a Greek university in Athens have adapted the PA. To our knowledge, only a few studies have analyzed the frequency of PA in the general population and especially in an academic environment before and during COVID-19 restrictions.

This study aimed to compare the frequency of PA participation, by gender and age, in a Greek academic society before and during restriction measures and the types of PA that the participants chose. Our hypothesis was that PA would have been reduced during the restriction measures due to the COVID-19 pandemic.

Material & Methods

Study procedures

An online survey was conducted during the 2nd lockdown in Greece (November – December 2020). This study was approved by the Ethic Committee of Research of the University of West Attica (27.7.2020/app.no.50413). The content of the questionnaire and the use of data collection methods ensured participant privacy and dignity. The protocol was granted, and informed consent or assent were obtained from the participants. An online questionnaire was created by the researchers and transferred to Google Forms. The contents of the questionnaire concerned sports activity prior to the onset of the SARS-CoV-2 pandemic and during the restriction measures.

Materials and participants

The questionnaire was divided into 3 modules: (a) demographics – sex, age, and status; (b) physical activity – participation and type of exercise involvement; and (c) body weight and physical condition. The frequency of PA participation, before and during the restrictions, was measured from “never” = 1 to “daily” = 6. Because of the ban of operation of gyms, sport centers, and sport teams during the restriction measures, the types of PA differed between the two periods. Before the online survey, a pilot study was provided to ensure the correctness and understanding of the questions. The link to the Google Forms’ questionnaire was sent via e-mail to the academic community of a Greek university in Athens. The recipients were students and educational staff. The completion of the questionnaire was anonymous.

Statistics Analysis

All the data collected through the questionnaire were entered into an electronic database created using Excel software. Data analysis was performed using IBM SPSS Statistics for Windows, version 26.0. Frequencies were calculated for the qualitative variables. Categorical variables for gender, age categories, and status in the university were studied using chi square (χ^2) and descriptive analysis in relation to (a) the association with PA before and during restrictive measures and (b) the type of PA. The Kolmogorov–Smirnov test was applied to check the normality between the two periods. The differences between PA participation before and during the restrictions were determined using the Wilcoxon signed rank test, which provided the mean and standard deviation. The significance level chosen was a P -value <0.05 (two-tailed). There were no missing data.

Results

The sample consisted of 1022 respondents, who were members of a Greek university. Of the respondents, 74.2% [n=758] were females, and 25.8% [n=264] were males. In total, 869 (85.2%) were undergraduate and postgraduate students, and 153 (14.8%) were education staff. Most of the respondents were between 18 and 25 years old [n=709, (69.4%)] and 26 and 35 years old [n=120, (11.7%)]. A large proportion of the education staff were between 36 and 45 and 46 and 55 years old. Of the age categories, 56–65-year-olds were 2.4% [n=25]. Details of the demographic characteristics are presented in Table 1.

Table 1. Demographic characteristics of participants

Age categories	N (Total)	%	Respondents				Status			
			Male		Female		Students		Educational staff	
			n	%	n	%	n	%	n	%
18-25	709	69.4	154	58.3	555	73.2	697	80.2	12	7.8
26-35	120	11.7	40	15.2	80	10.6	90	10.4	30	19.7
36-45	81	7.9	31	11.7	50	6.6	50	5.7	31	20.3
46-55	87	8.5	28	10.6	59	7.8	26	3	61	39.8
56-65	25	2.4	11	4.2	14	1.8	6	0.7	19	12.4
Total	1022		264	100	758	100	869	100	153	100
%		100	25.8	100	74.2	100	85.2	100	14.8	100

Physical Activity and Gender

The PA significantly increased during the restriction measures in the university participants (mean before: 3.1 df=1.4, mean during: 3.7 df=1.2, $p<0.001$). The PA participation frequencies before and during the restriction measures showed a statistically significant difference ($p<0.001$) according to the respondents' answers. PA frequency increased by 7.2% for the option of "daily" and 5.5% for the option of "4–5 times per week". However, the most common "2–3 times per week" frequency of participation in PA decreased by 8.8%, and the option "rarely" decreased by 5.7% (Figure 1A).

Between the sexes, there was an increase in the frequency of PA during restriction measures ($p<0.05$) in the options of "4–5 times per week" (males ↑ 5.6%, females ↑ 5.4%) and "every day" (males ↑ 3%, females ↑ 8.7%). Females were more likely to participate more times per week during restriction measures, and males had a negative result, according to the increase by 4.5% for the option of "never" (Figure 1B, 1C).

The relationship between gender and type of sport activity is presented in Figure 2. Before the restriction measures, both sexes preferred individual PA [females $n=322$ (42.5%), males $n=113$ (42.8%)]. Gym membership was mentioned by 24.2% of females and 30.6% of males.

Physical activity types differed between the two periods considered due to the ban of gyms, sports teams, and sports facility operations during the pandemic. During the restrictions, we observed increasing participation in permissible forms of PA. Respondents appear to have participated in many different forms of PA. Gender is related to the type of PA, such as individual indoor exercise ($p<0.001$), online PA programs ($p<0.001$), and individual outdoor exercise ($p<0.05$). Individual indoor home activities and online programs were preferred by females, and individual outdoor activities were preferred by males (Figure 2).

Online Physical Activity Programs

A total of 354 participants were involved in online PA programs. Females were more likely to participate in YouTube PA programs "often" or "every day" ($n=258$, 34%) compared with males ($n=28$, 10.6%) with a statistically significant difference ($p<0.001$). On the other hand, males preferred sport team programs (21.5%) and gym programs (26.3%) compared with females at 13.6% and 12.6%, respectively. The restriction measures contributed to the continuation of the online PA programs between the two restriction measure periods (1st and 2nd lockdown) ($p<0.001$) for 20.4% of females and 10.2% of males.

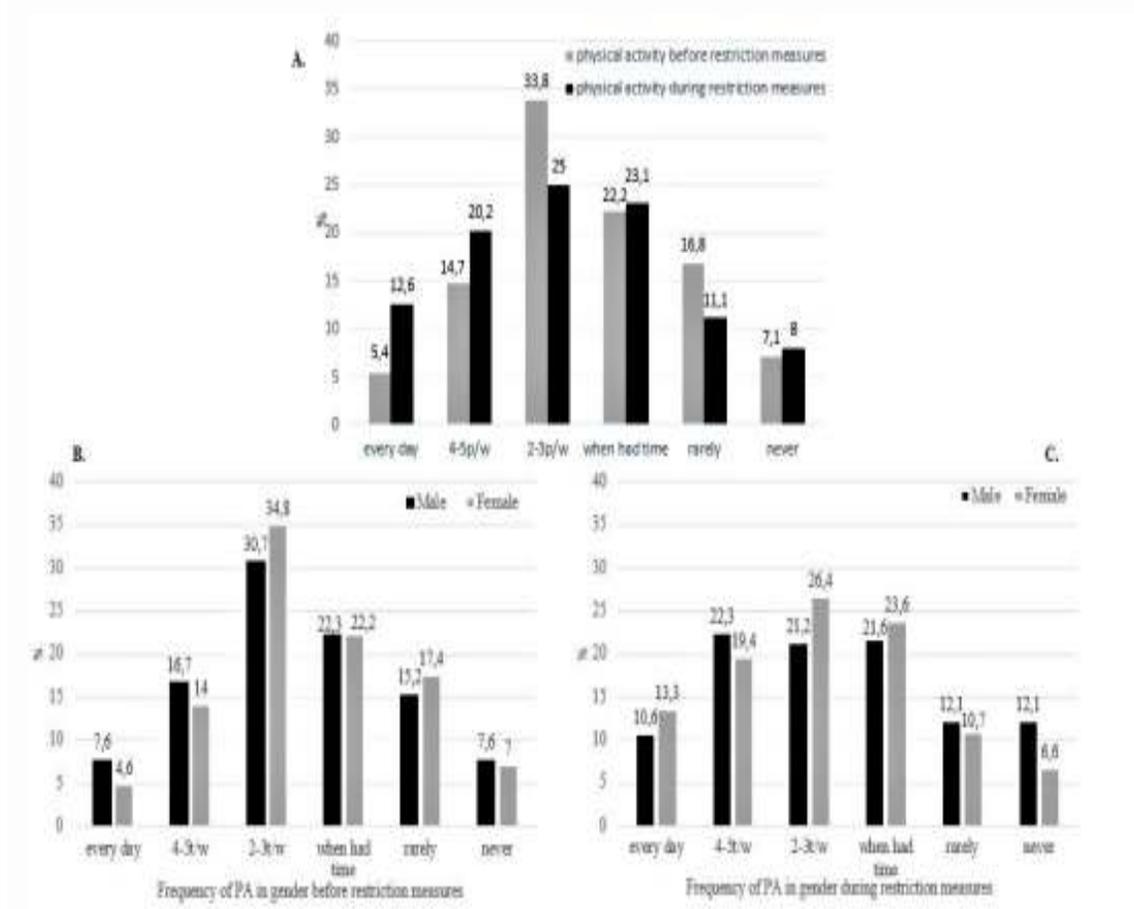


Figure 1. (A) Weekly frequency of Physical Activity in all participants before and during restriction measures, (B) Frequency in gender before and (C) during restriction measures.

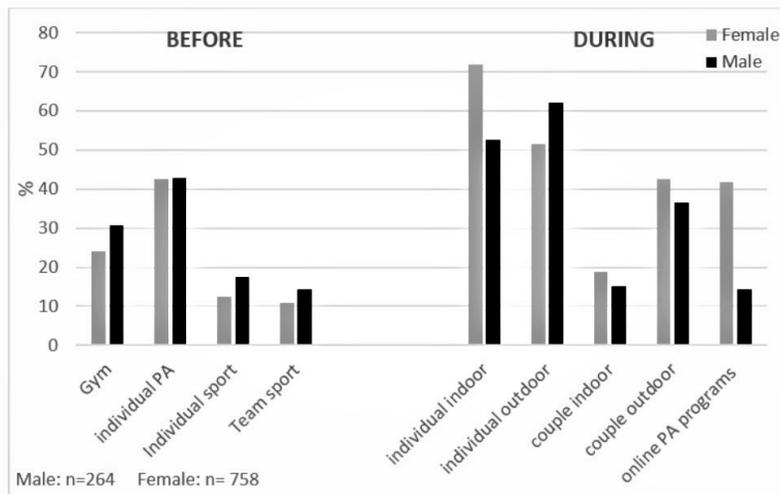
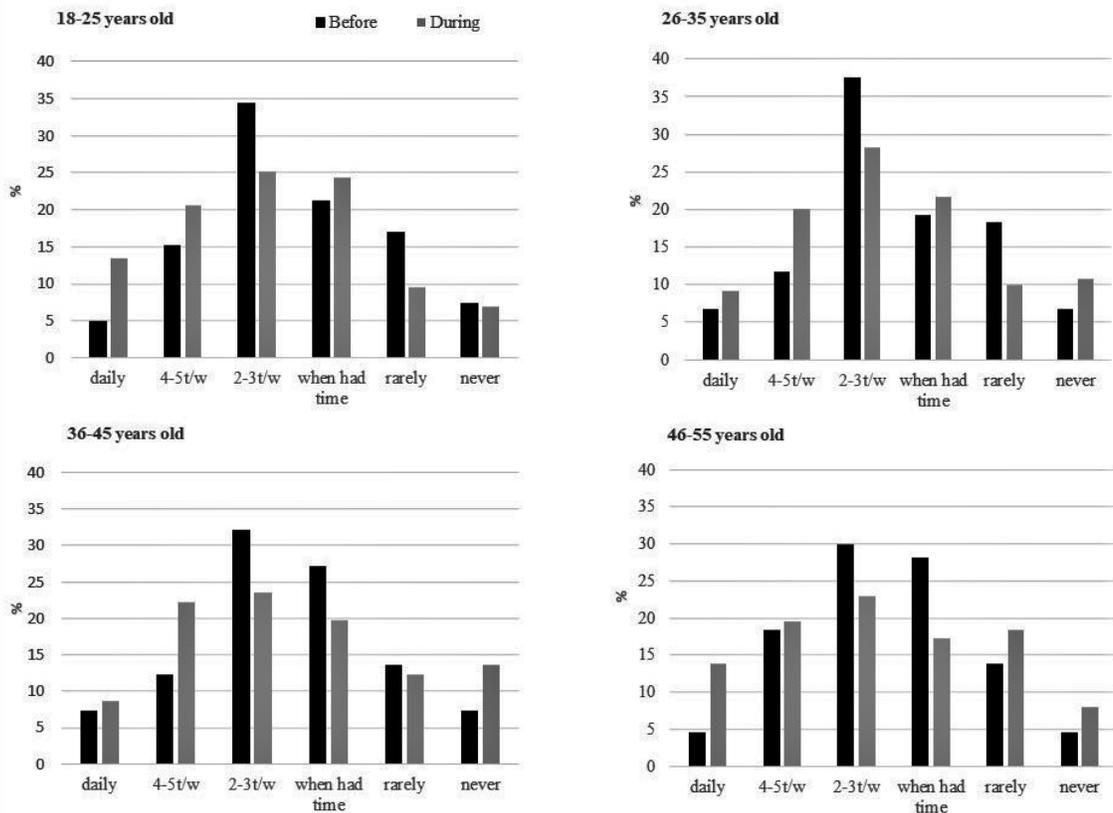


Figure 2. Gender and type of Physical activity before & during restriction measures

Age and Physical Activity

Respondent age had an important role in the frequency of PA before and during the restriction measures. All age categories increased PA in the categories of “daily” and “4–5 times per week”. There was a statistically significant difference in daily PA in the age categories: (a) 18–25 years old (8.5%, $p < 0.001$), (b) 46–55 years old (9.2%, $p < 0.001$), and (c) 56–65 years old (8%, $p < 0.001$). Conversely, “never” participation in PA programs during the Covid-19 restrictions increased in the 26–55-year-old age group (min=3.4%, max=6.2%) (Figure 3).



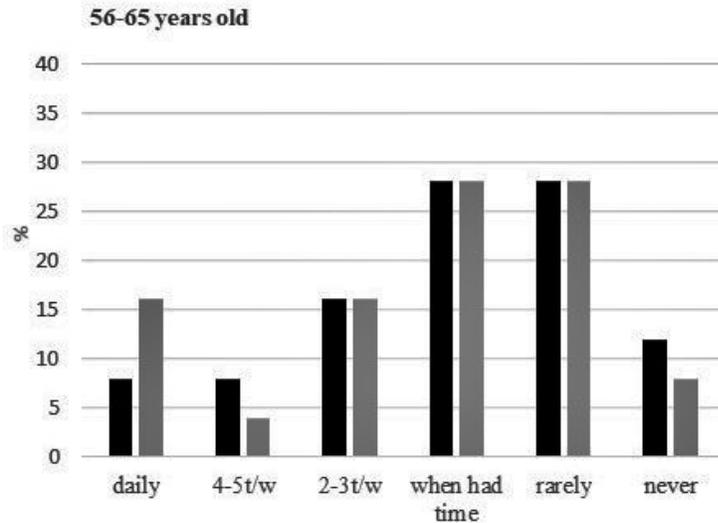


Figure 3. Age categories and weekly frequency of physical activity before and during the restriction measures

Body Weight and Physical Condition

During Covid-19 restrictions, 32.8% (n=336) of participants reported that they increased in body weight, and 60.2% (n=616) reduced in body weight. Association between gender and body weight was found only for the 18–25-year-old category ($p=0.005<0.05$) and the 56–65-year-old ($p=0.04<0.05$) category. In those who gained weight, we found that females were more likely to increase in weight (n=236) than males (n=100), excepted in the age category of 18–25 years old, where males predominated (39.6% males, 27.7% females). A statistically significant difference was identified between body weight and frequency of PA during the restriction ($p<0.001$). The increase in body weight statement was inversely proportional to the frequency of PA per week [daily PA (17.8% ↑ body weight), 4–5 times per week (21.8% ↑), 3–4 times per week, (28.9% ↑), when they had time (44% ↑), rarely (46% ↑), and never (46.3% ↑)].

According to the participant statements, their physical condition improved (n=353) or remained the same (n=380). Overall, 428 participants (41.9%) mentioned that they intended to integrate exercise into their daily life when the restrictions caused by the Covid-19 pandemic were eliminated.

Discussion

In this study, the results showed that the PA frequency increased during restriction measures compared to PA levels before among academic members in the Greek university under study here. The relationship between COVID-19 and PA behavior has already been addressed, and the importance of PA during restricting measures has been given. Our results were not in agreement with Bourdas & Zacharakis, (2020) in which the Covid-19 pandemic was associated with negative changes in PA in term of frequency and sports participation. Schnitzer et al. (2020) indicated that this condition forces people, even the youngest, to become inactive and adopt sedentary behaviors.

De la Camara et al. (2021) mentioned in their study that 44.3% of responders reported that they increased their interest in exercise during the confinement. However, this interest was significantly higher in those who did not perform regular exercise before the confinement. This report can be linked with an increase in the frequency of physical activity in our study. Prospectively, this increase may be associated with the increase in leisure and free time. Lack of time is the most frequently mentioned reason for not engaging in sports and PA (Schnitzer et al.,2020). Additionally, outdoor physical activity may have been used as an escape and an opportunity to get out. Citizens had to leave their house only for specific reasons and with permission via mobile messages. Code 6 relating to the exit for physical activity was used widely (National Public Health Organization, 2020).

However, Mutz & Gerke (2020) showed a significant decline in sport and exercise activities at the population level. In Germany, the percentage of those who did not engage in PA before or during restrictions was approximately 36%, (Mutz & Gerke, 2020) which was much higher than the results from our study. Decreased physical activity was also mentioned in studies of Italian medical students and American university students and employees during the restrictions (Barkley et al., 2020; Luciano et al., 2020).

Furthermore, there was a significant decrease of moderate intensity PA in Spanish people with chronic conditions in both sexes and different ages (Lopez-Sanchez et al., 2020). Our results are also not in agreement with data from the Special Eurobarometer 472 "Sport and physical activity" (European Commission, 2017). For the period of 2013–2017, it was recorded that only 2% did daily exercise, 9% did exercise 3–4 days per week,

12% did 1–2 days per week, and 68% never did any exercise. In another survey of nine European countries, including Greece, data showed a decrease in PA. Our opinion is that these results are due to the small number of Greek participants and their mean age (n: 97, age mean: 42.3) (Pisot et al., 2020).

Another important reason for the increased PA participation of individuals in our study might be the weather. In Greece, the weather was sunny when the restrictive measures were imposed. Day length and good weather encouraged people to get out of the house and do activities outside (Wagner et al., 2019). Developing outdoor exercise programs help increase participation in outdoor physical activity (Raiola & Di Domenico, 2021). These activities can be mild, including walking or jogging, but certainly do not constitute inactivity. This is in contrast with the decrease in exercise because of the closing of sports clubs, fitness centers, and other activity-related facilities that provide mainly indoor activities, as mentioned in other countries (Schnitzer et al., 2020; Barkley et al., 2020).

Females were more prompt to participate in surveys about physical activity. A Spanish study of the general population mentioned 69% women participation (National Public Health Organization, 2020), while in a study conducted in the USA and carried out in a University environment, the participation of females were three times more than that of males (Barkley et al., 2020). These findings are in agreement with our study in which males were more inactive (Bourdas & Zacharakis, 2020). However, Weitzer et al. (2020) noted that women were less likely to become active than men over the years. Younger age groups are more likely to maintain sport and exercise levels compared with older ones. Additionally, older people do not participate in online PA programs. As people get older, the participation in a variety of PA is limited. Reductions in PA were more common among older age groups compared to younger ones (Luciano et al., 2020).

In our study, the number of people who participated less in sport activities before the restrictions, corresponded to the number who exercised more frequently during the restrictive measures. The positive effects of participation in PA were influenced by the young age of the participants. Many young people participated already to a sport or a PA program. Significant differences in sport activity participation among younger age groups increased generally at the beginning of the pandemic in Germany (Luciano et al., 2020; Klostermann & Nagel, 2012). Our analysis indicates that many people substituted organized sporting activities with individual home-based or outdoor exercises. Our participants also chose during the confinements to do more than one activity. Before the restriction measures, most respondents had chosen to do individual PA. The same preference was apparent during the confinements by adding online exercise programs to the choice of one third of our participants, especially females, who prefer supervised activity indoors with people of the same sex and age (Weitzer et al., 2020). A home-based workout, such as aerobic, dance, as stationary bikes, is presumably an easier option for those who already have the right equipment and the necessary space in their homes. In addition, they must have the capacity to carry out and continue exercise without instructions (Hammami et al., 2020).

When the pandemic emerged, sports organizations, fitness clubs, and personal trainers started developing online fitness programs for their members to support home-based training (Luciano et al., 2020). Team spirit and psychological support for athletes could be maintained through online group meetings during the lockdown. Restrictive measures drove many individuals to improve their skills in online communication. Innovations in online PA promotion and online coaching have taken place. Many people promoted online exercise, but it is possible that some of these individuals were not exercise specialists and persons without the professional background to show the right exercises. Sport organizations may need to pay attention to this issue. These online novelties lead to ethical questions, such as privacy and personal freedom (Papaioannou et al., 2020). New technology leads to the evolution and greater acceptance of online programs, and more research is needed on its use (Dwyer et al., 2020).

The increase in body weight during the restraining measures represented one third of our participants and matched those who did not have PA in their weekly routine. This may link to the fact that, in sedentary healthy humans, appetite regulation may be different depending on physiological mechanisms. Food intake may not be matched by the decrease in energy requirement associated with inactivity. A sedentary lifestyle may increase the appetite and the desire to eat. The problem of appetite may not only be attributed to a lack of movement but also to the stimulation provided by replacing activities (Panahi & Tremblay, 2018). When physical exercise is restricted, energy intake may be dependent on psychological factors that influence metabolic regulation and body composition (Hammami et al., 2020; Narici et al., 2020). The weight management could be tackled by exercise outdoors (Adamakis, 2021). The improvement of the physical condition and the intention to include PA into their daily routine after the confinements of the pandemic was noted by our participants. Clearly, regular exercisers will return to their normal routine after confinements and will enjoy the health benefits of PA. The main attention must be on the non-regular exercisers. The current situation of the pandemic must promote the benefits of exercise. The positive effects of PA enhance the well-being, general health, and prevention of serious chronic diseases (De la Cãmara et al., 2021) The amount of exercise that is required for protection from illness and a poor physical condition is difficult to determine. The Physical Activity Guidelines for Americans reports that 150–300 min per week of moderate intensity aerobic PA and 2 sessions per week of muscle strength training are recommended. That means almost 30-40 min every day to stay healthy (Narici et al., 2020). Less

than 5000 steps per day may be associated with increased body fat composition, cardiometabolic risk, and insulin sensitivity (Tudor-Locke et al., 2013).

To our knowledge, our study is the first to report an increase in PA frequency during COVID-19 restrictions generally and between the two sexes. However, our study had limitations. We examined a sample of individuals at a university and cannot extend these findings to other fields. Additionally, the data were all self-reported, and the survey required participants to recall past behaviors. Furthermore, we asked participants about their personal assessment of PA participation, body weight, and physical condition without using time measures or PA categories. We found that this approach was quicker and more attractive for the respondents. Furthermore, these survey methods were a good option because the university was closed and person-to-person data collection was not possible.

Conclusions

Our results provide evidence of the impact of restrictive measures and university closure due to the COVID-19 pandemic and show that the PA frequency increased during restriction measures compared to PA levels beforehand. Perhaps outdoor physical activity was used as an escape and an opportunity to get out. However, the elements are encouraging for participation in any type of PA, particularly among young adults. Their preference for individual PA and online programs showed that it could be carried out successfully using technology. However, older people did not participate in online PA programs. Females were more apt to participate in surveys about physical activity, and their participation were three fold that of males. Males were more inactive. Our participants chose to do more than one activity than before the restriction measures. Additionally, they noted that their physical condition improved and they intended to include PA in their daily routine after the confinements of the pandemic. The period of confinements due to the Covid-19 pandemic and the negative effects on physical health should be an opportunity to integrate PA, considering the benefits to the human body. In this respect, we strongly echo Dr. Steven Blair's quote from Dr. Ken Powell: "Some activity is better than none, and more is better than less" (Zhu, 2019).

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