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Original Article

ANALYSIS OF THE BEHAVIOR OF PHYSICAL EXERCISERS IN PORTUGAL DURING THE COVID-19 PANDEMIC

ANÁLISE DO COMPORTAMENTO DOS PRATICANTES DE EXERCÍCIO FÍSICO EM PORTUGAL DURANTE A PANDEMIA DA COVID-19

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RESUMO

O presente estudo objetivou analisar o comportamento de praticantes de exercício físico em Portugal durante a pandemia de Covid-19, com um foco particular nas variáveis sociodemográficas e no nível de atividade física antes e durante a pandemia. Trata-se de um estudo de cunho descritivo-correlacional, de corte transversal e de abordagem quantitativa. A pesquisa incluiu 274 adultos de ambos os sexos (masculino=122, feminino=152) com idades variando entre 18 e 67 anos e que estavam envolvidos em alguma forma de exercício físico. Para avaliar o comportamento de atividade física e as informações sociodemográficas, foi utilizado um questionário elaborado pelos próprios pesquisadores, composto por 13 questões objetivas, divididas em três seções, sem o uso de escala Likert. As opções de resposta foram apresentadas em categorias específicas, permitindo aos participantes escolher aquela que melhor descrevesse sua situação, de acordo com cada questão. A primeira seção explicou os objetivos da pesquisa e obteve o consentimento informado. A segunda seção coletou dados sociodemográficos, enquanto a terceira seção abordou o comportamento de exercícios físicos antes e durante a pandemia da Covid-19. Nossos resultados mostraram uma queda significativa nos níveis de atividade física durante a pandemia. Antes da pandemia, 71,53% dos indivíduos eram suficientemente ativos, enquanto durante a pandemia esse número caiu para 47,45%. Os resultados evidenciaram um declínio significativo nos níveis de atividade física durante a pandemia de Covid-19 entre os praticantes de exercício físico em Portugal, com diferenças notáveis entre os gêneros e uma maior resiliência entre aqueles com mais tempo de prática.

Palavras-chave: Exercício físico; Pandemia; Atividade física; Medidas restritivas.

ABSTRACT

The present study aimed to analyze the behavior of physical exercise practitioners in Portugal during the Covid-19 pandemic, with a particular focus on sociodemographic variables and the level of physical activity before and during the pandemic. This is a descriptive-correlational study, cross-sectional and with a quantitative approach. The research included 274 adults of both sexes (male=122, female=152) aged between 18 and 67 years old and who were involved in some form of physical exercise. To assess physical activity behavior and sociodemographic information, a questionnaire designed by the researchers themselves was used, consisting of 13 objective questions, divided into three sections, without the use of a Likert scale. The answer options were presented in specific categories, allowing participants to choose the one that best described their situation, according to each question. The first section explained the objectives of the research and obtained informed consent. The second section collected sociodemographic data, while the third section addressed physical exercise behavior before and during the Covid-19 pandemic. Our results showed a significant drop in physical activity levels during the pandemic. Before the pandemic, 71.53% of individuals were sufficiently active, while during the pandemic this number dropped to 47.45%. The results showed a significant decline in physical activity levels during the Covid-19 pandemic among exercise practitioners in Portugal, with notable differences between genders and greater resilience among those with more practice time.

Keywords: Physical exercise; Pandemic; Physical activity; Restrictive measures.

Introduction

The Covid-19 pandemic, declared by the World Health Organization (WHO) on March 11, 2020, brought about drastic changes to daily life across the globe[1]. In Portugal, the first two cases were confirmed on March 2, 2020, and on March 18, the government declared a state of emergency[2]. With the implementation of restrictive measures, such as mandatory home confinement and the closure of recreational and sports facilities, many individuals experienced

interruptions or significant alterations to their physical activity routines[3]. Despite these restrictions, individuals sought strategies to maintain their physical activity levels at home[4].

According to a study published in *The Lancet*, "social isolation and restrictive confinement measures imposed by several countries have resulted in a significant reduction in the practice of physical activities, especially in outdoor environments."[5;1781]

Stockwell et al.[6] assert physical activity levels decreased significantly during the COVID-19 pandemic, while sedentary behavior increased substantially, especially during periods of confinement. The lack of regular physical activity, combined with the stress caused by the pandemic, has increased the risk of conditions such as obesity, hypertension and diabetes, seriously impacting the health of the world's population[7].

Several recommendations have been published throughout the pandemic, emphasizing the importance of maintaining regular physical activity, even in isolation conditions. Organizations such as the World Health Organization (WHO) and the Brazilian Society of Sports Medicine have reinforced that physical activity is essential for mental and immune health, helping to reduce stress, anxiety and the risk of chronic diseases[8,9].

Regular physical activity is crucial for maintaining both physical and mental health, contributing to the prevention of chronic diseases and enhancing mood and quality of life[10]. Studies have demonstrated that regular exercise can mitigate the negative effects of stress and anxiety, conditions that became more prevalent during the pandemic[11-13]. However, the social isolation measures imposed to curb the spread of the virus led to a significant decrease in physical activity levels among various populations[14,15].

It has also been found that men and women faced different challenges, with women often taking on a greater burden of domestic responsibilities and childcare, which limited their opportunities to maintain adequate levels of physical activity[16,17].

Moreover, it has been found that men and women faced different challenges, with women often bearing a greater burden of domestic responsibilities and childcare, which limited their opportunities to maintain adequate levels of physical activity[16,17]. Evidence suggests that individuals with a regular routine of physical activity before the pandemic displayed greater resilience in maintaining their activity levels during this period, possibly due to established habits and intrinsic motivation[18-20].

Given the potential negative consequences of this period of confinement, regular physical activity plays a fundamental role, particularly when considering that changes in daily routines may lead to increased sedentary behaviors[21]. In Portugal, data from the 2019 National Health Survey, published in the National Program for the Promotion of Physical Activity (PNPAF) by the Directorate-General for Health[22], indicated that 65% of Portuguese people never engage in sport or physical activity. Among the 33% who do, only 4% practice daily[23]. In light of the restrictive measures, changes in the behavior of the Portuguese population regarding physical activity remain largely unknown.

This study aimed to analyze the behavior of individuals who engage in physical exercise in Portugal during the Covid-19 pandemic, focusing on sociodemographic variables and levels of physical activity before and during the pandemic. This research seeks to provide a comprehensive overview of the factors influencing the maintenance or reduction of physical activity, contributing to the development of health promotion strategies better tailored to the population's needs.

Methods

Sample

This study used a descriptive-correlational cross-sectional design with a quantitative approach[24]. The non-probabilistic convenience sample consisted of 274 adults living in

Portugal (122 males and 152 females). They were aged between 18 and 67 years (31.82 ± 12.52). The inclusion criteria were: being 18 years or older, practicing some form of exercise before the pandemic, and living in Portugal. Exclusion criteria were incomplete or incorrect completion of the form and submission of duplicate forms. Informed consent was obtained from all individuals.

Procedures

To assess physical activity behavior and sociodemographic information, a questionnaire designed by the researchers themselves was used, consisting of 13 objective questions, divided into three sections, without the use of a Likert scale. The answer options were presented in specific categories, allowing participants to choose the one that best described their situation, according to each question. The first section explained the objectives of the research and obtained informed consent. The second section collected sociodemographic data, while the third section addressed physical exercise behavior before and during the Covid-19 pandemic. The questionnaire was administered online through Google Forms and disseminated through social networks such as WhatsApp® and Instagram®, in line with social isolation measures during the pandemic.

Statistical analysis

Descriptive analyses of central tendency and dispersion measures were conducted. Additionally, the data distribution was analyzed in terms of relative and absolute frequencies. Pearson's chi-square (χ^2) test was used for inferential analysis to assess the association between categorical variables related to physical exercise behavior before and during the pandemic, and sociodemographic variables. Participants were classified as sufficiently active (≥150 minutes of physical exercise per week) or insufficiently active (<150 minutes per week) based on WHO[25] criteria. The 95% confidence interval was used to calculate the odds ratio (OR), and a significance level of $p < 0.05$ was adopted. All analyses were performed using IBM SPSS® software version 27.

Results

The socioeconomic characteristics of the study sample are shown in Table 1. The table shows the distribution of participants by age group, gender, educational level, marital status, and provides a comprehensive overview of the demographic profile.

Table 1. Socio-demographic characteristics of the sample.

	n (%)
Age group (years)	
18 to 29	163 (59.5%)
30 to 39	36 (13.1%)
40 to 49	42 (15.3%)
50 to 59	26 (9.5%)
More than 60	7 (2.6%)
Gender	
Male	122 (44,5%)
Female	152 (55,5%)

Education Level	
Basic education	5 (1,8%)
Secondary education	101 (36.9%)
Higher education	168 (61.3%)
Marital status	
Single	175 (63.9%)
Married	90 (32.8%)
Divorced	8 (2.9%)
Widowed	1 (0.4%)

Note: Legend: n – absolute frequency; (%) – relative frequency.
Source: authors.

The majority of the participants (59.5%) were aged between 18 and 29. Most participants had higher education (61.3%), while 36.9% had secondary education, and only 1.8% had basic education. Regarding marital status, 63.9% of the participants were single, 32.8% married, 2.9% divorced, and 0.4% widowed.

Table 2 shows the participants' characteristics in terms of physical activity before and during the pandemic.

Table 2. Characteristics of physical exercise before and during the Covid-19 pandemic.

	n (%)
Sports	
Crossfit	80 (29.2%)
Bodybuilding	153 (55.8%)
Maximum strength	41 (15%)
Weekly frequency pre-covid-19	
1 x	37 (13.5%)
2-3 x	136 (49.6%)
4-5 x	74 (27.0%)
More than 5	27 (9.9%)
Weekly attendance during Covid-19	
0	43 (15.7%)
1x	47 (17.2%)
2-3 x	106 (38.7%
4-5 x	63 (23%)
More than 5	15 (5.5%)
Duration of pre-covid-19 training	
30’	27 (9.9%)
30’-45’	44 (16.1%)
45’-60’	131 (47.8%)
> 60’	72 (26.3%)

Duration of training during Covid-19	
0’	43 (15,7%)
30’	40 (14.6%
30’-45’	72 (26.3%)
45’-60’	84 (30.7%)
> 60’	35 (12,8%)
Goal before COVID-19	
Hypertrophy	71 (25.9%)
Weight loss	54 (19.7%)
Generalized maintenance	50 (18.2%)
Health	46 (16.8%)
Leisure	26 (9.5%)
Competition	14 (5.1%)
Aesthetics	13 (4.7%)
Have you changed your goal during the pandemic?	
Yes	77 (28.1%)
No	197 (71,9%)
Objective during COVID-19	
Generalized maintenance	61 (22,3%)
Weight loss	48 (17,5%)
Hypertrophy	44 (16,1%)
Health	36 (13,1%)
Aesthetics	20 (7,3%)
Leisure	14 (5,1%)
Competition	8 (2,9%)
Have you changed your weekly frequency?	
Increased	34 (12,4%)
Maintained	113 (41,2%)
Reduced	127 (46,4%)
Have you changed the duration of your training?	
Increased	16 (5,8%)
Maintained	114 (41,6%)
Reduced	144 (52,6%)

Note: Legend: n – absolute frequency; (%) – relative frequency.
Source: authors.

Regarding the type of physical exercise, it was observed that before the pandemic, weight training was the most practiced activity, with 55.8% of the participants, followed by Crossfit (29.2%) and maximum strength exercises (15%). The weekly frequency of exercise before Covid-19 showed that nearly half of the participants exercised two to three times a week (49.6%), while 27% exercised four to five times a week, and 9.9% exercised more than five

times a week.

During the pandemic, there was an increase in physical inactivity, with 15.7% of participants not engaging in any physical activity, and a reduction in the frequency of exercise. Only 5.5% of participants continued to exercise more than five times a week, and the majority (38.7%) maintained a frequency of two to three times a week. Regarding the duration of workouts before the pandemic, most participants (47.8%) trained for between 45 and 60 minutes, with 26.3% training for more than 60 minutes. During the pandemic, there was a decrease in the duration of workouts, with an increase to 15.7% of participants not doing any workouts, and 12.8% training for more than 60 minutes.

The goals of physical exercise were also analyzed. Before the pandemic, the main goals were hypertrophy (25.9%), weight loss (19.7%), and general maintenance (18.2%). During the pandemic, 28.1% of participants reported changing their goals, while 71.9% maintained the same goals. As a result, general maintenance became the most prevalent goal during the pandemic (22.3%), followed by weight loss (17.5%), hypertrophy (16.1%), and health (13.1%).

The weekly frequency of exercise also changed: 46.4% of the participants reduced their workout frequency, 41.2% maintained it, and 12.4% increased it. Regarding the duration of workouts, 52.6% of participants reduced the duration, 41.6% maintained it, and only 5.8% increased it.

When analyzing physical activity behavior before and during the Covid-19 pandemic (Table 3), the majority of participants (71.5%) were classified as sufficiently active before the pandemic, while only 28.5% were considered insufficiently active. During the pandemic, 47.4% were considered sufficiently active, and 52.6% were insufficiently active.

Table 3. Relationship between physical activity levels before and during the Covid-19 pandemic.

	Active enough during the pandemic	Insufficiently active during the pandemic	
	n (%)	n (%)	Total (%)
Active enough before the pandemic	119 (91.54%)	77 (53.47%)	196
Insufficiently active before the pandemic	11 (8.46%)	67 (46.53%)	78
Total	130	144	274

Note: Legend: n – absolute frequency; (%) – relative frequency.
Source: authors

The chi-square test (χ^2) revealed a statistically significant difference in maintaining or changing physical activity levels before and during the pandemic ($\chi^2(1)= 48.617$; $p < 0.001$), with a Phi coefficient of 0.421, indicating a moderate to strong association. Additionally, the odds ratio (OR) for being insufficiently active during the pandemic among those who were insufficiently active before the pandemic compared to those who were sufficiently active was 9.41 (95% CI = 4.679-18.940).

Regarding gender (Table 4), it was observed that before the pandemic, the majority of males (86.07%) were classified as sufficiently active, while only 59.87% of females were sufficiently active. During the pandemic, most males (58.20%) remained sufficiently active, but the majority of females (61.18%) became insufficiently active.

Table 4. Distribution of physical activity levels before and during the Covid-19 pandemic by gender.

	PA level before the pandemic			PA level during the pandemic		
	Sufficiently active	Insufficiently active		Sufficiently active	Insufficiently active	
	n (%)		Total	n (%)		Total
Male	105 (86.07%)	17 (13.93%)	122	59 (38.82%)	93 (61.18%)	122
Female	91 (59.87%)	61 (40.13%)	152	71 (58.20%)	51 (41.80%)	152
Total	196 (71,53%)	78 (28.47%)	274	130 (47.45%)	144 (52.55%)	

Note: Legend: n – absolute frequency; (%) – relative frequency.
Source: authors.

The chi-square analysis (χ^2) revealed a statistically significant difference in the distribution of physical activity levels between men and women before the pandemic (χ^2 (1) = 22.809; $p < 0.001$), with a Phi coefficient of 0.289, indicating a moderate association. The odds ratio (OR) for being insufficiently active among women compared to men was 4.14 (95% CI = 2.258-7.593). During the pandemic, the chi-square analysis revealed a statistically significant difference in physical activity levels between men and women (χ^2 (1) = 10.195; $p = 0.001$), with a Phi coefficient of 0.193, indicating a moderate association. The odds ratio (OR) for being insufficiently active among women compared to men was 2.19 (95% CI = 1.350-3.566). However, no statistically significant associations were found between gender and continuity of training ($\chi^2(1) = 0.514$, $p = 0.473$). The effect size calculated using the Phi coefficient was $\varphi = 0.043$, suggesting a very weak association.

When we descriptively analyzed the frequency distribution between levels of physical activity before the pandemic and whether participants completely stopped exercising during the pandemic (Table 5), we found that the majority of participants who maintained their physical activity during the pandemic (88.3%) were already sufficiently active before the pandemic. This suggests that those with a higher level of physical activity previously tend to continue exercising, even in the face of external challenges, such as the lockdown caused by the pandemic. This group possibly already had consolidated habits of regular exercise, which made it easier to maintain their behavior.

Among those who stopped exercising completely, the majority (53.49%) were also sufficiently active before the pandemic. Although this seems counterintuitive, it represents only 11.7% of all those who were sufficiently active before the pandemic. This figure can be interpreted as an exception, indicating that even among active individuals, some may have encountered significant difficulties in continuing to exercise during the pandemic, such as space limitations, access to equipment or other motivational factors.

On the other hand, insufficiently active participants who stopped training completely represented 25.6% of all those who were insufficiently active before the pandemic. This confirms the expectation that individuals with less established exercise habits faced greater barriers to continuing physical activity in a scenario of social isolation.

Table 5. Maintenance of physical activity during the pandemic in relation to the level of physical activity before the Covid-19 pandemic.

	Maintaining the practice during the pandemic		
	Stopped training	He hasn't stopped training	
	n (%)	n (%)	Total (%)
Active enough before the pandemic	23 (11,7%)	173 (88,3%)	196 (71,53%)
Insufficiently active before the pandemic	20 (25,6%)	58 (74,4%)	78 (28,47%)
Total (%)	43 (15,7%)	231 (84,3%)	274 (100%)

Note: Legend: n – absolute frequency; (%) – relative frequency.
Source: authors.

The results of the chi-squared test (χ^2) revealed a statistically significant association between the level of physical activity before the pandemic and the decision to stop or continue training during the pandemic (χ^2 (1) = 8.155; p = 0.004). The Phi coefficient of -0.173 indicates that this association was moderately negative, suggesting that as the level of physical activity before the pandemic increased, the likelihood of stopping training during the pandemic decreased.

When examining the odds ratios, we found that individuals who were sufficiently active before the pandemic were 2.59 times more likely to continue training during the pandemic compared to those who were insufficiently active (OR = 2.59; 95% CI = 1.32-5.09). This reinforces the idea that pre-existing physical exercise habits play a crucial role in resilience in the face of disruptive events. In contrast, the chance of stopping training among those insufficiently active before the pandemic was 0.39 times compared to those sufficiently active (OR = 0.39; 95% CI = 0.199-0.761), reinforcing the vulnerability of this group to changes in circumstances.

In addition to gender and pre-pandemic physical activity levels, the duration of practice was also associated with physical activity levels during the pandemic (χ^2 (1) = 8.907, p = 0.003) (Table 6). When calculating the odds ratio (OR), it was observed that participants who had been practicing for up to one year were less likely to be sufficiently active during the pandemic (OR = 0.457, 95% CI = 0.272 - 0.769).

Table 6. Distribution of the level of physical activity during the COVID-19 pandemic in relation to the length of time practiced.

	PA level during the pandemic		
	Sufficiently active	Insufficiently active	
Practice time	n (%)	n (%)	Total (%)
Up to 1 year	32 (34,8%)	60 (65,2%)	92 (33,58%)
Over 1 year	98 (25,6%)	84 (74,4%)	182 (66.42%)
Total (%)	130 (47,45%)	144 (52,55%)	274 (100%)

Note: Legend: n – absolute frequency; (%) – relative frequency.
Source: authors.

Despite the various associations found, some variables showed no significant association in this study. Specifically, the level of physical activity (PA) during the pandemic was not associated with age ($\chi^2(4) = 3.459$; p = 0.484; Cramer's V = 0.112), schooling ($\chi^2(2) = 2.858$; p = 0.240; Cramer's V = 0.102), type of practice ($\chi^2(2) = 8.887$; p = 0.012; Cramer's V = 0.180) or purpose of practice during the pandemic ($\chi^2(6) = 12.476$; p = 0.052; Cramer's V =

0.232).

Discussion

Our results revealed a significant decline in physical activity levels during the pandemic. Prior to the pandemic, 71.53% of individuals were sufficiently active; however, this figure dropped to 47.45% during the pandemic. This outcome aligns with the scientific literature, which has also documented reductions in physical activity due to mobility restrictions and the closure of gyms[14,26]. For instance, Castañeda-Babarro et al.[14], in a study of 3,800 individuals, reported a 19.4% reduction in regular physical activity during home confinement. Similarly, Mattioli et al.[26] highlighted that quarantine measures negatively impacted physical activity levels, thereby increasing the risks associated with a sedentary lifestyle.

The reduction in physical activity levels observed during the Covid-19 pandemic among exercisers in Portugal can be explained by several factors, including the characteristics of the participants, the methodology employed and external influences, such as government policies and the social context. One relevant factor is the rigidity of social isolation policies, which varied between countries and regions. Studies such as Aknin et al.[27] suggest that the rigidity of restriction policies directly impacted the behavior of the population, limiting access to exercise spaces such as gyms and parks and reducing motivation to practice physical activity. These restrictions may have been particularly severe in Portugal, where measures were stricter at certain times during the pandemic.

Furthermore, regular exercise before the pandemic appears to play a crucial role in maintaining physical activity during this period. Studies indicate that individuals with greater cardiorespiratory fitness and who exercise regularly have a lower risk of death from COVID-19[28,29]. For example, Christensen et al.[28] showed that patients with high cardiorespiratory fitness had a significantly lower risk of death compared to those with low fitness. This suggests that exercise not only improves physical health, but may also have a positive impact on the immune response, helping to mitigate the effects of the virus. Nevertheless, the study by Malisoux et al.[29] reinforces the idea that regular physical activity can act as a protective factor against COVID-19, improving the immune response and reducing the progression of the disease.

Another possible explanation for the results observed is related to the effect of the previous duration of the physical exercise habit. Those with more than a year of consistent practice showed greater resilience in maintaining their physical activity levels. This may be associated with the fact that individuals with established habits tend to have greater discipline and perceive exercise as an integral part of their routine, even in the face of adversity[11]. This behavior may also be related to psychological well-being, since studies have shown that regular exercise is associated with lower levels of anxiety and depression, which may have helped these individuals cope better with the stress of the pandemic.

The significant reduction in physical activity levels observed during the COVID-19 pandemic reflects a well-documented global trend. In addition to the studies mentioned, other research corroborates these findings. Tison et al.[30], using data from physical activity tracking devices, demonstrated an overall drop in step count by up to 27% during the first weeks of lockdown. This decline is associated with increased sedentary behavior, a known risk factor for several health conditions, including cardiovascular disease and type 2 diabetes. However, this approach may underestimate the practice of physical activity at home, such as exercise performed indoors, which suggests that some forms of exercise may not have been adequately captured. In addition, differences in the level of technological adaptation among the participants may have influenced the results, since individuals more accustomed to using electronic devices may have been more likely to continue tracking their physical activity habits.

Outdoor exercise has not been shown to be associated with COVID-19 cases, as

evidenced by a study by Cloosterman et al.[31], which found that physical activity in street runners was not associated with the development of symptoms of the disease. This reinforces the idea that physical activity may be a protective factor, not only against the severity of COVID-19, but also against the infection itself. Therefore, promoting physical activity during and after the pandemic may be a crucial strategy to improve public health and reduce the risks associated with respiratory diseases and other health conditions.

An analysis by gender revealed that men were more likely to maintain sufficient levels of physical activity during the pandemic compared to women (58.20% versus 38.82%, respectively). This finding is supported by studies such as Knell et al.[15] in the United States and López-Bueno et al.[32] in Spain, which also found that men maintained higher levels of physical activity during lockdown. Possible reasons for this disparity include the greater responsibility women assumed for household chores and childcare during lockdown, as well as differences in perceived safety and access to exercise spaces[16].

The observed difference in physical activity levels between men and women during the pandemic can be further understood by considering psychosocial and cultural factors. Studies indicate that women often bore a greater burden of domestic responsibilities and family care during lockdown periods, which may have limited their opportunities to maintain adequate levels of physical activity. For example, research by Flanagan et al.[33] found that women reported greater difficulty finding time to exercise due to these additional responsibilities. Additionally, safety concerns when engaging in outdoor physical activities may have been a more significant barrier for women than for men. Hall et al.[34] reported that women were more concerned about safety and were more likely to avoid outdoor activities during the pandemic. Heinzelmann et al.[35] highlighted that Portuguese women faced significant challenges during the pandemic, particularly regarding unpaid work and domestic responsibilities, which may explain the greater reduction in physical activity among women. This overload of tasks likely limited the time and energy available for exercise.

The demographic characteristics of the participants may also have influenced the results. Men's greater resilience in maintaining sufficient levels of physical activity, as observed in the study, may be related to differences in social roles and responsibilities during the pandemic. Studies indicate that women have faced a greater burden of household chores and family care during the lockdown, which may have restricted the time available for physical exercise. In addition, women may have faced more barriers to exercising outdoors due to safety concerns, as suggested by Nienhuis e Lesser[36]. Therefore, factors such as gender and household dynamics directly influenced physical activity levels, resulting in significant disparities.

Another significant finding was the association between the duration of exercise habits before the pandemic and the likelihood of maintaining these habits during the pandemic. Individuals who had been exercising consistently for more than a year were more likely to remain active during the pandemic. This result aligns with studies suggesting that individuals with an established exercise routine exhibit greater resilience to disruptions such as those caused by the pandemic. Brand et al.[18] found a positive correlation between exercise frequency and subjective well-being, indicating that those with well-established exercise habits were less likely to abandon their routines. Similarly, Mutz and Gerke[19] observed that the German population with regular physical activity routines demonstrated a greater capacity to adapt during self-quarantine.

The relationship between pre-pandemic exercise habits and maintaining physical activity during the pandemic underscores the importance of long-term habits for behavioral resilience in crisis situations. Longitudinal studies, such as the one conducted by Cheval et al.[37], highlight that individuals with established exercise routines show greater adaptation and maintenance of their physical activity levels, even in the face of significant restrictions. Other studies support this observation; for example, Constandt et al.[38] found that people in Belgium

with a regular history of physical activity were more likely to maintain their exercise routines during the pandemic. Moreover, Meyer et al.[11] noted that in the United States, individuals with regular exercise habits experienced less decline in physical activity and reported lower levels of anxiety during lockdown. Regular exercise is associated with psychological benefits, such as reduced vulnerability to stress and anxiety, which are critical factors during a crisis like the pandemic.

Although this study did not focus directly on mental health, it is important to note that maintaining physical activity during the pandemic has been associated with better mental health outcomes, including lower levels of anxiety and depression. Lesser and Nienhuis[39] demonstrated that regular physical activity acted as a protective factor against psychological stress during lockdown, reinforcing the importance of continuing to exercise during times of crisis. Additional studies, such as Schuch et al.[40], also support the notion that physical activity can mitigate the negative effects of the pandemic on mental health. Indeed, Maugeri et al.[41] found a positive correlation between physical activity levels and psychological well-being during lockdown, suggesting that physical activity served as a buffer against the stress and anxiety induced by the pandemic. Studies such as Löwe et al.[42] and Spitzer et al.[43] have shown that the increase in anxiety and depression during the pandemic may have affected individuals' willingness to engage in physical activity. The relationship between mental health and physical activity creates a cycle: the less active participants become, the greater the risk of psychological problems and, in turn, these problems make it more difficult to resume exercise.

Conclusion

This study revealed a significant decline in physical activity levels among exercisers in Portugal during the COVID-19 pandemic, with notable differences between genders and greater resilience observed among those with longer exercise habits. Comparisons with international studies confirm the global trend of reduced physical activity due to the restrictions imposed by the pandemic, underscoring the importance of strategies to promote the continuity of physical exercise during crises, given the benefits for both physical and mental health. This research provides a comprehensive overview of the factors influencing the maintenance or reduction of physical activity, contributing to the development of health promotion strategies tailored to the needs of the Portuguese population. The study suggests that establishing and maintaining regular exercise routines is essential for coping with future crises that may restrict mobility. Additionally, it highlights the need for specific strategies to support physical activity among women during confinement periods, to reduce the inequalities exacerbated by traditional gender roles.

The main limitations of this study include the use of a non-validated questionnaire, which may affect the accuracy of the collected data. Additionally, the lack of a probabilistic sample limits the generalization of the results to the entire Portuguese population. Finally, the absence of a specific classification for types of physical exercise, particularly for predominantly anaerobic exercises, restricts a detailed analysis of the impacts of different exercise modalities.

Future studies could explore interventions that promote physical activity during times of social restriction, focusing on strategies specific to women, addressing barriers such as household responsibilities and safety concerns. Additionally, research could investigate the long-term impact of reduced physical activity on mental health and the development of chronic diseases, especially among individuals with different levels of pre-pandemic exercise habits. Analyzing digital solutions, such as home-based exercise programs or virtual communities, could also provide valuable insights into how technology can mitigate the effects of future crises on physical activity levels.

This study is relevant to Portugal, filling the research gap on the effects of the pandemic on physical activity and providing important data for public health. In addition, it contributes to the global literature by highlighting the impact of pandemic restrictions on exercise and the need for strategies to promote physical activity in times of crisis, allowing for international comparisons.

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