



# Changes in Exercise Habits of University Students During the Covid-19 Lockdown

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**Abstract:** The purpose of this investigation was to investigate how the exercise habits of college students changed during the COVID-19 pandemic lockdown. Data were collected via an online survey distributed through the University of Southern Maine student email distribution list. All current university students were invited to participate in the survey starting in February 2021 through March 2021. The study included a questionnaire designed to capture the exercise habits of university students three months before the lockdown of COVID-19 (January – March 2020) and their exercise habits after a lockdown in (February - April 2021). The survey questions were based on the American College of Sports Medicine (ACSM) physical activity guidelines to analyze the participant's exercise habits. The participants showed a decrease in the exercise along with an increase in weekly sitting time. Before COVID-19, 21.8% of participants were sitting >35 hours per week. After the COVID-19 lockdown, 50.45% of participants were sitting >35 hours per week. The results of this study could be used for further research to promote an increase in exercise at home. With the uncertainty of the pandemic, motivating people to stand and walk more could be the first step in breaking the increase in sitting habits and help to increase exercise habits. The COVID-19 pandemic has indeed imposed many restrictions on our daily routines, but it could also guide us to new approaches for prescribing exercise programs in the future.

**Keywords:** COVID-19, Physical activity, Exercise, lockdown, Increase sitting



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## 1. Introduction

The Coronavirus pandemic 2019 (COVID-19) is a new virus that has swept through over 100 countries. In early 2019, many countries downplayed the threat of the virus and referred to it as the common cold [1,2]. With a high infection rate and limited resources, COVID-19 has had catastrophic consequences and has revealed inequities in our healthcare system. Across the world, public health measures such as social distancing, travel restrictions, curfews, and school closures, handwashing, and mask mandates, put unprecedented restrictions on all citizens [3-5].

A population of particular concern is college students who were forced off-campus and into an online learning world [6]. While all these public health measures were essential in reducing the spread of the virus, other factors surfaced, such as boredom, frustration, and unhealthy routines [7, 8]. The unprecedented level of restriction to their lives over the

past year and a half has also presented a barrier to exercise. However, restrictions vary from state to state, the general population of college students were forced off campus needing to seek alternative exercise programs or risk the termination of their exercise routine. Looking for a new way to stay active has presented an opportunity to review how exercise is currently prescribed and review alternative ways to promote safe exercise programs at home [9].

The COVID-19 restrictions limited access to athletics, gyms, group exercise, and leisure time activities [10]. Results of a 2020 global survey by Ammar et al, 2020 showed that days per week physical activity decreased by 24% and hours sitting increased by 28.6% due to home confinement. In addition, vigorous intensity activity decreased by 22.7% and moderate activity decreased by 24%. These results indicate that the COVID-19 confinement has increased sedentary behavior and a decrease in all levels of physical activity [10].

In a 2019 national survey, 22.3% of surveyed students reported engaging in moderate-intensity cardio or aerobic activity for at least 30 minutes 0 days per week, 56.2% reported 1-4 days, and 21.2% reported 5-7 days a week. 43% of surveyed students reported engaging in vigorous-intensity cardio or aerobic activity for at least 20 minutes 0 days per week, 30.6% saying 1-4 days, and 26.3% report 5-7 days a week [11]. This is of concern because physical activity recommendation from the American College of Sports Medicine and the American Heart Association 2018 that state all healthy adults ages 18-65 should engage in moderate-intensity cardio or aerobic exercise for at least 30 minutes on 5 or more days per week, or vigorous-intensity cardio or aerobic exercise for at least 20 minutes on 3 or more days per week [12].

The American College of Sports Medicine (ACSM) recommendation for moderate cardiovascular physical activity is 5x per week or at least 150 mins at 40-60% heart rate reserve or 2-3x per week or at least 40-60 minutes at  $\geq 60\%$  heart rate reserve. Their recommendation for muscle strengthening activity is 2-3x per week, 2-4 sets, 8-25 reps at 60-80% 1 RM of multi-joint full body movements [12]. Although during the pandemic lockdown, these guidelines were challenging, ACSM recommended still trying to maintain 30-60 minutes of physical activity on most days with continued social distancing. An adapted physical activity routine may include being creative outdoors, home workouts, or alternative times. Developing new approaches to physical activity will

help improve mental health and reduce anxiety and depression [9, 13].

The present study aimed to investigate how the exercise habits of college students changed as a result of the COVID-19 pandemic lockdown. This survey compared exercise habits three months before the lockdown and within two months after the lockdown was lifted. The researchers hypothesized that the limitations of the lockdown would decrease exercise in those exercising before the lockdown and exercise would increase in those who were not exercising prior to the lockdown. It was also hypothesized that all respondents would have an increase in sitting time. Data were collected from students via an online survey distributed through a university student email distribution list.

## 2. Materials and Methods

### 2.1 Participants

All university students, including undergraduates, graduates, and alumni, were invited to participate in the online survey from February 2021 through March 2021. The participants were recruited through the university student email distribution lists. Participation in this study was voluntary and they had to have a current university email to receive the survey. Inclusion criteria were a) must be 18 yrs or older; b) current student of USM; and c) able to give consent. The study was approved by the Institutional Review Board of the University of Maine.

### 2.2 Software

The information was collected by an electronic survey using the Qualtrics platform and was kept confidential and anonymous. The survey was shared through the university's student email distribution list. The survey was divided into three sections: informed consent, exercise and sitting habits, and demographics.

### 2.3 Procedures

The study included a questionnaire designed to capture the exercise habits of university students three months prior to the lockdown of COVID-19 (January 2020 – March 2020) and their exercise habits two months after lockdown (February 2020 - April 2021). The survey questions were based on the current American College of Sports Medicine (ACSM) physical activity guidelines, including several days a week exercising, a combination of moderate and vigorous

activity, aerobic and strength activities, and hours of sitting. We understand that the working definitions of exercise and PA are a limitation of this study. In this study, they will be used interchangeability.

## 2.4 Statal Analysis

The survey instrument included pairs of questions, each containing one question related to before COVID-19 lockdown and another pertaining to current post lockdown. New variables were computed by comparing these pairs to determine if exercise had decreased, remained the same, or increased over time. The analysis performed for this study included frequencies to summarize each survey question's distribution across answer categories. Frequencies were also run for the new change variables and were used to look for differences between exercise subpopulations for each changing variable.

## 3. Results

Table 1 shows a total (n= 548) participants including (n = 126 male, n = 401 female, n = 14 non-binary, n = 3 not listed, and n = 4 prefer not to say) ages 18 yrs to 60+ yrs participated in the survey.

All participants were current students from the University of Southern Maine and had a current student email address. Current job status could have multiple answers for one participant and included (n = 147 full-time, n = 256 part-time, n = 103 unemployed, n = 72 seeking opportunities, n= 32 not seeking opportunities, n = 7 retired, and n = 6 alumni). Marital status showed (n = 116 married, n = 398 not married, and n = 30 with domestic partners).

### *Days per Week of Aerobic Exercise*

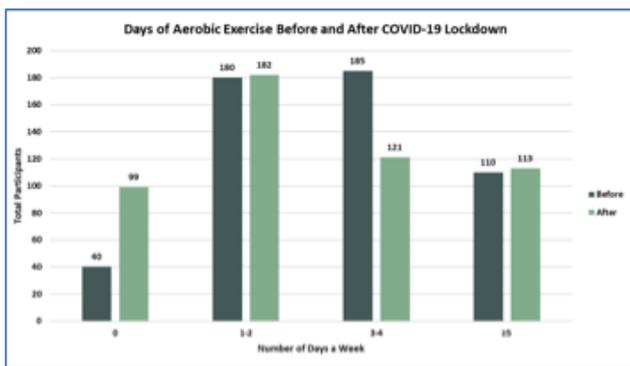
Respondents (n = 515) were asked how many days a week they participated in aerobic exercise before the COVID-19 lockdown. They were presented with four answer categories: 0 days, 1-2 days, 3-4 days, and  $\geq 5$  days. Figure 1 shows that the most frequently used response category was 3-4 days, with (n = 185) respondents choosing this answer. The next frequently used response category was 1-2 days at (n = 180) followed by  $\geq 5$  days at (n = 110) and 0 days at (n = 40). Respondents were also asked how many days a week they participate in aerobic exercise after the COVID-19 lockdown.

**Table 1.** Demographic Characteristic of Participants

Variables		n = (548)	%
Gender	Male	126	23%
	Female	401	73%
	Non-binary	14	2.6%
	Not listed	3	0.5%
	Prefer not to say	4	0.7%
Age (yrs)	18-30	392	71.7%
	31-44	91	16.6%
	45-59	57	10.4%
	$\geq 60$	7	1.3%
Job Status	Employed full-time	147	27%
	Employed part-time	256	47%
	Unemployed	103	19%
	Seeking opportunities	72	13%
	Not seeking opportunities	32	6.0%
	Retired	7	1.0%
	Alumni	6	1.0%
Marital Status	Yes	116	21.2%
	No	398	72.6%
	Domestic partnership	30	5.5%
	Prefer not to say	0	0%

They were presented with the same answer categories. The most frequently used response category was 1-2 days, with (n = 182) respondents choosing this category. The next frequently used response category was 3-4 days at (n = 121) followed by ≥5 days at (n = 113) and 0 days at (n = 99)

The changing variable computed from the responses to these two questions shows that the largest segment of respondents (41.7%) experienced a decrease in exercise, followed by those who reported the same level of exercise (32.8%) and those who increased exercise (25.4%).



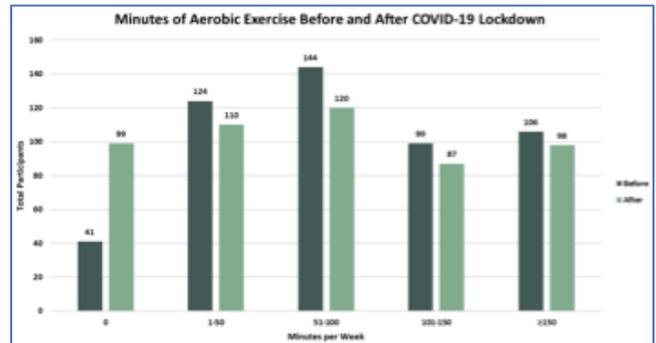
**Figure 1.** Comparison of days of aerobic exercise per week in college students (n = 515) between before and after COVID-19 lockdown.

**Minutes per Week of Aerobic Exercise**

Respondents (n = 514) were asked how many minutes a week they participated in aerobic exercise before the COVID-19 lockdown. They were presented with five answer categories: 0 minutes, 1-50 minutes, 51-100 minutes, 101-150 minutes and ≥150 minutes. Figure 2 shows that the most frequently used response category was 51-100 minutes, with (n = 144) respondents choosing this answer. The next frequently used response category was 1-50 minutes at (n = 124) followed by ≥150 minutes at (n = 106) then 101-150 minutes at (n = 99) and 0 minutes at (n = 41).

Respondents were also asked how many minutes a week they exercised they participated in aerobic exercise after the COVID-19 lockdown. They were presented with the same answer categories. The most frequently used response category was 51-100 minutes, with (n = 120) respondents choosing this category. The next frequently used response category was 1-50 minutes at (n = 110) followed by 0 minutes at (n = 99) then ≥150 minutes at (n = 98) and 101-150 minutes at (n = 87)

The changing variable computed from the responses to these two questions shows that the largest segment of respondents (38.6%) remained the same, followed by those who decreased their minutes of exercise per week (38.2%) and those who increased exercise (23.2%).



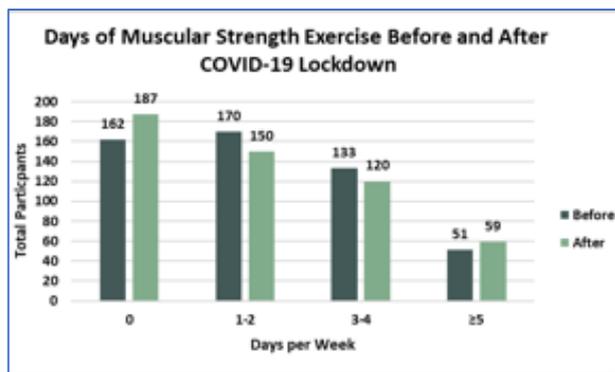
**Figure 2** Comparison of minutes of aerobic exercise per week in college students (n = 514) between before and after COVID-19 lockdown.

**Number of Days per Week of Muscular Strength Exercise**

Respondents (n = 516) were asked how many days a week they engaged in muscle strengthening exercise before the COVID-19 lockdown. They were presented with four answer categories: 0 days, 1-2 days, 3-4 days, and ≥5 days. Figure 3 shows that the most frequently used response category was 1-2 days, with (n = 170) respondents choosing this category. The next frequently used response category was 0 days at (n = 162) followed by 3-4 days at (n = 133) and ≥5 days at (n = 51).

Respondents were also asked how many days a week they engaged in muscle strengthening exercise after the COVID-19 lockdown. They were presented with the same answer categories. The most frequently used response category was 0 days, with (n = 187) respondents choosing this answer. The next frequently used response category was 1-2 days at (n = 150) followed by 3-4 days at (n = 120) and ≥ 5 days at (n = 59).

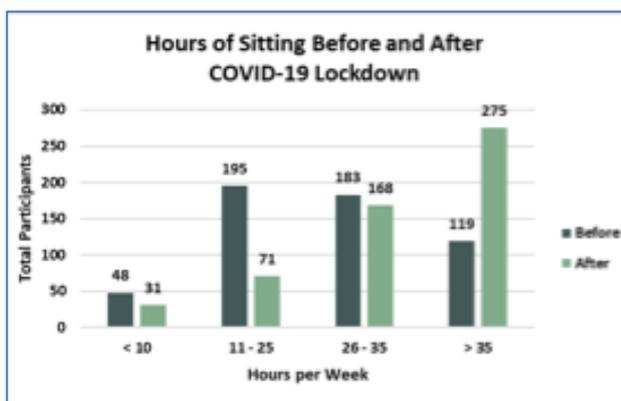
The changing variable computed from the responses to these two questions shows that the largest segment of respondents (43.2%) continued the same level of exercise, followed by those who reported a decrease in exercise (29.8%) and those who increased exercise (26.9%).



**Figure 3.** Comparison of days per week of muscle strengthening exercise per week in college students (n = 516) between before and after COVID-19 lockdown.

#### Number of Hours per Week of Sitting

Respondents (n = 545) were asked how many hours a week they spent sitting before the COVID-19 lockdown. They were presented with four answer categories: < 10 hours, 11-25 hours, 26-35 hours, and > 35 hours. Figure 4 shows that the most frequently used response category was 11-25 hours, with (n = 195) respondents choosing this category. The next frequently used response category was 26-35 hours at (n = 183) followed by > 35 hours at (n = 119) and <10 hours at (n = 48).



**Figure 4.** Comparison of hours per week of sitting in college students (n = 545) between before and after COVID-19 lockdown.

Respondents were also asked how they spent sitting after the COVID-19 lockdown. They were presented with the same answer categories. The most frequently used response category was > 35 hours (n = 275). The next frequently used category was 26-35 hours (n = 168), followed by 11-25 hours (n = 71) and < 10 hours (n = 31).

The changing variable computed from the responses to these two questions shows that the largest segment of respondents (49.7%) increased the number of hours they spent sitting, followed by those

who reported staying the same (43.5%) and those who decreased (6.8%).

#### Exercise Habits Before and After COVID-19 Lockdown

Responses to the exercise habits and sitting behavior before and after the COVID-19 lockdown. Table 2 below includes the proportion of those who *decreased*, *stayed the same*, and *increased* in the various types of exercise studied. This was computed by comparing the categories reported before the COVID-19 lockdown and those reported after the COVID-19 lockdown. The authors acknowledge that there are limitations to this approach because survey responses were categorical rather than numeric.

#### 4. Discussion

This study aimed to investigate how the exercise habits of college students changed before and after the COVID-19 pandemic lockdown. The researchers compared exercise habits three months prior to the lockdown and within two months after the lockdown was lifted. The researchers hypothesized that the limitations of the lockdown would decrease exercise in those exercising prior to the lockdown and exercise would increase in those who were not exercising prior to the lockdown. It was also hypothesized that all respondents would have an increase in sitting time.

The results showed a negative impact from the lockdown on all exercise, including moderate, vigorous, and muscle strengthening in participants. In addition, as expected, there was a substantial increase of hours of sitting per week. The study's findings confirmed our hypothesis that a number of participants changed their exercise habits due to the pandemic and had an increase in hours per week of sitting time.

Despite the public health recommendations to continue healthy behaviors during the COVID-19 lockdown, the confinement and social distancing limit all daily activities, exercise, and social activities. The increase in inactivity and sedentary behavior has shown to have numerous adverse effects on health, physical fitness, and mental wellbeing [14-16]. The loss of a regular routine coupled with financial nervousness and loneliness only added to a lack of motivation to continue daily activities [17]. In contrast, some researchers found that the lockdown increased sitting time and increased physical activity time.

**Table 2.** Responses to the exercise habits survey before and after the COVID-19 lockdown

		Before Lockdown	After Lockdown	% Decreased	% Stayed the same	% Increased	
<b>All PA</b>	Days/week						
	0	65	125		46.0%	54.0%	
	1-2	144	131	32.0%	22.0%	47.0%	
	3-4	186	146	56.0%	32.0%	12.0%	
	≥5	146	139	46.0%	54.0%		
	Min/week						
	0	66	126		45.5%	54.5%	
	1 to 50	98	93	27.6%	30.6%	41.8%	
	51-100	131	99	51.2%	22.5%	26.4%	
	101-150	99	90	53.1%	31.6%	15.3%	
	≥150	154	136	41.2%	58.8%		
	<b>Aerobic Exercise</b>	Days/week					
		0	40	99		22.5%	77.5%
1-2		180	182	28.9%	33.9%	37.2%	
3-4		185	121	56.8%	25.4%	17.8%	
≥5		110	113	52.7%	47.3%		
Min/week							
0		41	99		22.0%	78.0%	
1 to 50		124	110	27.4%	39.5%	33.1%	
51-100		144	120	44.4%	30.6%	25.0%	
101-150		99	87	49.5%	30.3%	20.2%	
≥150		106	98	47.2%	52.8%		
<b>Moderate Intensity</b>		Days/week					
		0	74	123		54.1%	45.9%
	1-2	185	181	26.5%	40.5%	33.0%	
	3-4	155	117	59.4%	31.0%	9.7%	
	≥5	99	92	48.5%	51.5%		
	Min/week						
	0	147	214		64.6%	35.4%	
	1 to 50	105	88	45.7%	38.1%	16.2%	
	51-100	103	94	52.4%	28.2%	19.4%	
	101-150	94	61	53.2%	30.9%	16.0%	
	≥150	67	59	47.8%	52.2%		
	<b>Vigorous Intensity</b>	Days/week					
		0	147	214		64.6%	35.4%
1-2		191	153	43.5%	36.1%	20.4%	
3-4		121	95	52.9%	35.5%	11.6%	
≥5		57	54	50.9%	49.1%		
Min/week							
0	147	214		64.6%	35.4%		

	1 to 50	105	88	45.7%	38.1%	16.2%
	51-100	103	94	52.4%	28.2%	19.4%
	101-150	94	61	53.2%	30.9%	16.0%
	≥150	67	59	47.8%	52.2%	
<b>Muscle</b>						
<b>Strengthening</b>	Days/week					
	0	162	187		55.6%	44.4%
	1-2	170	150	30.6%	38.2%	31.2%
	3-4	133	120	53.4%	36.1%	10.5%
	≥5	51	59	60.8%	39.2%	
<b>Sitting</b>						
<b>hrs/week</b>	< 10	48	31		41.7%	58.3%
	11-25	195	71	4.6%	21.0%	74.4%
	26-35	183	168	7.1%	39.3%	53.6%
	> 35	119	275	12.6%	87.4%	

Romero-Blanco et al., 2020 found that health science students spent more time sitting and more time participating in physical activity. Despite not having access to a gym, group activities, or social activities, the number of days and minutes per week increased. This increase in physical activity in this group was attributed to the possibility that the health science curriculum could have influenced their decision that promoted health habits [18].

Sañudo *et al.*, 2020 concluded that home quarantine affected physical activity, sedentary behavior, smartphone use, and sleep patterns. Researchers concluded that participants spend less time being active and more time sitting than a greater number that met the physical activity guidelines prior to the lockdown [18]. Ammar *et al.*, 2020 reported decreases in vigorous and moderate activity along with an increase in daily sitting time. This study concluded that the reduction of physical activity could contribute to a growth in physical health problems long term and continued research is needed [19].

These survey results showed similarities with other researchers that demonstrated that the COVID-19 pandemic had an impact on daily routines, including athletic sports and exercise [19, 20]. Even among more technically savvy college students and with the increased availability of physical activities programs online, this did not help maintain adequate exercise levels. Participating in exercise at home can have limitations. The selection of a new exercise routine may require experience and knowledge. Although home exercise programs can support decreasing sedentary activity, they are not appropriate for everyone.

Individuals, family, and friends should take caution when participating or suggesting an activity to someone else [21].

In general, the results were seen in table 2 establish a similar trend of a decrease in exercise and an increase in hours sitting between groups. One of the most notable increases was observed in the group reporting "0 days" or "0 minutes," showing that more individuals were not exercising at all during the pandemic. Another notable increase was in the number of hours sitting per week, with those reporting sitting >35 hours per week more than doubling during the pandemic. This general decrease in activity and increase in hour sitting can lead to many adverse side effects as this trend increases the risk of developing comorbidities [22, 23].

In this population, a large percentage were not participating in muscle strengthening exercises prior to the lockdown and did not engage in any muscle strengthening activity post lockdown. Conducting home-based exercises can be difficult and unsafe. As a result, exercise prescription is challenging when establishing a muscle strengthening program at home [21]. Since this is not a novel topic and positive benefits have been reported, no specific guidelines have been established for home-based activity [9].

Finally, it is important to realize that motivating college students to stay physically active and social engagement was difficult during the COVID-19 lockdown. Home confinement altered normalcy with respect to education, work, family, friends, exercise, and sedentary behavior. These results were consistent with similar studies and that the COVID-19 lockdown

has been described as a worldwide public health risk [24].

## 5. Conclusion

The results of this study should be used for further research to promote an increase in exercise at home. With the uncertainty of the pandemic, motivating people to stand and walk more could be the first step in breaking the increase in sitting habits and help to increase exercise. The COVID-19 pandemic has certainly imposed many restrictions on our daily activities, but it could also help develop new approaches for prescribing exercise in the future. One important consideration for working with clients remotely is safety. Within a virtual setting, a no-touch approach will be challenging to monitor heart rate, blood pressure, cardiovascular symptoms and not be able to spot clients while exercising. This is a new area in our field that will need to be explored in more detail.

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Written consent was obtained from the participants

### **Conflict of interest**

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### **Does this article screened for similarity?**

Yes

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