

The Impact of COVID-19 on Physical Activity among Employees and Students at a Midsize University

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Abstract Background: At the outset of the pandemic in January 2020, statewide confinement measures were imposed to varying degrees to limit viral spread. Evidence suggests that imposed measures may have negatively impacted physical activity (PA), specifically, in communities such as colleges or universities that generally maintain higher than average levels of PA. **Purpose:** To evaluate the impact of the COVID-19 pandemic on PA and recreational facility use on students, faculty, and staff at a midsize university. **Methods:** A sample of 128 participants completed the International Physical Activity Questionnaire (IPAQ), which assessed PA in March 2020 and March 2021. **Results:** March 2021 PA levels were significantly lower than PA reported from March 2020 (2902 ± 2990 vs. 2266 ± 2343 MET-hours per week; $p < 0.001$). **Conclusion:** PA and attendance at recreational and gym facilities significantly decreased in March 2020 as compared to March 2021. Public health restrictions implemented to address COVID-19, may have influenced the reductions of PA observed among employees and students. Considering the benefits to immunity and the long-term health benefits that PA provides, public health experts should consider the short-and long-term negative health impacts that may result from closure of PA-focused recreational facilities when implementing public health restrictions.

Keywords: COVID-19, pandemic, public health, restrictions, activity

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1. Introduction

The onset of the SARS-CoV-2 (COVID-19) pandemic was declared by the World Health Organization (WHO) in January of 2020 [1]. As of January 2021, greater than 90 million confirmed cases and over 2 million deaths from COVID-19 have been reported worldwide [2,3]. During this time, effective treatments or a federally approved vaccine was unavailable in the mitigation of continued viral spread [4]. Thus, preventative and protective measures were recommended by regional and federal public health agencies to reduce the spread of the virus, which included increased hand washing, donning of face coverings or filtration masks, implementation of physical distancing between individuals, and stay at home orders. Additionally, these measures (depending on the geographic region) were supplemented with temporary school and business closures. These may have also included nationwide closures of recreational facilities (i.e., parks and outdoor built-environment spaces) and exercise-related facilities such as gyms, as well as other locations where people could congregate and perform exercise or physical activity (PA) [5]. Such drastic changes over a

brief period of time inevitably altered the landscape of human activities from a societal, economic, and physical movement standpoint [6].

Physical activity has been demonstrated to be a safe, effective, and accessible means for the maintenance or improvement of general health. The American College of Sports Medicine (ACSM) provides recommendations and guidelines for exercise to promote and maintain health. Adults are recommended to engage in at least 150 minutes of moderate-intensity aerobic physical activity per week, or 75 minutes of vigorous-intensity aerobic PA per week. These include at least 30 minutes of moderate-intensity aerobic activity on five days of each week or vigorous-intensity aerobic activity for a minimum of 20 minutes on three days of each week [7]. Engaging in regular PA results in energy expenditure and is not only for health but weight management [8]. Achieving the recommended amount of PA may result in increased health benefits, highlighting the need to promote regular PA at home, schools, and work. Completion of at least minimum daily walking steps has been demonstrated to positively contribute to greater levels of perceived quality of life [9]. Thus, public health-mediated confinement measures may pose a significant challenge to achieving the recommended PA.

Maintaining high levels of health and vitality throughout the lifespan requires active participation in daily PA. For example, obtaining or achieving at least minimal levels of recommended PA has also been demonstrated to result in increases in immune function, cognitive performance, mental health, quality of life, in addition to reductions in risk factors that may predispose an individual to chronic disease states [10-13]. Cardiovascular disease is a leading cause of death in the U.S. and evidence has shown that getting moderate PA lowers major risk factors for multiple cardiovascular disorders [14]. Moreover, regular PA has multiple biological and hormonal impacts on the risk reduction of all-cause mortality, type-2 diabetes, some types of cancers, mental health disorders, and improves overall quality of life [15-19].

Approximately 70–80% of American adults do not meet the recommended daily PA [7]. Despite the many programs which have been designed to enhance PA, many people continue to remain sedentary. Several barriers have been identified which may act as preventative mechanisms and inhibit individuals from being active. Researchers have reported a lack of time, lack of access to recreational facilities, and minimal amounts of motivation contribute to other significant barriers in achieving minimum recommended levels of PA [20,21]. Furthermore, increased sedentary behavior can worsen chronic health conditions such as high blood cholesterol, high blood pressure, diabetes, and obesity [22].

Transitioning to remote classes and work during the pandemic has emerged as a barrier to PA. For example, individuals may not have had the access to space and equipment to perform PA at home. Reductions in access to recreational centers and gyms have been shown to increase sedentary behavior and decrease PA [23]. Given that most students, staff, and faculty attend classes on campus and frequently use provided recreational facilities, researchers have sought to examine the impacts of the COVID-19 pandemic on PA. Yet very few studies have examined the impacts of COVID-19 on PA before (March 2020) and a year later (March 2021). Thus, the purpose of this study was to evaluate the impact of the COVID-19 stay at home orders on PA and recreational facility use by students, faculty, and staff from a midsize public university. It was hypothesized that the lack of classes and access to the gym on campus would increase sedentary time and reduce PA.

2. Methods

This study was conducted in March 2021 via an online survey. Participants were asked to recall information on their PA: before campus closure (March 2020) and following a return to campus (March 2021) on campus.

2.1. Theoretical Framework

The guidance and inception of this study was influenced by the Theory of Planned Behavior (TPB). Constructs that were most pertinent to this study were perceived control, intention to perform behavior, and motivation to comply as potential factors that may have

influenced decisions relating to stay-at-home orders, COVID-19, and the limited ability to perform PA [24]. Specifically, these TPB constructs directed this study in the following ways, 1) global PA has continued to decline, 2) Lack of PA has been associated with a wide variety of debilitating health conditions, and 3) COVID-19 and public health restrictions have imparted an aspect of behavioral control that may have negatively impacted PA. For future planning and coordination with public health agencies, these data may better inform practitioners as it relates to the implementation of pandemic-related restrictions, impacts on PA, and evaluation of both on overall health maintenance for a population.

The Institutional Review Board approved the study [IRB approval # 2008-2608]. The survey was initially sent to 1000 participants from a university-based listserv, including students, staff, and faculty who reported themselves as being 18 years of age or older. Two hundred and thirty-one participants completed the survey which equates to approximately a 23.1% response rate. However, following the initial assessment of data integrity and removal of surveys that had outlying or missing data, completed surveys from 128 participants were considered eligible for analysis. A summary of respondent demographics is presented in Table 1.

Participants self-reported their biological sex at birth, gender, age, and role at the University (student, faculty, or staff). Assessment of PA was carried out by self-report through completion of the International Physical Activity Questionnaire (IPAQ). The IPAQ short form asks about three specific types of activity undertaken in the three domains introduced above and sitting. The specific types of activity assessed within the instrument include walking, moderate-intensity activities, and vigorous intensity activities; frequency (measured in days per week) and duration (time per day). When assessing all domains of PA and sedentary behaviors across 12 countries, the IPAQ has been shown to be a valid and reliable measure of PA levels in adults aged 18-65 [25].

Participants were asked to complete the IPAQ twice, answering questions about their PA in the last 7 days as well as recall 7 days one year prior. Respondents were first asked to report their current PA at the time they completed the survey. Specifically, respondents were asked: “During the last 7-days, on how many days did you do vigorous, moderate and walking physical activities?” Participants were then asked to recall PA prior to the university’s closure by requesting them to “Think about a time you spent being physically active during a typical week in February of 2019” and “During pre-pandemic, on how many days did you do vigorous, moderate and walking physical activities?” Respondents were also asked if they felt that the COVID-19 pandemic impacted their physical activity and their current use of recreational facilities.

Following observations of outlying raw data, supplementary exploratory procedures (SPSS Explore) were carried out. Missing or erroneous data were removed from analyses. Data from the short-form IPAQ were calculated by each sub-segment of the three domains in addition to a grand total of the domain. The IPAQ Metabolic Equivalence (MET-minute) values have been estimated based on the 2011 compendium of physical

activities [26] as follows: walking (3.3 METs), moderate work and leisure PA (4.0 METs), and vigorous work and leisure PA (8.0 METs).

For each domain sub-section, the MET equivalent was multiplied by the total minutes of PA. Then the subcomponents, for a given domain, were summed to find a total domain MET min/week. Calculations of MET min/week for type of PA (walking, moderate, and vigorous) were carried out by combining the associated domain sub-categories in accordance with the IPAQ processing rules. The IPAQ also includes three questions on sedentary behavior, which were collected, but not analyzed.

3. Statistical Analysis

SPSS statistical software (IBM, version 21) and Microsoft Excel were used to perform statistical analyses with significance set at $\alpha < 0.05$. The continuous variables and percentages for categorical variables were calculated and reported as means \pm standard deviation (SD). Paired samples *t*-tests were used to assess differences in responses before and during the COVID-19 pandemic. One-way Analyses of Variance (ANOVA) was used to evaluate group differences in university role (student, faculty, staff), age, gender, and race by time.

Table 1. Respondent Demographics

	Mean \pm SD	n	%
Female		86	67
Male		38	30
Other		4	3
Age	18-24	10	8
	25-34	9	7
	35-44	23	18
	45-54	38	31
	55-64	33	27
	64-74	11	9
Student		52	41
Faculty		58	45
Staff		18	14

4. Results

March 2021 walking, light, moderate, vigorous, and total PA levels were significantly lower than prior to the onset of the pandemic (2902 ± 2990 vs. 2266 ± 2343 MET-hours per week; $p < 0.001$). Respondents who answered "yes" the pandemic impacted their PA levels significantly decreased MET-hours per week compared to respondents who answered "No" ($p < 0.05$). No significant group differences were found in changes in PA by age or position. Total days per week of recreational facility usage prior to March 2020 (1.8 ± 1.9) was significantly greater than March 2021 levels (0.6 ± 1.5 ; $p < 0.001$). Individuals who used a recreational facility more frequently (March 2020 and before) reported significantly greater decreases in PA as compared to those who used recreational facilities less frequently ($p < 0.05$). Those individuals with greater pre-campus closure facility attendance also had

significantly greater March 2021 facility visits ($r = 0.4$, $p < 0.001$). Relevant representative data are presented in Table 2.

Table 2. Descriptive Survey Responses

Question	Response	n
Do you feel COVID-19 has impacted your physical activity level?	Yes	103
	No	25
How much has COVID-19 impacted your physical activity level?	Decreased a Lot	38
	Decreased Somewhat	46
	Increased Somewhat	28
	Increased a Lot	12
	No Change	4

5. Discussion

Investigators of this study compared the changes in students' and employees' PA from March of 2021 against March of 2020. Results from this investigation demonstrated that PA significantly declined from March 2020 to March 2021. Approximately 66.0% of the respondents reported a decrease in PA, 31.0% experienced an increase in PA, and 3.0% reported no change in PA. In addition, respondents who reported they felt the pandemic negatively impacted their PA levels showed a significant reduction in MET-hours per week. Reductions in PA by group, while statistically insignificant, were observably greater among staff than students, and by age group. Total days per week of recreational facility usage decreased among 65.0% of participants. Those who utilized campus recreation centers frequently in 2020 were found to have greater decreases in PA than respondents who used gym facilities less frequently prior to March 2020. While pre and post pandemic gym use was shown to be significantly correlated, indicating that individuals who used recreational facilities did return to using them, use did not return to pre-pandemic levels. These finding suggests that closure of recreational facilities due to the pandemic significantly decreased PA levels of users.

Previous studies have reported similar decreases in PA as a result of COVID-19-related campus closures [26]. The decreases in PA observed in this study are consistent with another study that highlighted decreases in PA observed in office workers who were required to work from home due to pandemic-related public health stay-at-home orders. [27]. Recent systematic reviews have also supported the findings of this study in that reductions in PA have been observed across multiple studies investigating PA changes due to COVID-19-related public health restrictions [28,29]. However, some contradictory results have been reported in a study that compared participants PA during stay-at-home period. Investigators reported that participants increased their overall weekly PA from pre-to-post public health restrictions as result of lifestyle modification and health-related behavior reassessment [30]. It is important to note that approximately 31% of respondents in this study did report increases in PA, however, the greater majority reported reductions in PA.

The individual interpretation and manifestation of barriers to PA may present themselves to varying degrees among individuals. During the most restrictive time

periods following the initiation of public health stay-at-home orders and thereafter, opportunities to visit campus exercise and recreation centers were almost completely eliminated in certain regions of the country. However, because of the numerous ways that PA is uniquely carried out on university campuses, the simple act of closing a university campus may have had wide-reaching impacts on PA, especially among employees and students who utilize these services as their main source of activity. For example, many students walk back and forth between buildings on campus as a means of transportation. Students, faculty, and staff may participate in campus wellness programs or intramural activities. Thus, these public health measures may have, consequently, increased sedentary behavior [31]. While the SARS-CoV-2 virus and subsequent variants have become more globally endemic, decreases in PA incurred during these initial stay-at-home orders may have added to an already dismal situation regarding PA in the United States. Prolonged periods of sedentary behavior may have a negative impact on chronic illness in this country and thus may shorten lifespans [32].

6. Future Recommendations

The long-term effects of the COVID-19 pandemic on PA, sedentary behavior, and health will not be fully understood for some time. Many opportunities to be physically active were suspended for a considerable length of time and evidence demonstrated herein showed many individuals did not return to recreational facilities after they were re-opened. Given the known relationship between PA, depression, and anxiety it is important to evaluate the impact of decreased PA levels on mental health both during and after the pandemic. Online and hybridized courses in higher education generally increased which has likely added to the already diminished PA even following higher education institutions re-opening. Thus, public health practitioners should consider partnering with exercise professionals and implementing methods of expert-led online or at-home exercise programs, should there be a need to implement stay at home orders in the future. Furthermore, in the university setting, an opportunity now exists to develop strategic exercise or PA programs to accommodate the needs for students who have chosen to continue in online or hybridized educational programs. By doing so, efforts can directly target the improvement of mental and physical health by aiming to increase PA in this specific demographic sample.

7. Limitations

While the information presented in this study has demonstrated the negative impacts of campus closures on PA, our group has also demonstrated the importance of creative solutions toward maintenance or increasing PA during a pandemic-type situation. However, this study is not without limitations. First, the survey was self-reported and required participants to recall information from a year prior to the survey assessment. This might introduce bias and unreliable responses. The IPAQ has been shown to be

valid and reliable for 7-day recall but has not been validated for long-term recall. Secondly, the survey was conducted utilizing the campus community, and there was no equal number of participants in each category (student, faculty, and staff) making it challenging to generalize these results to a larger population. Finally, no objective measures (personal activity trackers, fitness apps) were used to measure PA.

8. Conclusion

In conclusion, the study has demonstrated that the COVID-19 pandemic and the associated public health restrictions negatively affected students and staff by reducing access to university gym and recreation centers, thus reducing PA. Home confinement or university closure also contributed to the reduction of PA as compared to the March 2020 time point. Previous studies have shown that PA is beneficial to overall health outcomes and that lack of time and/or recreational center access can act as barriers to PA. Many students and staff are more active when on campus. Considering known benefits and these barriers of PA, it is important to generate new ideas and to implement creative programs that allow students, staff, and employees to incorporate more PA into their day. Institutions should also encourage people working or attending classes remotely to use other available resources to be active and promote a healthy lifestyle.

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Conflict of Interest Statement

This was an unfunded research project. The authors have no conflicts of interest to declare.

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