



Research article

Avoidance of fitness or sports facilities during a lockdown: Gender and training environment could be protective factors

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ABSTRACT

The COVID-19 pandemic has swept the world, claiming nearly seven million lives by now. Despite a decline in the mortality rate, in November 2022, the virus-linked death cases still exceeded 500 every day. There is a belief that it is over now, but similar health-crisis situations may re-occur, and therefore it is essential to learn from such human disasters. It is an accepted fact that the pandemic has changed people's lives worldwide. One specifically and significantly affected life domain, especially during the lockdown, is the practice of sports and planned physical activities. Hence, this study examined the exercise practices and attitudes towards attending fitness facilities in 3053 working adults during the pandemic, along with the differences associated with the preferred training environment, including fitness/sports facilities, home, outdoor, or their combinations. The results revealed that women (representing 55.3% of the sample) are more precautionous than men. Further, exercise behavior and COVID-19 attitudes broadly vary among people choosing different training venues. In addition, age, exercise frequency, place of exercise, fear of infection, flexibility in training form, and desire to exercise freely are predictors of non-attendance (avoidance) of fitness/sports facilities during the lockdown. These results expand earlier findings to exercise settings, suggesting that women are more precautionous than men in the exercise context too. They are also the first to indicate that the preferred exercise environment entails attitudes that shape exercise patterns and beliefs associated with the pandemic differently. Therefore, men and regular fitness center attendees need more attention and special guidance in enforcing legislative prevention measures during a health crisis.

1. Introduction

The COVID-19 pandemic may soon be over, but by the end of this year, it may have claimed seven million lives worldwide [1], which is more than three times the population of Slovenia and exceeds the population of Slovakia and many other small countries. Despite a notable decline in the mortality rate, in October 2022, the daily death rate was still over 1000, and in November 2022, the virus-linked death cases were under 1000 only for about one week [1]. While the current pandemic appears to end, another variant of the virus or a new virus may result in another health crisis. Therefore, the lessons learned from COVID-19 can be helpful in preparation for another unexpected health crisis.

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1.1. Brief history

On March 11, 2020, the World Health Organization [2] made an announcement that changed the world. The WHO declared COVID-19 a pandemic. As an immediate response, numerous nations worldwide resorted to lockdown measures, including home confinement, to contain the transmission of the virus [3]. In Hungary, the first lockdown was in effect from March 28, 2020, prohibiting people from leaving their homes except for work, buying food or medication, and *individually* performing physical activity [4]. A second lockdown started on November 11, 2020 [5], and a third in March 2021, which lasted until late May 2021, specifically until five million people in the country had received a vaccine [6]. The general rules of the lockdowns concerning physical activity and sports were eased from November 2020 in that limited recreational activities were permitted outdoors as long as they were performed individually (not in groups) and competitive athletes with their club's certificate (as described later) could also perform indoor exercise training.

1.2. Effects of health protection measures

Regardless of geographical region, home confinement triggers necessary and obligatory changes in people's lives, forcing them to quickly adapt to an unexpectedly emerging and unpredictable situation. Consequently, the restrictions are very stressful [7,8]. For example, competitive athletes and those highly committed leisure exercisers who usually train in a fitness/sports facility experience stress due to lockdown measures [9]. However, there is individual variability in coping with stress [10,11]. The *goodness of fit hypothesis* is a theoretical model that may account for the stress and individual differences during lockdown [12]. This model purports that personal interpretation of a challenging situation for which the person is unprepared interacts with one's coping resources to predict how the person deals with a situation that requires fast adaptation. This model implies considerable individual variability in coping with the pandemic and aligns with the *health belief model* [13], purporting that one will likely appraise health preservation measures in the function of perceived health risks and action benefits, broadening individual variability further. However, in an exercise setting, individual variability can also be associated with the form of exercise, level of commitment to training habits, and the place of the regular exercise environment.

1.3. Exercise during lockdown

COVID-19 is still a health risk in many parts of the world. During the health crisis, those who exercised regularly had to reduce their usual exercise volume. For example, during a lockdown, home confinement is accompanied by reduced physical activity [14]. This reduction can be around 50% of the usual exercise volume [15]. Objectively tracked data also support the significant decrease in physical activity during the lockdown [16]. Figures from Hungary indicate that three months after the pandemic onset, the mean physical activity decreased by 166 min per week in a large physically active sample [17].

Apart from competitive athletes, the lockdown affects most attendees of fitness/sports facilities [18]. Such training milieus have a unique clientele comprised of many avid exercisers, some even exhibiting behaviors associated with exercise addiction [15]. In these people, the perceived benefit of exercise is higher than in exercisers not exhibiting such symptoms [19]. Therefore, they may increase, rather than decrease, their exercise volume during the lockdown to cope with stress [20]. However, high exercise volume might only reflect an intense passion for exercise. Indeed, de la Vega et al. [15] also found that the risk of exercise addiction was inversely related to the changes in exercise volume during the pandemic. Still, after controlling for passion and perfectionism, this association has vanished. Whether it is passion or exercise addiction, avid exercise *before lockdown* results in more stress *during lockdown* promoting training to control such stress [21].

In Hungary, individual exercise (home or outdoor) was permitted during the lockdown, but in-group exercising was banned even outdoors in November 2020 [5]. Later in February 2021, attending fitness/sports facilities was permitted again but only for competitive athletes. However, leisure exercisers used many backdoors to obtain a competitive athlete certificate [22]. These certificates were checked (not to fail an unexpected authority raid) but keenly accepted by the eager-to-survive fitness centers [22].

1.4. Gender differences

Studies have shown that women are more precautionary or responsible concerning preventive measures than men [7,23,24]. However, whether adult women's COVID-19-related attitudes differ from those exhibited by men in sports and exercise settings has not been evaluated in the academic literature. Only a few sporadic investigations exist in this area. Two of them suggest that during the pandemic, in a student sample, women choose different forms of physical activities than men [25], and among adults, men and women perceive the quality of fitness center-offered physical activities differently [26]. Further, another recent study found that the perceived risk of infection has a more significant impact on women's exercise behavior than men's [27]. Furthermore, differences in exercise form and volume between men and women could be related to risk management. For example, Colley et al. [28] found that compared to men, more women reported exercising indoors. Finally, different exercise preferences between men and women could also shape training attitudes and practices during the pandemic [29].

Despite recommendations [21] and few attempts to understand gender differences in attitudes and exercise behaviors during the pandemic, focused research on these factors is lacking. The importance of such investigations relates to the threat of infection posed by indoor places, such as fitness/sports facilities [30]. Since regular exercise and sports are part of many adults' lifestyles, precautionary attitudes and behaviors in fitness and sports settings, especially indoors, are crucial in controlling the pandemic.

1.5. Training environment

There are no studies on how exercise attitudes and behaviors vary in function of training place preference among habitual exercisers. So why is it essential to pose this question? First, those who exercise at home or outdoors or a combination of the two may be less affected by a lockdown (especially one that permits people to exercise outdoors) than those who exercise in fitness/sports facilities. Consequently, these individuals may experience less stress due to the lockdown and manifest different attitudes towards exercise in a health crisis. Further, many people stop attending their usual training venue, such as a fitness/sports facility [31]. In most cases, avoiding indoor exercise places is a wise decision [30], but what factors could predict such precautionous behavior?

1.6. The current study

This survey aimed to fill several gaps in the literature concerning working adults' exercise practices and attitudes during the pandemic. Specifically, the research posed an *exploratory question*: What factors could predict compliance with lockdown measures or the avoidance of fitness/sports facilities during a lockdown? Based on the literature reviewed, we also formulated and tested two hypotheses. *Hypothesis I*: Women exhibit more precautionous attitudes and behaviors toward COVID-19 than men in the exercise context. *Hypothesis II*: Individuals who used to exercise in a fitness/sports facility before the pandemic are less likely to avoid their usual training venue and exhibit more permissive attitudes.

2. Methods

2.1. Participants

2.1.1. Ethics

This study did not require ethical clearance based on Article 2.4 of the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans [32]. The Research Ethics Board of the Faculty of Education and Psychology at Eötvös Loránd University follows this policy and adopts the TCPS 2: CORE-2022 (Course on Research Ethics) to train its members. Specifically, the exemption is because the authors have received the dataset from a third party that has fully anonymized it, so no personal data or information source could

Table 1

Demographics of the sample (n = 3053).

Demographics	Frequency (n; %)
Age categories*	18–24 years: n = 122, 4.0% men and 4.0% women 25–39 years: n = 1,982, 64.4% men and 65.3% women 40–54 years: n = 829, 27.8% men and 26.8% women ≥55 years: n = 119, 3.8% men and 4.0% women Missing: n = 1, 0.03%
Education	High school or lower: n = 579, 19.0% University or higher: n = 2,465, 80.7% Missing: n = 9, 0.3%
Occupation	Employee: n = 2,294, 75.1% Manager: n = 463, 15.2% Civil servant: n = 140, 5.6% Employer: n = 99, 3.2% Missing: n = 27; 0.9%
Exercise frequency	About once a week: n = 103, 3.4% More than once per week: n = 580, 19.0% Three or four times per week: n = 1,740, 57.0% Five or six times per week: n = 540, 17.7% Every day: n = 90, 2.9% Missing: n = 0
Number of fitness/sports facilities attended in a month before the COVID-19	One: n = 1,141, 37.4% Two: n = 1,172, 38.4% Three or more: n = 719, 23.6% Missing: 21, 0.7%
Fitness/sports facility attended during lockdown	Yes: n = 888, 29.1% No: n = 2,164, 70.9% Missing: n = 1, 0.03%
Usual place(s) of exercise	Fitness/sports facility: n = 1,439, 47.1% Home: n = 46, 1.5% Outdoor: n = 81, 2.7% Home and outdoor: n = 68, 2.2% Fitness/sports facility and home: n = 193, 6.3% Fitness/sports facility and outdoor: n = 912, 29.9% Fitness/sports facility, home, and outdoor: n = 304, 10% Missing: n = 10, 0.3%

Note: * Categorical assessment of demographic measures further ensured the participants' anonymity.

be connected to the individual responses. Further, the collected data did not contain ethically sensitive answers; hence, the study could be considered a “minimal risk” [33].

Furthermore, the data collection was entirely voluntary. By completing the survey, volunteers showed interest in participating and simultaneously gave passive consent. This practice follows APA ethics [33]. Last, respondents could terminate answering the questions at any time without any consequence.

2.1.2. Recruitment

A large sports-management company, issuing a multi-facility discount leisure sports pass solely for employees and employers, posted a calls for participation in a study examining leisure exercisers’ attitudes and training habits during the COVID-19 pandemic on its website for two weeks in April 2021. Participants could win one of the following: one month of free sport-pass, ten thermoses, ten gym bags, or ten turbo-diet packages. After completing the online survey, those wishing to enter the draw had to provide their contact e-mails on another accessible platform. Still, there was no way the responses could be linked to the contact details of the participants wishing to participate in the draw. Likewise, the researchers had no access to information about those interested in participating in the draw.

2.1.3. Sample

We received the anonymous data of 3115 participants, but 62 respondents claimed they did not exercise regularly, so we deleted their responses. In addition, since the company’s website was visited by workers and employers (an eligibility criterion) with access to the sports pass, no students or pensioners participated in the study. Consequently, we analyzed responses from 3053 working adults (1359 men, 1683 women, and 11 undisclosed). The sample’s characteristics are presented in Table 1.

2.2. Materials

The research contained ten questions besides the demographic questions in Table 2. Three solicited *yes* or *no* answers, and the others required responses on a 5-point strong disagreement (1) to strong agreement (5) scale. We present justifications for the questions in Appendix A.

2.3. Procedure

The company’s Information Technology (IT) department posted the online survey on the sports management company’s website. This reasonably short survey could be completed in between 3 to 5 min. Further, the respondents knew that their participation was voluntary and anonymous and that completing the survey implied consent to participation and publication of the group results. Furthermore, the data were anonymized further by the sports management company’s IT department staff for the source (i.e., location/IP address) and forwarded to the researchers in the second half of 2021 in an entirely anonymous format. Finally, the research team examined the data. These data are openly available on the Mendeley data repository (DOI:10.17632/bsz6874jht.2). We have removed the answers from those who could not be considered regular exercisers, for example, those who reported no exercise or exercising less frequently than once a week ($n = 62$). We performed the statistical analyses between late 2021 and early 2022. The report writing took place during the summer of 2022. Corrections, to the original report, based on reviewers’ recommendations, were made during January 2023.

Table 2
Questions in the survey.

Questions	Answer form
1. Could online training replace fitness/sports facility training?	Yes: $n = 187$, 6.1% No: $n = 2,863$, 93.8% Missing: $n = 3$, 0.1%
2. Would you switch to online training on a long-term basis?	Yes: $n = 135$, 4.4% No: $n = 2,912$, 95.4% Missing: $n = 6$, 0.2%
3. Fitness/sports facilities pose a greater risk of COVID-19 infection than supermarkets.	Yes: $n = 959$, 31.4% No: $n = 2,082$, 68.2% Missing: $n = 12$, 0.4%
4. Fitness/sports facilities are COVID-19 hotspots.	Likert scale 1 to 5 *
5. You can hardly wait for fitness/sports facilities to reopen.	Likert scale 1 to 5 *
6. You greatly fear attending a fitness/sports facility.	Likert scale 1 to 5 *
7. You are keen to switch training forms to avoid infection.	Likert scale 1 to 5 *
8. Exercise and good nutrition aid in avoiding COVID-19.	Likert scale 1 to 5 *
9. A high rate of COVID-19 infection is due to poor health.	Likert scale 1 to 5 *
10. Outdoor exercises also present a risk of COVID-19 infection.	Likert scale 1 to 5 *

Table note: * 1 = strongly disagree and 5 = strongly agree.

2.4. Data analyses

We used binary logistic regression to explore the factors associated with avoiding fitness/sports facilities during the pandemic. We also employed Chi-square tests and multivariate analysis of covariance (MANCOVA) to test hypotheses I and II. We performed the statistical tests with both JASP software [34] and the Statistical Package of Social Sciences (SPSS v. 28, [35]).

3. Results

The correlations between the dependent measures (Appendix B) only served as crude indices of the answers' reliability (expected direction). Attendance of a fitness/sports facility during the lockdown correlated statistically significantly ($p < .001$) but weakly ($r = -0.064$ to 0.190) with all dependent measures (see Appendix B). This measure also correlated significantly with age ($r = 0.111$, $p < .001$), exercise frequency before COVID-19 ($r = 0.176$, $p < .001$), and the venue of exercise ($r = 0.101$, $p < .001$). Calculating the r square values indicates that all these correlations are weak and the shared variances are small. Indeed, these correlations' statistical significance may be primarily linked to the large sample size.

We also performed a chi-square (χ^2) test to examine the differences between those who did and did not attend a fitness facility during the lockdown in the context of their exercise frequency before the pandemic. This test was statistically significant (χ^2 [4] = 10.35 , $p < .001$). Only 13.59% of those who exercised about once a week attended a fitness/sports facility during the lockdown. This figure was 16.55% in those who trained 1–2 times per week, 29.56% in those exercising 3–4 times per week, 37.75% in those exercising 5–6 times per week, and 29.09% in those who reported exercising every day. Therefore, the figure was close to or above 30% in those exercising three or more time a week, suggesting that exercise frequency reaching or exceeding three weekly workouts is associated with less compliance with lockdown.

3.1. Predictors of compliance with lockdown

Nearly one-third ($n = 888$) of the current sample used a fitness/sports facility during the lockdown. In contrast, more than two-thirds ($n = 2164$) have refrained from attending a fitness center and complied with the lockdown. Using a binary logistic regression, we tested which correlated dependent measures could predict compliance with lockdown regulations, such as not attending fitness/sports facilities when the pandemic measures prohibit it. The logistic regression model was statistically significant: Chi-square (χ^2 [32]) = 276.86 , $p < .001$, -2 Log likelihood = 3212.32 , Nagelkerke $R^2 = 0.130$. The Hosmer & Lemeshow test was statistically not significant (χ^2 [8] = 6.35 , $p = .609$), which supported the goodness of fit of the model. The percent of the variance in avoiding a fitness/sports facility during lockdown measures was correctly identified in 72.7% of the cases. The significant predictors in the model are presented in Table 3.

3.2. Gender differences

First, four Chi-square (χ^2) tests were calculated to examine gender differences in the dependent measures (Table 4). Subsequently, a multivariate analysis of covariance (MANCOVA), controlling for age (Table 5), was calculated to assess gender-related differences in

Table 3

The significant predictors of not attending a fitness facility during the pandemic.

Predictor	B	S.E.	Wald	df	p	OR	95% C.I.	
							Lower	Higher
Age			28.265	3	<.001			
Age range 25–39 years	.203	.217	.880	1	.348*	1.226	.801	1.875
Age range 40–54 years	.684	.230	8.840	1	.003	1.981	1.262	3.109
Age >55 years	.976	.344	8.070	1	.004	2.654	1.353	5.205
Exercise Frequency			41.103	4	<.001			
Once or twice a week	-.090	.358	.063	1	.801	.914	.453	1.842
Three or four times a week	-.559	.347	2.591	1	.107	.572	.289	1.129
Exercising 5–6 times a week	-1.029	.357	8.304	1	.004	.357	.177	.719
Exercising every day	-.976	.417	5.477	1	.019	.377	.166	.853
Place of Exercise			16.110	6	.013			
Home	-.369	.212	3.040	1	.081	.691	.457	1.047
Outdoor	.097	.517	.035	1	.851	1.102	.400	3.036
F/SF and Outdoor	.702	.454	2.389	1	.122	2.018	.828	4.915
Home and Outdoor	-.201	.215	.876	1	.349	.818	.537	1.246
F/SF, Home, and Outdoor	1.041	.573	3.306	1	.069	2.833	.922	8.707
F/SF and Home	-.063	.242	.069	1	.793	.939	.584	1.509
Eager for fitness/sports facilities to reopen	.155	.075	4.239	1	.039	1.168	1.007	1.354
Fear of attending a fitness/sports facility	.135	.047	8.386	1	.004	1.144	1.045	1.254
Keen to switch training forms to avoid infection	.131	.043	9.394	1	.002	1.140	1.048	1.240

Table note: * = The contrast variable is the first category. B = the regression coefficient; S.E. = Standard Error; Wald = chi-square value; df = degrees of freedom, p = level of statistical significance; OR = Odds Ratio; C.I. = 95% Confidence Interval.

Table 4
Results of the Chi-square tests examining gender differences.

Questions	Percent 'yes' answers	χ^2 (df = 1)	n	OR	95% Confidence interval		p
					Lower	Higher	
Attended a fitness/sports facility during lockdown (yes, no)	Men 32.60% Women 26.22%	14.83	3041	1.36	1.16	1.59	<.001
Online training can replace fitness/sports facility training (yes, no)	Men 3.83% Women 8.03%	22.93	3040	0.46	0.33	0.63	<.001
Would switch training forms on a long-term basis (yes, no)	Men 2.87% Women 5.72%	14.34	3036	0.49	0.33	0.71	<.001
Fitness/sports facilities pose a greater risk of COVID-19 infection than supermarkets (yes, no)	Men 31.81% Women 31.34%	0.07	3030	1.02	0.88	1.19	=.783
	Percent total	χ^2 (df = 4)	n	γ^*	95% Confidence interval of γ		p
Exercise frequency	Men 44.68% Women 55.32	33.21	3042	-.16	-.22	-.10	<.001

Table note: χ^2 = Chi-square value; n = number of total observations; OR = Odds Ratio; p = level of statistical significance of the Chi-square test; γ = gamma; * due to 2 by 5 contingency table, not the OR but ordinal gamma (γ) and its 95% confidence interval were calculated.

Table 5
Univariate tests that follow up the statistically significant MANCOVA results in gender differences.

Questions (Rated 1 to 5)	Mean \pm SD	F	df	p	η_p^2
Fitness/sports facilities are COVID-19 hotspots	Men 2.27 \pm 1.18 Women 2.25 \pm 1.14	0.18	1, 2962	=.692, NS	.001
Eager for fitness/sports facilities to reopen	Men 4.65 \pm 0.72 Women 4.57 \pm 0.80	9.20	1, 2962	=.002	.003
Fear of attending a fitness/sports facility	Men 2.36 \pm 1.36 Women 2.64 \pm 1.42	29.46	1, 2962	<.001, Age+	.010
Keen to switch training forms to avoid infection	Men 2.83 \pm 1.25 Women 3.26 \pm 1.27	88.10	1, 2962	<.001	.029
Exercise and good nutrition help avoid COVID-19	Men 3.27 \pm 1.37 Women 3.18 \pm 1.36	2.29	1, 2962	=.086, NS, Age-	.001
A high rate of COVID-19 infection is due to poor health	Men 3.74 \pm 1.18 Women 3.79 \pm 1.16	1.36	1, 2962	=.243, NS	.000
Outdoor exercises also carry a risk of COVID-19 infection	Men 1.98 \pm 0.92 Women 2.06 \pm 0.99	4.38	1, 2962	=.036	.001

Table note: SD = Standard Deviation; F = univariate test value; df = degrees of freedom; p = level of statistical significance; NS = Not Significant; η_p^2 = effect size, partial Eta squared; Bolded cells: Age+ = Age is a statistically significant positive mediator (r = 0.09, p < .001); Age- = Age is a statistically significant negative mediator (r = - 0.08, p < .001).

the answers to questions 4–10 (refer to Table 2). The MANCOVA yielded a statistically significant multivariate gender effect (Pillai's Trace = 0.044, F(7, 2956) = 19.45, p < .001, effect size (η_p^2) = 0.044) and age was a significant covariate (Pillai's Trace = 0.020, F(7, 2956) = 8.63, p < .001, η_p^2 = 0.020). The univariate tests in Table 5 showed that gender differences occurred in four out of seven measures, and age was a significant covariate in two dependent measures.

3.3. Place of exercise

Similar to testing gender differences, first, cross-tabulations with four χ^2 tests were calculated to examine differences in the dependent measures between those exercising in various venues (Table 6). Subsequently, we performed a MANCOVA, controlling for age and gender (Table 7), to assess exercise place-related differences in the answers to questions 4–10 (refer to Table 2). The MANCOVA yielded a statistically significant multivariate exercise place effect (Pillai's Trace = 0.319, F(42, 17,682) = 23.62, p < .001, η_p^2 = 0.053) and the covariates age (Pillai's Trace = 0.019, F(7, 2942) = 8.18, p < .001, η_p^2 = 0.019) and gender (Pillai's Trace = 0.034, F(7, 2942) = 14.60, p < .001, η_p^2 = 0.034) were also statistically significant. The univariate tests in Table 7 showed that exercise venue differences occurred in all measures, while age and gender were statistically significant (p < .05) and covaried with two dependent measures.

4. Discussion

First, this study explored factors that could predict compliance with lockdown measures or the avoidance of fitness/sports facilities during a lockdown. It also tested whether women were more precautionary than men in the context of the exercise COVID-19 relationship. Finally, based on the rational argument that different expectations and attitudes could exist in exercise venue preference, the

Table 6
Results of the Chi-square tests examining exercise place-related differences.

Questions	Group (1–7) and percent 'yes' answers	χ^2 (df = 6)	n	Gamma	95% Confidence interval of Gamma		p
					Lower	Higher	
					Attended a fitness/sports facility during lockdown (yes, no)	1–34.05% 2–13.04% 3–8.64% 4–29.64% 5–7.35% 6–23.36% 7–19.17%	
Online training can replace fitness/sports facility training (yes, no)	1–1.88% 2–43.48% 3–19.72% 4–3.29% 5–38.24% 6–11.55% 7–16.58%	370.13	3040	–0.466	–0.545	–0.388	<.001
Keen to switch training to online training in the long-term (yes, no)	1–0.58% 2–47.83% 3–12.35% 4–1.21% 5–35.29% 6–11.51% 7–12.95%	510.21	3037	–0.553	–0.632	–0.475	<.001
Fitness/sports facilities pose a greater risk of COVID-19 infection than supermarkets (yes, no)	1–27.08% 2–63.04% 3–49.38% 4–28.87% 5–50.75% 6–43.42% 7–36.27%	82.63	3031	–0.155	–0.213	–0.096	<.001

Table note: Groups: 1 = fitness/sports facility; 2 = home; 3 = outdoor; 4 = fitness/sports facility, and outdoor; 5 = home and outdoor; 6 = fitness/sports facility, home and outdoor; 7 = fitness/sports facility and home. χ^2 = Chi-square value; df = degrees of freedom; n = number of total observations; Gamma = strength of associations; p = level of statistical significance.

study also tested whether the preferred exercise place is connected to exercise practices and COVID-19 attitudes.

4.1. Predictor of compliance (non-attendance of fitness centers)

In our sample, close to one-third (29.1%) of the adult leisure exercisers attended a fitness/sports facility during the lockdown. In contrast, more than two-thirds of the sample (70.9%) have abstained from attending fitness facilities. Compliance with the lockdown was predicted by age, frequency of exercise before the pandemic, preferred place of training, eagerness for fitness/sports facilities to reopen, fear of attending a fitness/sports facility, and will to switch training forms to avoid infection. Being 40 years and over was a *positive* and significant predictor of compliance. This finding agrees with past results showing that younger age groups generally are less worried about the risk of infection and adopt a less conservative attitude during the lockdown than older adults [7,36].

The reported exercise frequency before the pandemic was *negatively* associated with avoiding fitness facilities during lockdown, with those exercising 5–6 times per week being the least likely to stay away. This finding matches the recent reports in the literature that a high volume of habitual exercise is associated with difficulty in adapting to lockdown measures that interfere with regular exercise [15,20,21]. Some people may even buy athletic status certificates to access their usual training environment [22]. So avid exercisers appear to represent a unique group. Indeed, about 29–28% of those exercising three or more times a week reported attending a sports/fitness facility during the lockdown.

While the place of the exercise was also a significant predictor of non-attending a fitness/sports facility during the lockdown, none of its categories reached the conservative level of statistical significance. However, those preferring to exercise in fitness/sports facilities and outdoors, as well as at home, were more than twice as likely not to attend a fitness/sports facility during the lockdown based on odds ratios >2. Unfortunately, these findings cannot be compared to past research in the literature as they do not exist. A plausible explanation for these results is that these individuals had an alternative, such as exercising outdoors, at home, or both places. During the lockdown, they could take advantage of these alternatives. Also noteworthy is the result that home exercise had an odds ratio of less than one, suggesting that it was a negative (but non-significant; $p = .081$) predictor of abstinence from attending a fitness/sports facility during the lockdown. We have no explanation for this trend, but it can reflect a projection of one's wish versus reality or preference in contrast to availability. Still, this explanation is speculative. To clarify the issue, further research in this direction is needed.

Three other predictors of compliance with the lockdown measures were: 1) eagerness for fitness/sports facilities to reopen, 2) fear of attending a fitness/sports facility, and 3) keenness to switch training forms to avoid infection. All three measures were positive

Table 7

Univariate tests associated with the statistically significant MANCOVA results in exercise place differences.

Questions (Rated 1 to 5)	Group	Mean ± SD	F	df	p	η_p^2
Fitness/sports facilities are COVID-19 hotspots	1 ^{2,3,5,6}	2.12 ± 1.14	16.58	6, 2948	<.001	.033
	2 ¹	2.67 ± 1.18				
	3 ^{1,4,7}	2.96 ± 1.11				
	4 ^{3,5,6}	2.23 ± 1.14				
	5 ^{1,4,7}	2.87 ± 1.20				
	6 ^{1,4}	2.57 ± 1.15				
	7 ^{3,5}	2.35 ± 1.11				
Eager for fitness/sports facilities to reopen	1 ^{2,3,5,6,7}	4.78 ± .59	105.14	6, 2948	<.001	.176
	2 ^{1,3,4,6,7}	3.12 ± 1.17				
	3 ^{1,2,4,6,7}	3.79 ± 1.04				
	4 ^{2,3,5,6,7}	4.71 ± .64				
	5 ^{1,4,6,7}	3.46 ± 1.18				
	6 ^{1,2,3,4,5}	4.39 ± .81				
	7 ^{1,2,3,4,5}	4.27 ± .92				
Fear of attending a fitness/sports facility	1 ^{2,3,5,6,7}	2.30 ± 1.34	24.05	6, 2948	<.001 *, #	.047
	2 ^{1,4}	3.36 ± 1.50				
	3 ^{1,4}	3.42 ± 1.44				
	4 ^{2,3,5,6,7}	2.45 ± 1.38				
	5 ^{1,4}	3.41 ± 1.34				
	6 ^{1,4}	2.91 ± 1.40				
	7 ^{1,4}	2.97 ± 1.39				
Keen to switch training forms to avoid infection	1 ^{2,3,4,5,6,7}	2.54 ± 1.18	107.52	6, 2948	<.001 #	.180
	2 ^{1,4}	4.21 ± 1.05				
	3 ^{1,4}	3.85 ± 1.17				
	4 ^{1,2,3,5,6,7}	3.27 ± 1.16				
	5 ^{1,4}	4.24 ± 1.15				
	6 ^{1,4}	3.91 ± 1.10				
	7 ^{1,4}	3.76 ± 1.05				
Exercise and good nutrition help avoid COVID-19	1 ³	3.26 ± 1.38	4.72	6, 2948	<.001 *	.010
	2	2.90 ± 1.56				
	3 ^{1,4}	2.67 ± 1.21				
	4 ^{3,5}	3.31 ± 1.32				
	5 ⁴	2.73 ± 1.43				
	6	3.14 ± 1.33				
	7	3.10 ± 1.38				
A high rate of COVID-19 infection is due to poor health	1	3.75 ± 1.18	3.14	6, 2948	=.005	.006
	2	3.57 ± 1.36				
	3 ⁴	3.37 ± 1.28				
	4 ³	3.86 ± 1.12				
	5	3.68 ± 1.16				
	6	3.73 ± 1.17				
	7	3.66 ± 1.13				
Outdoor exercises also carry a risk of COVID-19 infection	1 ^{2,7}	1.96 ± .94	6.94	6, 2948	<.001	.014
	2 ¹	2.45 ± 1.25				
	3	2.21 ± 1.04				
	4 ⁷	1.99 ± .95				
	5	2.30 ± 1.01				
	6	2.13 ± .93				
	7 ^{1,4}	2.31 ± 1.01				

Table note: Groups: 1 = fitness/sports facility; 2 = home; 3 = outdoor; 4 = fitness/sports facility and outdoor; 5 = home and outdoor; 6 = fitness/sports facility, home, and outdoor; 7 = fitness/sports facility and home. Superscripts (*italics*) denote the Bonferroni-corrected statistically significant differences ($p < .05$) from the respective group (i.e., 1², indicates that group 1 (fitness/sports facility exercise) differs from group 2 (home exercise)). SD = Standard Deviation; F = test value; df = degrees of freedom; p = level of statistical significance; η_p^2 = effect size, partial Eta squared. * = age is a significant covariate; # = gender is a significant covariate.

predictors, which suggested an increase in the likelihood of compliance, or non-attendance of a fitness/sports facility, by 14–16% based on the odd ratios. While the first measure might reflect delay-based self-control by hoping the lockdown is over soon, the other two reflect distress or anxiety associated with the possibility of being infected. Again, these findings are novel as based on our literature search through which we could not locate similar research. We suggest that the predictors of compliance with lockdown measures in sports and exercise settings should be further evaluated. We hope that these preliminary findings could provide an incentive for such research.

4.2. Gender differences

In accord with reports from non-exercise settings [7,23,24], our survey reveals that exercising women are more precautious than men concerning COVID-19 and associated measures. For example, fewer women than men attended a fitness/sports facility during the

lockdown, while more women were inclined to change their training forms long-term if necessary to avoid infection. Furthermore, more women than men thought online training could replace fitness/sports facility training, suggesting flexibility to adapt to the new situation and to protect themselves.

Women were less eager than men for fitness/sports facilities to reopen, suggesting a kind of patience or acceptance. However, despite statistical significance, the effect size was small, so the interpretation of this finding should be cautious. Further, women reported greater fear of attending a fitness/sports facility, which agrees with other research results in physical activity [37] and general population settings [38]. In association with this measure, women also appeared to be more open to switching training forms to avoid infection, which mirrors a precautionary attitude. Furthermore, fewer women than men thought that good nutrition and exercise could help prevent COVID-19, suggesting that women are either more skeptical or better informed about the virus. Finally, the finding that more women than men believed that outdoor exercises also carry a risk of COVID-19 infection might be associated with greater fear, skepticism, and even a more realistic evaluation (in case of not maintaining personal) distance of the pandemic. Overall, our results expand the results concerning more precautionary and responsible attitudes of women compared to men from the general population level [39] to fitness and exercise settings.

4.3. Place of exercise

The possible connection between place of exercise and COVID-19 attitudes were not examined to date. We scrutinized this issue based on common sense that different exercise places carry different levels of risk of infection. Our findings suggest that the most significant proportion of those who attended a fitness/sports facility during the lockdown were individuals who exercised in an environment involving fitness/sports facilities. These people were the least inclined to believe online training can replace fitness/sports facility training. Further, they were the least keen to switch their training place in the long term.

Furthermore, they disagreed the most with the statement that fitness/sports facilities pose a greater risk of COVID-19 infection than supermarkets. This finding may be partly explained by the status quo bias [40], which can occur even at the expense of risk or missing some benefits. Still, another alternative explanation is that avid, passionate exercisers, some showing symptoms of exercise addiction, cannot deprive themselves of the customary exercise regimen. Indeed, the deprivation stress may further increase exercise volume to cope [20].

4.4. Strengths and limitations

A strength of the study is the large sample size. Also, in contrast to the bulk of psychological research online, it examined an adult (non-student) income-earning sample. Further, it explored some determinants of staying away from fitness centers during a lockdown. Furthermore, it represents the first attempt to examine COVID-19 behavior and attitudes in the context of the preferred exercise place. However, this study also has limitations. First, due to its cross-sectional nature, there are no causal links. Second, self-selection to participate in this research might bias the data. Third, the findings are limited to working people with a relatively high education level and the Hungarian population.

5. Conclusions

The results of the current study suggest that age, past exercise frequency, place of exercise, fear of infection, flexibility to change training form, and wish for fitness centers to reopen could predict the non-attendance (avoidance) of fitness/sports facilities during the lockdown. Further, exercising women appear to be more precautionary than men. Furthermore, exercise behavior and associated COVID-19 attitudes varied greatly among people choosing different training venues. Additionally, the results suggest that preference for exercise places entails attitudes shaping exercise patterns and beliefs associated with the COVID-19 pandemic. The study's message is that men and committed fitness/sport facility attendees (avid exercisers) should be given special attention and guidance during health crises.

Author contribution statement

Attila Szabo: Conceived the research questions and the hypotheses; Analyzed and interpreted the data; Wrote the paper.

Krisztina E Ábel: Conceived and designed the hypotheses; Analyzed and interpreted the data.

Zsuzsa Mihalik: Conceived and designed the study; Collected the raw data; Analyzed and interpreted the descriptive data.

István Soós; Szilvia Boros: Contributed to the literature review, statistical analyses and creation of Tables.

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Data availability statement

Data associated with this study has been deposited at Mendeley data repository: <https://data.mendeley.com/datasets/bsz6874jht/>

2.

Declaration of interest's statement

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

This table presents the rationales for the questions in the study.

Questions	Justification
1. Could online training replace fitness/sports facility training? (yes or no)	To test this belief and whether it relates to not attending a fitness/sports facility by gender or training place. Also, it is expected to be related to behavioral intent (see question [Q]2).*
2. Would you switch to online training on a long-term basis? (yes or no)	To test this behavioral intention and whether it relates to not attending a fitness/sports facility, gender, or training place. Answers may project a flexible approach to the training milieu. Their positive correlation with Q1 is a crude index of reliability (answer direction agreement).
3. Fitness/sports facilities pose a greater risk of COVID-19 infection than supermarkets. (yes or no)	Most often, visits to food supermarkets were/are permitted during a lockdown, but fitness/sports facilities are closed or restricted to athletes' use, but (by law)** not leisure exercisers. Therefore, not perceiving fitness facilities as more dangerous than supermarkets could be inversely related to their attendance during a lockdown. If reliable, the answers were expected to correlate negatively with those given to Q4 and positively with those to Q6.
4. Fitness/sports facilities are COVID-19 hotspots. (Likert scale 1 to 5)	Similar to the above, the perception of the <i>level of risk</i> of infection in closed spaces may be inversely related to fitness center attendance during a lockdown and differ between men and women, as well as people exercising in different places (i.e., at home or outdoors). The answers should relate positively to Q6.
5. You can hardly wait for fitness/sports facilities to reopen. (Likert scale 1 to 5)	A high eagerness for fitness/sports facilities to reopen could be related to attendance (even at the cost of breaking the law) during a lockdown. Furthermore, differences could be expected between those who exercise at home, outdoors, or in a fitness/sports facility.
6. You greatly fear attending a fitness/sports facility. (Likert scale 1 to 5)	The fear of attending a fitness/sports facility, whether due to lockdown policy or infection risk, can be assumed to be inversely related to fitness center attendance. Also, based on the extant literature, there might be gender-related differences, and, rationally, such fear may differ among those who exercise at home or outdoors. Finally, the ratings' positive correlation with Q3, Q4, Q7, and Q10 can be considered a crude index of reliability (answer direction).
7. You are keen to switch training forms to avoid infection. (Likert scale 1 to 5)	In contrast to categorical question 2 above, this question assesses the <i>level</i> of behavioral intent as a temporary momentary measure to avoid infection. It may differ between genders and people exercising at various places and could also be a predictor of the avoidance of fitness/sports facilities during the pandemic. Therefore, it should correlate positively with Q6.
8. Exercise and good nutrition aid in avoiding COVID-19. (Likert scale 1 to 5)	A greater level of agreement with this statement may be considered a form of self-justification (rationalization) for attending fitness/sports facilities during a lockdown. Reliable answers should correlate positively with answers to Q9.
9. A high rate of COVID-19 infection is due to poor health. (Likert scale 1 to 5)	Similarly to question 9 above, a higher level of agreement in avid exercisers may be inversely related to compliance with lockdown, based on literature showing that very intensely involved exercisers perceive more health benefits. Since the answer should correlate with the answer to question 8, it is also a measure of reliability.
10. Outdoor exercises also present a risk of COVID-19 infection. (Likert scale 1 to 5)	Responses to this question may reflect extreme fear and over-precaution. Therefore, answers to this question should correlate positively with answers to Q6. However, since there is recent evidence that women prefer more exercising at home, we also wanted to test gender differences concerning this question.

Note: Appendix A highlights the correlation coefficients among the dependent measures examined for answer reliability, primarily in the expected direction.

* = the actual (obtained) correlations were in the expected directions (see Appendix B).

** = despite governmental regulations prohibiting attendance of fitness facilities by leisure exercisers, many overcame by getting (paying for) an athlete's ID card legally or illegally to bypass the law.

Appendix B

Pearson (r) correlations between the dependent measures and (highlighted in the last row) attendance of fitness/sports facilities during the lockdown.

		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Q1. Could online training replace fitness/sports facility training?		–									
Q2. Would you switch to online training on a long-term basis?	r	.563									
	p	<.001									
Q3. Fitness/sports facilities pose a greater risk of COVID-19 infection than supermarkets	r	.130	.122								
	p	<.001	<.001								
Q4. Fitness/sports facilities are COVID-19 hotspots	r	–.136	–.110	–.572							
	p	<.001	<.001	<.001							
Q5. You can hardly wait for fitness/sports facilities to reopen	r	.306	.390	.273	–.254						
	p	<.001	<.001	<.001	<.001						
Q6. You greatly fear attending a fitness/sports facility	r	–.150	–.148	–.567	.629	–.319					
	p	<.001	<.001	<.001	.000	<.001					
Q7. You are keen to switch training forms to avoid infection	r	–.231	–.244	–.307	.386	–.342	.458				
	p	<.001	<.001	<.001	<.001	<.001	<.001				
Q8. Exercise and good nutrition aid in avoiding COVID-19	r	.054	.058	.340	–.375	.178	–.402	–.234			
	p	.003	.001	<.001	<.001	<.001	<.001	<.001			
Q9. A high rate of COVID-19 infection is due to poor health	r	.021	.044	.270	–.290	.137	–.317	–.141	.572		
	p	.250	.015	<.001	<.001	<.001	<.001	<.001	<.001		
Q10. Outdoor exercises also present a risk of COVID-19 infection	r	–.082	–.087	–.240	.310	–.165	.359	.246	–.261	–.218	
	p	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	
Did you attend a fitness/sports facility during the lockdown?	r^*	–.088	–.064	–.114	.149	–.105	.190	.177	–.117	–.074	.099
	p	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001

Note: These correlation coefficients are low, and their statistical significance can be attributed to the large sample size.

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