COVID-19 and Physical Activity: Analyzing the Behaviour of Returning to Gym and/or Recreation Facilities Among Regular Gym Users During the COVID-19 Pandemic

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Abstract

Background
Physical Activity (PA) is bodily movement that involves energy output from the muscles and is associated with numerous health benefits. However, with the emergence of the COVID-19 pandemic on March 11, 2020, stay-at-home orders and public health measures led to a decreased trend in PA levels throughout the Canadian population. As restrictions began to ease in British Columbia (BC), gym and recreation facilities re-opened on May 19, 2020, under new public health safety protocols. This study explored whether gym and/or recreational facility attendance among regular users was impacted by public health safety or financial factors during COVID-19.

Methods
A self-administered online survey was distributed using an online forum website (Reddit) and posted in a health clinic with a QR code. They survey included demographic questions as well as questions regarding COVID-19 safety protocols in gyms and recreation facilities. Nominal data was collected, and the Pearson's Chi-Square test was used to determine if associations existed between returning to fitness facilities during COVID-19 public health safety or financial factors.

Results
Among the 303 responses collected, up to 270 were suitable to be included in the analyses. A statistically significant association was found between all three sub hypotheses for public health safety factors (users disinfecting equipment before and after use, physical distancing, and mask use) and returning to the gym and/or recreation facility ($p= 0.00$). Two of the five sub hypotheses for financial factors revealed significant results; income loss ($p= 0.02$) and going to the gym as a priority expense ($p= 0.00$). No significant results were found with the other three hypotheses; employment status ($p= 0.10$), hourly wage ($p= 0.13$), and gym membership or drop in fee increase ($p= 0.15$).

Conclusion
The results suggest that regular gym users' decision to return to the gym and/or recreation facilities was influenced by whether appropriate COVID-19 safety measures were implemented to provide a safe exercise environment. The majority of regular gym users chose to return to the gym regardless of having experienced a loss in income and indicated fitness as a priority expense, revealing the importance of physical activity for their health. The results from this study can be used to help support the current COVID-19 safety measures in gyms and recreation facilities and to prevent the transmission of various diseases post pandemic. Furthermore, a gym membership

or drop-in fee at a reduced rate can be introduced for the lower income individuals and families experiencing financial stress due to COVID-19.

Keywords: *COVID-19, physical activity, exercise, public health safety, financial*

Introduction

Physical activity (PA) is the voluntary movement of the body that involves energy output (World Health Organization, 2020b). PA ranging from moderate to vigorous intensity is associated with many health benefits, such as the reduced risk of diabetes, heart disease, and cancer (CDC, 2020). On March 11, 2020, a novel coronavirus, known as COVID-19 was declared as a global pandemic (WHO, 2020a). COVID-19 is a respiratory disease that is transmitted from person to person through droplet spread or contact with contaminated objects (WHO, 2020a). Governments began to implement isolation, quarantine, and physical distancing measures to combat the spread of the virus (WHO, 2020a). In Canada, non-essential services were required to shut down and stay at home advisories were implemented (Public Health Agency of Canada, 2020). The closure of many establishments led to job losses and changes in income and affected the socioeconomic status of individuals and families. Moreover, gyms and recreation facilities were closed to control transmission within the community (PHAC, 2020). With these new COVID-19 restrictions, barriers were placed on the public to achieve adequate physical activity levels to promote a healthy lifestyle. The aim of this literature review is to explore the impact of COVID-19 protocols and how this affects the levels of PA in various age groups.

Literature Review

Benefits of Regular Exercise

According to Statistics Canada (2019), only 16% of adults are meeting the recommended amounts of PA. Chronic diseases that arise from a physically inactive population present with a heavy economic burden. It is estimated that physical inactivity costs the Canadian healthcare system $10 billion per year (Krueger et al., 2014). Immediate health benefits from PA involve its positive impact on brain health, such as alleviating stress levels and reducing the risk of anxiety and depression (CDC, 2020). Further benefits of staying active include minimizing the risk of common cancers (eg. breast, colon, and lung cancer) and cardiovascular diseases (CDC, 2020). Not only does PA improve physical and mental health, but it also contributes to

the overall well-being of an individual and their quality of life.

PA Levels of Various Age Groups

The WHO guidelines for recommended PA in children and youth is a daily minimum of 60 minutes at moderate to vigorous intensity (WHO, 2020b). However, during the initial period of COVID-19, the government response to close schools led to Canadian and American children not being able to achieve these guidelines (Dunton et al., 2020; Moore et al., 2020). Education was delivered through an online model or through home-schooling where children were unable to participate in activities such as recess, physical education class, and after-school sports. The studies on Canadian and American children each used online surveys completed by their parents, and both noted decreased levels of PA and increased levels of sedentary behaviour (SB) during the pandemic (Dunton et al., 2020; Moore et al., 2020).

Before the COVID-19 pandemic was declared, many young adults were attending in person lectures at university campuses. However, the introduction of physical distancing measures prompted post-secondary institutions to close and transition to virtual learning. Online lectures and schoolwork have led to a longer duration of screen time and contributed to increased SB (Chen et al., 2020). The sedentary lifestyle adopted during COVID-19 may have detrimental effects on health in the long term. Prolonged SB is linked to higher mortality rates and cardiovascular health problems (Celis-Morales et al., 2018). Overall trends suggest that the young adult population is sitting, on average, three hours more during COVID-19 compared to before the pandemic (Chen et al., 2020; Romero-Blanco et al. 2020; Sañudo et al, 2020). Researchers have acknowledged that the increase in SB and decrease in PA levels have resulted in this age group failing to meet the weekly recommendation of 150-300 minutes of moderate-intensity, 75-150 minutes of vigorous, or combined level of PA (WHO, 2020b). Even though the overall pattern of PA has declined during COVID-19, some individuals may begin to exercise and engage in a more active lifestyle, thereby increasing their PA levels. Researchers Karuc et al. (2020) conducted a study looking at Croatian young adults and found that there was a downturn in PA levels in both males and females; however, it was seen that previously active individuals saw a drop in their PA

levels, whereas individuals not previously active saw an increase in their PA levels.

Prior to the pandemic, middle aged adults would spend a large proportion of their day at work; however, abrupt changes to the work environment were introduced during COVID-19 to ensure employee safety. Daily routines have been disrupted as more adults performed their work duties remotely from home and did not need to commute to work (Knell et al., 2020). Consistent with the findings with other age groups, it has been shown that adults are also exhibiting less movement and increased sitting behaviours while spending more time indoors (Constandt et al., 2020; Meyer et al. 2020; Qin et al., 2020; Smith et al., 2020).

The elderly represent a vulnerable population with an increased risk of complications from COVID-19. Therefore, PA is important for older adults to protect their physical health, cognitive function, and to lower their chances of becoming ill (CDC, 2020). A current study surveyed Japanese older adults before and during COVID-19 and found that public health restrictions had reduced their overall PA (Suzuki et al., 2020). It was also noted decreased subjective well-being and a lower health related quality of life contributed greatly to the drop in PA (Suzuki et al., 2020).

PA Levels and Financial Considerations

Studies have found that a major barrier to physical activity during COVID-19 is the closure or limitations on public facilities (Knell et al., 2020; Qin et al., 2020). Given COVID-19 workplace restrictions, adults working from home may not have adequate space to exercise as they may live in smaller houses or apartments where space is limited (Knell et al., 2020). Some studies have recognized that COVID-19 related financial shifts throughout the course of the pandemic lockdown have led to decreased PA in individuals (Carroll et al., 2020; Fearnbach et al., 2021). The economic instability from employment loss or reduced income has pressured individuals to prioritize their expenditures such as paying for housing or food expenses, resulting in fewer funds towards fitness (Carroll et al., 2020). Similarities can be found in studies looking at U.S. adults and Belgian adults where those who need to balance work duties from home and family responsibilities (eg. childcare) have less time to exercise (Constandt et al., 2020; Knell et al., 2020). On the contrary, survey data from studies on UK adults revealed that household income was

associated with PA levels; individuals with a higher household income reported higher levels of PA compared to those with a lower household income during COVID-19 (Robinson et al., 2020; Smith et al., 2020). A higher socioeconomic status provides more access to resources such as online workout classes and fitness equipment (Knell et al., 2020).

Purpose of the Study

There has been considerable research done on the initial period of COVID-19 in Canada, where stricter public health measures were in place and their impact on PA levels in various populations. However, there is currently limited research looking at exercise habits during the period of loosened or modified restrictions in the pandemic. The re-opening of gym and recreation facilities in British Columbia (BC) on May 19, 2020, has allowed users to return under new COVID-19 safety protocols. Given the uncertainty towards the modified exercise environment, and the ongoing financial stress caused by the pandemic, gym users may find it difficult to return to these facilities. The purpose of this study was to examine physical activity in regards to gym and/or recreation facility attendance during COVID-19. More specifically, the study aimed to determine whether the behaviour of returning to the gym and/or recreation facility among regular users in BC was associated with public health safety factors or financial factors relating to COVID-19.

Methods and Materials

Materials

The materials used for this project included a laptop to perform the statistical analysis and survey design. Microsoft Excel 365 was used to organize the raw data, and NCSS 2020 was the statistical software used for the data analysis (NCSS, 2020). The survey design and distribution were completed through the SurveyMonkey software, with a Canadian server license. A $25 Amazon.ca eGift Card was used for the prize draw.

Methods

A self-administered online survey was generated using SurveyMonkey, a secure online survey platform used to create and distribute surveys (SurveyMonkey, 2020). A Canadian server license was obtained to ensure that participant responses were kept confidential in Canada. The survey took three to four minutes to complete and was made available through an online forum website, Reddit, as well as in a health clinic through a QR code. The survey was made available for

two weeks from January 12, 2021 to January 26, 2021. The survey gathered information on the participant demographics, as well as attitudes of gym and recreation facility users under COVID-19 protocols.

Inclusion and Exclusion Criteria

Individuals who were a current resident of BC (living in BC for at least 12 continuous months), and a regular gym or recreation facility user pre-COVID-19 (3-4 times per week or more) were included in this study. Any individual who was temporarily living in BC for work or school was excluded, as well as friends, family, and classmates of the investigators.

Ethical Considerations

According to the British Columbia Institute of Technology (BCIT) Research Ethics Board (REB), any research involving human participants requires a review and approval process (BCIT Research Ethics Board, 2018). Before distributing the survey for data collection, BCIT REB reviewed and approved the proposed study.

Results

Description of Data

The data collected in this survey was all non-numerical. The demographics section collected dichotomous and multichotomous nominal data and ordinal data. The COVID-19 Gym and Recreation Facility questions collected only dichotomous nominal data.

Descriptive Statistics

All demographic data from the study were presented in bar graphs. The distribution of responses from each category were displayed in percentages. A total of 303 individuals participated in the survey; however, the analyses only included approximately 270 responses as participants who did not meet the eligibility criteria were redirected to the end of the survey and marked as “Skipped”. Participants who did not answer all the questions were excluded from the study, which contributed to the reduced number of responses used for analysis. Further, the “prefer not to answer” responses were not included in the analysis. For gender, 57.20% (N= 155) of respondents identified as male, 42.44% (N=115) identified as female, and 0.37% (N= 1) identified as other. In terms of age, the majority of respondents, 68.75% (N= 187), were in the 20-35 age group, while 5.15% (N= 14) were 19 or younger, 22.43% (N= 61) were 36-54, and 3.31% (N= 9) are 55 or older (Figure 1).

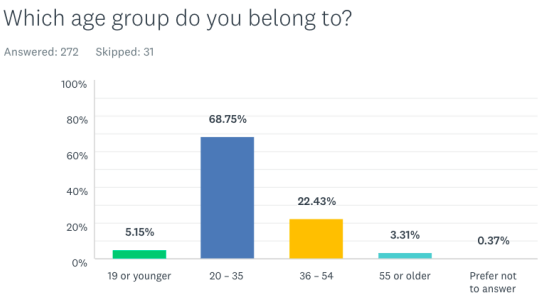

Figure 1. Age Profile of Respondents

In regard to highest level of education completed, most respondents had a bachelor's degree (37.87%; N=103), and it was relatively even for those who had a high school diploma (20.59%; N= 56) and a trade school or college diploma (24.26%; N= 66). Whereas fewer respondents have a graduate degree (14.34%; N= 39), and only a few completed some high school or earlier grades (1.84%; N= 5) (Figure 2).

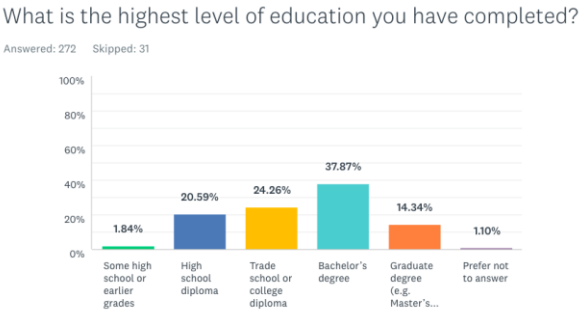

Figure 2. Education Profile of Respondents

Among the participants, 66.17% (N=178) indicated 'yes', and 33.83% (N= 91) indicated 'no' to having returned to a gym and/or recreation facility. In regard to participating in alternate forms of PA since the re-opening of gyms and recreation facilities, 75.09% (N= 202) indicated 'yes', and 24.91% (N= 67) indicated 'no' to participation.

Inferential Statistics

The statistical test used to analyze the nominal survey data was the Pearson's Chi-Square test. There are two main hypotheses for this study:

- $\mathbf{H_{01}}$: There is no association between **public health safety factors** and returning to the gym and/or recreation facilities among regular users during COVID-19.
- $\mathbf{H_{a1}}$: There is an association between **public health safety factors** and returning to the gym and/or recreation facilities among regular users during COVID-19.
- $\mathbf{H_{02}}$: There is no association between **financial factors** and returning to the gym and/or recreation facilities among regular users during COVID-19.
- $\mathbf{H_{a2}}$: There is an association between **financial factors** and returning to the gym and/or recreation facilities among regular users during COVID-19.

Each main hypothesis had sub hypotheses that were used as a measure to represent the overall association between public health safety factors or financial factors and respondents' decision to return to the gym. Public health safety factors and returning to the gym were represented by whether users were disinfecting equipment, physical distancing measures, and mask wearing requirements. Financial factors and returning to the gym were represented by income loss, going to the gym and/or recreation facility as a priority expense, employment status, hourly wage, and a fee increase in attendance prices during COVID-19.

#	**H_0 and H_a**	**Statistical Test**	**Result**	**Conclusion**
1a	**H_0:** There is no association between users disinfecting equipment and returning to the gym and/or recreation facilities among regular users during COVID-19. **H_a:** There is an association between users disinfecting equipment and returning to the gym and/or recreation facilities among regular users during COVID-19.	Chi-square test	P= 0.00	Reject H_0 and conclude that there is a statistically significant association between users disinfecting equipment and returning to the gym and/or recreation facilities among regular users during COVID-19. It appears that proportionately more individuals were likely to return to the gym and/or recreation facilities if users disinfected equipment before and after use. If users did not disinfect equipment before and after use, proportionately fewer individuals returned to the gym and/or recreation facilities.
1b	**H_0:** There is no association between physical distancing and returning to the gym and/or recreation facilities among regular users during COVID-19. **H_a:** There is an association between physical distancing and returning to the gym	Chi-square test	P= 0.00	Reject H_0 and conclude that there is a statistically significant association between physical distancing and returning to the gym and/or recreation facilities among regular users during COVID-19. It appears that proportionately more individuals were likely to return to the gym and/or recreation facilities if physical distancing measures were in place. If physical distancing measures were not in place, proportionately fewer individuals returned to the gym and/or recreation facilities.

	and/or recreation facilities among regular users during COVID-19.			
1c	**H_0:** There is no association between mask use requirements and returning to the gym and/or recreation facilities among regular users during COVID-19. **H_a:** There is an association between mask use requirements and returning to the gym and/or recreation facilities among regular users during COVID-19.	Chi-square test	P= 0.00	Reject H_0 and conclude that there is a statistically significant association between mask use requirement and returning to the gym and/or recreation facilities among regular users during COVID-19. It appears that proportionately more individuals were likely to return to the gym and/or recreation facilities if users were required to wear a mask. If users were not required to wear a mask, proportionately fewer individuals returned to the gym and/or recreation facilities.
2a	**H_0:** There is no association between income loss and returning to the gym and/or recreation facilities among regular users during COVID-19. **H_a:** There is an association between income loss and returning to the gym and/or recreation facilities among regular users during COVID-19.	Chi-square test	P= 0.02	Reject H_0 and conclude that there is a statistically significant association between income loss and returning to the gym and/or recreation facilities among regular users during COVID-19. Potential alpha error, therefore, by setting the p-value cutoff at 0.01 would minimize this error. It appears that proportionately more individuals were likely to return to the gym and/or recreation facilities if they experienced income loss. Proportionately fewer individuals returned to the gym and/or recreation facilities if they did not experience income loss.
2b	**H_0:** There is no association between gyms being a priority expense and returning to the gym and/or recreation facilities among regular users during COVID-19. **H_a:** There is an association between gyms being a priority expense and returning to the gym and/or recreation	Chi-square test	P= 0.00	Reject H_0 and conclude that there is a statistically significant association between gyms being a priority expense and returning to the gym and/or recreation facilities among regular users during COVID-19. It appears that proportionately more individuals were likely to return to the gym and/or recreation facilities if it was a priority expense. If it was not a priority expense, proportionately fewer individuals returned to the gym and/or recreational facilities.

	facilities among regular users during COVID-19.			
2c	**H_0:** There is no association between employment status and returning to the gym and/or recreation facilities among regular users during COVID-19. **H_a:** There is an association between employment status and returning to the gym and/or recreation facilities among regular users during COVID-19.	Chi-square test	P= 0.10	Do not reject H_0 and conclude that there is no statistically significant association between employment status and returning to the gym and/or recreation facilities among regular users during COVID-19. It appears that employment status did not increase or decrease the probability of individuals returning to the gym and/or recreation facilities.
2d	**H_0:** There is no association between hourly wage and returning to the gym and/or recreation facilities among regular users during COVID-19. **H_a:** There is an association between hourly wage and returning to the gym and/or recreation facilities among regular users during COVID-19.	Chi-square test	P= 0.13	Do not reject H_0 and conclude that there is no statistically significant association between hourly wage and returning to the gym and/or recreation facilities among regular users during COVID-19. It appears that hourly wage did not increase or decrease the probability of individuals returning to the gym and/or recreation facilities.
2e	**H_0:** There is no association between gym membership or drop-in fee increase and returning to the gym and/or recreation facilities among regular users during COVID-19. **H_a:** There is an association between gym membership or drop-in fee increase and returning to the gym	Chi-square test	P= 0.15	Do not reject H_0 and conclude that there is no statistically significant association between gym membership or drop-in fee and returning to the gym and/or recreation facilities among regular users during COVID-19. It appears that an increase in gym membership or drop-in fee did not increase or decrease the probability of individuals returning to the gym and/or recreation facilities.

	and/or recreation facilities among regular users during COVID-19.			

For public health safety factors, all three sub hypotheses (users disinfecting equipment, physical distancing, and mask use requirement) were statistically significant at a p-value of 0.00. For financial factors, statistically significant associations were found for two out of the five hypotheses representing financial factors. Income loss (p= 0.02) and going to the gym and/or recreation facility as a priority expense (p= 0.00) were significantly associated with regular gym users returning to the gym and/or recreation facility. The remaining three sub hypotheses on employment status (p= 0.10), hourly wage (p=0.13), and an increase in gym membership or drop-in fee (p= 0.15) revealed no significant results.

Discussion

Public Health Safety Factors

All results regarding public health safety factors were statistically significant. Based on the results from the study, it is evident that regular users were willing to return to the gym and/or recreation facility provided that adequate COVID-19 safety measures were in place. The majority of regular gym users indicated that appropriate physical distancing (2 meters), disinfection of equipment by patrons before and after use, and a mask requirement during the workout were necessary to prevent the spread of COVID-19 during their visit. This reveals that they perceive the health and safety in fitness facilities to be important in their decision for returning. Since the re-opening of gyms and recreation facilities on May 19, 2020, under COVID-19 safety protocols, twice as many respondents have indicated that they have returned. This demonstrates their satisfaction with the current safety measures implemented in these facilities. Regular gym users are not only returning to the gym and/or recreation facility, but they are also participating in alternate forms of physical activity, implying increased PA levels during the period of loosened COVID-19 provincial restrictions. These results refute previous research studies (Karuc et al., 2020; Suzuki et al., 2020) which have observed a decline in overall PA levels during the initial period of COVID-19 when fitness facilities were ordered to close. There is a clear pattern that public health safety measures are strongly associated with determining whether regular gym users decide to return to fitness facilities,

and directly impacting the health and fitness of this population.

Financial Factors

There were significant associations between income loss and attending the gym as a priority expense. Despite experiencing a loss in person income, most of the gym users reported that they returned to a fitness facility. This may suggest that gym users recognize the importance of regular physical activity and exercise for their health. However, individuals may simply have more time to visit the gym and/or recreation facility as many people are currently working from home. Likewise, the respondents also indicated that in terms of where their expenses go during COVID-19, attending the gym was a top priority. Nearly three times the number of respondents who considered the gym as a priority expense returned compared to those who did not prioritize it. In contrast to the study by Carroll et al. (2020) which found that individuals experiencing financial instability due to COVID-19 were not prioritizing their expenses towards fitness. These results demonstrate that gym users will ensure that there are sufficient funds allocated to attending the gym, despite sacrificing other expenses (eg. transportation, entertainment). PA levels appear to have increased in respondents as returning to the gym takes precedence over other expenses. This is inconsistent with previous research conducted by Carroll et al. (2020) and Fearnbach et al. (2020) which revealed that financial barriers such a loss in employment has resulted in the decreased likelihood of attending a gym and/or recreation facility.

No significant results were obtained for employment status, hourly wage, and a fee increase in gym membership or drop-in fees. A probable explanation could be due to the survey questions containing multiple response categories. As a result, responses for these questions were distributed across multiple categories. A larger sample size could have provided significant results for these sub hypotheses or it could have confirmed that no association exists. Additional studies need to be conducted to further examine the association between these three financial factors and gym users' decision to return to these facilities.

Overall, the findings from this study were internally valid as it was able to correctly measure factors that helped analyze the regular gym users' behaviour towards gym attendance during COVID-19. These findings can be extrapolated to other

provinces across Canada where gym and/or recreation facilities have re-opened under COVID-19 prevention and control measures.

Limitations

One of the major limitations in the methodology of this study was the time constraint as the survey was only made available for two weeks due to the project's timeline. A longer time frame where the survey is open to the public may have yielded a higher response rate and improved the internal validity of the study. Money was also a limitation in this study, which may have impacted the number of respondents. A larger prize draw amount may have served as a higher incentive for increased participation, which can increase the sample size and overall internal validity. Due to COVID-19 safety measures, the distribution of the survey restricted to online platforms. This limitation was apparent in the results as most respondent where from younger age groups, making them more likely to use the survey distribution methods (Reddit & QR code) in contrast with older age groups who may lack the technology knowledge, or prefer in-person surveys. An improved method would be to distribute the survey both in-person and online. An in-person survey could be conducted outside a recreation facility where eligible participants can easily be accessed. A wider range of participants could be captured, making the results more generalizable, therefore, increasing external validity.

Knowledge Translation

The results obtained from this study where regular gym users appear to strongly value public health safety factors when returning to the gym and/or recreation facilities can be used to reinforce these facilities' existing COVID-19 safety plans (eg. ensuring machines/equipment have adequate spacing). It is important to note that the protocols implemented during the pandemic are not only effective against the transmission of COVID-19 but have also been successful in reducing incidences of seasonal influenza (Olsen et al., 2020). Therefore, certain safety measures in fitness facilities that resulted from the pandemic can be carried forward in the future. By continuing to limit the number of occupants in a fitness facility at one time, maintain appropriate physical distancing between users, or frequent disinfection of equipment and common touch surfaces will minimize the spread of infectious diseases and create a healthier and safer indoor environment for physical activities. The results where individuals have returned to the gym and/or recreation facility regardless of

income loss can be used to encourage fitness facilities to introduce a membership or drop-in fee targeted towards lower income families or individuals during COVID-19. A reduced gym and/or recreation facility entrance fee can assist those who have been impacted most by lost wages and provide them equal access to maintain an active lifestyle.

Future Research

Recommended future studies are as follows:

- Repeat study only examining financial factors with large sample size, and a different target population (eg. other parts of Canada).
- Survey exploring how much income loss (eg. 10%, 20-30%, >50%, etc.) regular gym users experienced during COVID-19 and its impact on returning to fitness facilities.
- Survey on other potential barriers that affect regular users to return to the gym (eg. online appointment booking system, alternative forms of exercise, etc.).
- Survey on post pandemic public health safety protocols within fitness facilities For example, exploring whether current physical distancing measures and disinfection frequencies remain.
- Survey on whether virtual exercise classes remain or if gym users prefer a mix of virtual and in person methods to stay fit.

Conclusion

In conclusion, the results for this study suggest that public health safety factors and financial factors play a significant role in determining attendance to gym and/or recreational facilities during the COVID-19 pandemic. Regular gym users were more likely to return to the gym if proper physical distancing measures, mask use, and adequate disinfection from other users were implemented. A loss in personal income increased the likelihood of gym users returning to gyms and/or recreation facilities, along with it being a priority expense The information obtained form this study can be used to help enhance or modify existing policies and guidelines in gyms and creation facilities to create a safe environment for patrons to exercise and achieve their weekly recommended PA levels and promote a healthy lifestyle. Implementing public heath safety protocols should be maintained even after the COVID-19 pandemic ends as these measures are relevant to disease prevention in general and, therefore, will contribute to a healthier population.

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Competing Interests

The authors declare that they have no competing interests while conducting this study.

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