

# The effect of the COVID-19 pandemic on weight gain, physical activity and mental health among Turkish university students

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## Abstract.

**BACKGROUND:** The COVID-19 pandemic has brought many restrictions that affected Turkey as well as other countries around the world. Restrictions on education, sports activities and social activities affected students physically and psychologically.

**OBJECTIVE:** The aim of this study is to investigate the impact of the COVID-19 pandemic on weight gain, physical activity, and mental health among university students.

**METHODS:** The study included students of Pamukkale University aged between 18–25 years. Participants answered the online survey about changes in body composition and physical activity habits during the pandemic. International Physical Activity Questionnaire (IPAQ) was used to assess physical activity levels. Beck Depression Scale (BDS) was used to assess the mental health.

**RESULTS:** 848 (546 females, 302 males) students average aged  $20,72 \pm 1,63$  years were included in the study. When the physical activity times before and during the pandemic were compared, a statistically significant difference was found ( $p < 0.05$ ). Multivariate analyses showed that higher BDS scores ( $p = 0.000$ ) were significantly associated with increased weight gain. But there was no significant association with age and changes in physical activity time.

**CONCLUSIONS:** The results of the study showed that the COVID-19 pandemic has a negative effect on the physical activity level, weight gain and mental health of university students. Students reported an increase in weight during the pandemic. Also, the increase in depressive symptoms is related to higher levels of weight gain. Therefore, physical activity and mental health programmes should be offered to university students as an educational and health policy.

Keywords: Body composition, depression, restrictions, coronavirus

## 1. Introduction

The COVID-19 pandemic is a health problem that affects the world globally and accordingly many countries around the world applied some restrictions. The form and duration of restrictions varied by each country, but all segments of the society had to experience these restrictions [1]. In many coun-

tries, people were ordered to stay at their homes and asked not to leave their homes, not to stay in crowded environments and to isolate themselves as much as possible, except when necessary. In order to realize these precautions, primary-secondary and higher education institutions adopted the distance learning model in many countries around the world and started to apply internet-based education [2]. In Turkey, after the first patient was infected with COVID-19 on March 11, 2020, education in universities was suspended for 3 weeks and then online education

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process was started. In Pamukkale University, spring and summer semesters of the 2019–2020 academic year were completed with an online education model and also the 2020–2021 academic year continued online. In Turkey, some measures designed to limit disease transmission like distance learning and curfews are applied at certain intervals. Within the scope of these measures, the sports centers were closed and many recreational activities were restricted. Therefore, these restrictions increased the sitting and screen time, usage of computers, tablets and phones, reduced physical activity in their daily lives, and changed the lifestyles of all society.

According to studies, there is a relationship between physical activity and mental health. Physical activity can be effective on mental well-being and prevents symptoms of mental health disorders such as depression and anxiety [3–6]. Sloan et al. and Aldana et al. reported a reciprocal relationship between high physical activity levels and perceived stress. A sedentary lifestyle and low physical activity levels are positively associated with an increase in psychological distress, while regular physical activity is inversely associated with it [7, 8]. However, physical activities were restricted due to the mandatory quarantine during the pandemic.

The restrictions caused changes in dietary habits related to daily life patterns [9]. Yılmaz and Eskici evaluated emotional (depression) and behavioral (nutritional behaviour, physical activity status and sleep patterns) status of Turkish adult individuals during the COVID-19 pandemic period and reported that the top three foods consumed most during the pandemic period are tea and coffee (66.6 %), pastry (e.g., cake and cookies) (56.4 %) and desserts (49.6 %) [10]. For this reason, another important concern is the long-term effects of this pandemic on body weight management in adults [11]. Lifestyle changes were assessed across different BMI classifications in response to the global pandemic in the UK. According to the results, the researchers reported that with increased cases of weight gain and significant declines in mental health, COVID-19 may impact clinical practice for years to come [12].

There are several studies about physical activities, emotional status, mental health and daily living activities in adults during the COVID-19 pandemic [9, 10, 13–16]. Aslan et al. researched the prevalence of perceived stress and mental health among students during the pandemic and explored predictors of stress levels [17]. And also, there are several studies about weight gain during pandemic [11, 12]. Zachary

et al. reported that inadequate sleep, snacking after dinner, lack of dietary restraint, eating in response to stress, and reduced physical activity are risk factors for weight gain during self-quarantine [18]. A study on university students showed that the threat of stress and low physical activity increased the risk of weight gain [19]. Depression is a common mental health problem like stress during the pandemic. The COVID-19 pandemic has brought many restrictions that have affected our country as well as countries all over the world. Within the scope of the measures, distance learning started in universities and this situation significantly changed the lifestyles of university students. Restrictions on education, sports activities and social activities affected the students physically and psychologically. Faraji et al. commented on the effect of COVID-19 quarantine on the physical and social parameters of physical education providers and youth sport coaches because of physical nature of their job. They thought that this population faced some challenges in engaging in “distance learning” potentially leading to sedentary lifestyle, weight gain, and the development of depressive symptoms [20]. A few studies suggested that decreasing physical activity and increasing social isolation could cause depression, anxiety, weight gain and inactivity in this population [21, 22]. Although there is a little information about the relationship between occupational attention and mental health, all aspects of professional attainment could be associated with depressive symptoms [23]. For this reason mental health of students might be important for their future occupational attainment. To the best of our knowledge, the relationship between weight gain, physical activity levels and mental health has not been investigated among university students. Therefore, the aim of the study is to investigate the effect of the COVID-19 pandemic on physical activity levels, weight gain and depressive symptoms among university students. The results of this study will contribute to revealing the effects of the COVID-19 pandemic on university students and controlling its negative effects.

## 2. Methods

This is a cross-sectional study.

### 2.1. Subjects

Pamukkale University students participated in the study. The online survey was sent to the students

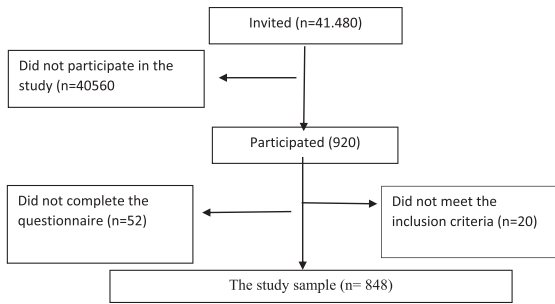


Fig. 1. Flowchart of the study design.

by e-mail and through all social media applications. The study sample consisted of 848 students who completed the questionnaire voluntarily in January 2021. Figure 1 shows the flowchart of the study design. Participants included males and females aged between 18–25 years in the study. The exclusion criteria included having a history of COVID-19 disease, malignancy, pregnancy, and any health problems that affected participation in physical activity. Inclusion and exclusion criteria were stated at the beginning of the survey and the students were ordered to follow these criteria. This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Pamukkale University (05.01.2021-01-E4341) and approval from the Turkish Ministry of Health was also obtained.

## 2.2. Sample size

The target population was 41,480 students at Pamukkale University. Convenience sampling technique was used to collect data. It was observed that the effect size obtained in the reference study [15] was low ( $r=0.088$ ). As a result of the power analysis considering that an effect size at this level, it was calculated that 80% power and 95% confidence level could be obtained when at least 794 people were included in the study. The sample size of the study (848) was larger than the calculated minimum sample size (794).

## 2.3. Assessment

The previously prepared survey was filled out by the participants online. An informed consent form was designed in the Google Forms web survey platform in the study. The participants were required to approve this form before starting the study. The

designed online survey consisted of four parts as demographic data, questions about COVID-related changes, International Physical Activity Questionnaire and Beck Depression Scale (BDS). Some of the variables were categorical variables (gender, age, field of study, weight gain, BDI scores) and some of them were continuous variables (weight, height, BMI, answers to questions about COVID-related changes except weight gain, IPAQ scores).

### 2.3.1. Demographic data

Age, gender, weight, height and field of study formed the demographic data.

### 2.3.2. Questions about COVID-related changes

The following questions asked the participants about COVID-related changes:

1. Did you gain weight during the pandemic?
2. If your answer is yes, how much weight have you gained?
3. How many minutes of physical activity were you doing weekly before the pandemic?
4. How many minutes of physical activity do you do weekly during the pandemic?

In the study, four questions about COVID-related changes were created by the researchers who were referenced in a previous study, in order to evaluate the change in weight and duration of physical activity participation related to COVID. A preliminary study was conducted to determine the reliability and validity of the questions [33]. 18 university students participated in the preliminary study. In order to determine the reliability and validity of the questions, the four questions and the IPAQ before the pandemic period were applied twice with an interval of 3 days. The test-retest reliability coefficient of the four questions was found between  $r=0.93$  and  $0.99$ ,  $p<0.05$ . The test-retest reliability coefficient of the IPAQ questionnaire before the pandemic period was found  $r=0.78$ ,  $p<0.05$ .

The validity of the questions about the duration of participation in physical activity in the 3rd question (pre-pandemic) and the 4th question (pandemic period) was evaluated by the physical activity participation time in the IPAQ. The correlation coefficient between question 3 and IPAQ was  $r=0.62$ ,  $p<0.05$ . The correlation coefficient between question 4 and IPAQ was  $r=0.72$ ,  $p<0.05$ .

### 2.3.3. International Physical Activity

#### Questionnaire (IPAQ)

The Turkish version of the International Physical Activity Questionnaire (IPAQ) which validity and reliability made by Sağlam was used to assess the physical activity levels of the participants [24]. The short form of the questionnaire, which includes the “last seven days”, was used to evaluate the level of physical activity. The short form of IPAQ consists of seven questions and provides information about sitting, walking, moderately vigorous activities and time spent in vigorous activities. The total score for the questionnaire includes the total duration (minutes) and frequency (days) of walking, moderately vigorous activity, and vigorous activity. To evaluate all of the activities, each activity must be done at least 10 minutes at any time. By multiplying the minute, day and MET value (resting oxygen consumption) a score is obtained as “MET-minute / week”. The walking time (minutes) was multiplied by 3.3 METs in calculating the walking score. In the calculation, 4 METs were taken for moderately severe activity and 8 METs for vigorous activity [25, 26].

### 2.3.4. Beck Depression Scale (BDS)

The Turkish version of the BDS, of which the validity and reliability were proven by Hisli, was used to assess the depressive symptoms of the participants [27]. The BDS was created by observing the symptoms and attitudes specific to depression and combining the frequently observed behaviours. There is no time limit and the questions can be answered in about 10–15 minutes. Each question of the questionnaire which is composed of 21 questions and scored between 0 and 3, the highest score that can be obtained is 63. Depressive symptoms are classified as scores between 0 and 9 points and are considered as “minimal depression”, 10–18 points are considered as “mild depression”, 19–29 points are considered as “moderate depression”, and scores of 30 and above are considered as “severe depression” [27, 28].

### 2.3.5. Statistical analysis

All statistical analyses were performed using SPSS (Statistical Package for Social Sciences) software package. Descriptive data were given as percent, mean and standard deviation values. The data did not conform to the normal distribution and parametric test assumptions were not provided. A Wilcoxon Signed Rank test was used in dependent group comparisons. Mann-Whitney U test was used for comparison of clinic data of students. Multivariate analyses were

performed to evaluate the associations among weight changes and age, BDS scores, and changes in physical activity time. The level of statistical significance was determined as  $p < 0.05$ .

## 3. Results

848 students aged between 18–25 years (average age:  $20,72 \pm 1,63$  years) were included in the study. 546 (64.4%) students were females and 302 (35.6%) students were males. Demographics and characteristics of participants are given in Table 1.

### 3.1. Comparison of weight and physical activity time before the pandemic and during the pandemic

458 (54%) of the students reported having an increase in weight during the pandemic. The average increase in weight of the students was  $5.31 \pm 4.33$  kg (Table 1). When the weight of the participants was compared before and during the pandemic, a statistically significant difference was found ( $p < 0.05$ ). Similarly, the physical activity times before and during the pandemic were compared, a statistically significant difference was found ( $p < 0.05$ ). The average physical activity time of students before the pandemic was  $222.77 \pm 627.74$  minutes and during the pandemic was  $123.45 \pm 446.44$  minutes (Table 2).

Table 1  
Characteristics of participants

	n = 848	
	min-max	mean±SD
Age (yr)	18–25	20,72 ± 1,63
BMI (kg/m <sup>2</sup> )	13,58–39,79	22,17 ± 3,78
IPAQ (MET-min/week)	0–48420	1250,15 ± 3360,20
BDS	0–63	16,84 ± 11,00
	Number of students (n = 848)	Percentage (%)
Gender		
Male	302	35.6
Female	546	64.4
Field of study		
Social science	236	27.8
Natural science	179	21.1
Health science	328	38.6
Educational science	105	12.4
Weight gain		
Yes	458	54
No	390	46

BMI: Body Mass Index, BDS: Beck Depression Scale, IPAQ: International Physical Activity Questionnaire.

Table 2  
Physical activity and weight changes of the participants

	n	Before the pandemic		During the pandemic		P <sup>a</sup>
		min-max	mean ± SD	min-max	mean ± SD	
Weight (kg)	848	40–110	61,03 ± 12,69	40–120	63,99 ± 13,95	***0,00
Physical activity (min)	848	0–10000	222,77 ± 627,74	0–9000	123,45 ± 446,44	***0,00

<sup>a</sup>Wilcoxon Signed Rank Test, \*\*\*P < 0.001.

Table 3  
BDS and IPAQ scores of participants

	Number of students (n = 848)	Percentage (%)
No depression	24	2,8
Minimal depression	200	23,6
Mild depression	308	36,3
Moderate depression	207	24,4
Severe depression	109	12,8
	Number of students (n = 848)	Percentage (%)
Inactive	292	34,4
Moderate active	488	57,5
Sufficient active	68	8,0

BDS: Beck Depression Scale, IPAQ: International Physical Activity Questionnaire.

### 3.2. Depression and physical activity level during the pandemic

According to scores on the BDS, 24 of the students had no depressive symptoms, and 200 students were classified as having minimal depression. 308 students had mild depressive symptoms and 207 students had moderate depression. 109 students were determined to have severe depressive symptoms. According to International Physical Activity Scale scores, 292 students were physically inactive (<600 MET-min / week), 488 students with low physical activity (600–3000 MET-min / week) and 68 students were physically active, their physical activity level was adequate (>3000 MET-min / week) (Table 3).

### 3.3. The factors that affect weight change

Multivariate analyses were performed to evaluate the associations among weight changes and age, BDS scores, and changes in physical activity times. Multivariate analyses showed that higher increased BDS scores ( $\beta = 0,180$ ; 95% CI: 0,028, 0,094,  $p = 0,000$ ) were significantly associated with increased weight gain. But there was not a significant association with age ( $\beta = 0,074$ ; 95% CI:  $-0,050$ , 0,357,  $p = 0,138$ ) and changes in physical activity time ( $\beta = -0,043$ ; 95% CI:  $-0,001$ , 0,000,  $p = 0,388$ ) (Table 4).

Table 4

Multiple regression analyses of the variables associated with weight gain, age, BDS and changes in physical activity time

Variable	Weight change		
	$\beta$	95% CI	p
Age	0,074	$-0,050$ 0,357	0,138
Changes in physical activity time	$-0,043$	$-0,001$ 0,000	0,388
BDS scores	0,180	0,028 0,094	***0,000

CI: Confidence Interval, \*\*\*P < 0.001.

## 4. Discussion

The aim of the current study is to investigate the effect of the COVID-19 pandemic on weight gain, physical activity and mental health among university students. The findings of the study are that the physical activity levels of university students decreased compared to those of the pre-pandemic period and it is revealed that there was weight gain during the pandemic when the pre-pandemic and pandemic periods were compared. In the pandemic, almost all participants (except for about three percent) were found to have depressive symptoms. When the physical activity levels of the participants during the pandemic were investigated, it was seen that approximately one-third of the participants did not participate in physical activity. In the multivariate regression analysis, it was determined that there was a relationship between weight gain and depressive symptoms among university students, but no relationship was found between weight gain and physical activity.

The novel coronavirus outbreak that originated in China has been officially designated as a global pandemic by the World Health Organization (WHO), affecting the majority of countries around the world [13, 29]. The transmission of the virus is quick and invisible and it has high morbidity and mortality rates worldwide. For this reason, fear of the disease and a dramatically high economic impact demonstrated psychological effects [30].

In addition, many people and several families may be affected by school closure, changes in daily habits and occupational status [31, 32]. Several studies have shown that the COVID-19 pandemic may cause

emotional, cognitive, physical, and behavioral reactions such as stress, anxiety, insomnia and suicidality [33–36].

Meyer et al. reported that sitting and activity looked similar between sexes, while there was evidence of some age differences. For example, younger adults (ages 18–34) appeared to self-report being inactive and more appeared to sit for >8 h/day compared to older adults. Strategies to mitigate the COVID-19 pandemic may impact physical activity and mental health, with those experiencing a decrease in physical activity have higher levels of stress and anxiety [37]. Similarly, in the current study physical activity decreased during the pandemic compared to before. And also almost all participants have depressive symptoms.

Physical activity is strongly associated with mental health and wellness [38] because physical activity is an effective way to reduce stress in adults [39, 40]. Measures aiming at containing COVID-19 include isolation, social distancing, and quarantine. In many countries, restrictions included the closure of city recreation facilities, national parks, and playgrounds. For this reason, physical activities were reduced globally for all ages.

A study assessed the impact of measures on physical activity behaviour and well-being of Canadians. The results suggested that while 40.5% of inactive individuals became less active, only 22.4% of active individuals became less active. Comparatively, 33% of inactive individuals became more active while 40.3% of active individuals became more active. The study reported an increase in negative psychological side effects such as post-traumatic stress syndrome, confusion and anger as an outcome of the pandemic and associated quarantine [14]. Cheval et al. collected data from European countries and determined declines in vigorous physical activity [41]. The results of our study also showed that the physical activity habits of university students changed during the pandemic and their mental health was also affected.

A recent review highlights some of the documented psychological impacts of COVID-19 on college students [42]. Many feel increased stress levels, anxiety, and depressive symptoms as a result of changed delivery and uncertainty of university education, technological concerns of online courses, being far from home, social isolation, decreased family income, and future employment. These impacts have been observed in universities across the world [43, 44]. To investigate the effects of the fear of

COVID-19, level of physical activity, and gender on negative stress (distress) in an Arab population, a study was designed. The sample of the study was composed of 459 participants (237 women and 222 men) including 137 students from universities, 178 students from secondary schools, and 144 students from basic schools. The “Fear of COVID-19” Scale, the short form of the “International Physical Activity Questionnaire,” and the “Perceived Stress Scale” questionnaires were used for assessments. The COVID-19 pandemic has an impact on psychological distress in Arab populations. The effect of physical activity levels on psychological distress is shown to be particularly important during the pandemic [13]. Meyer et al. investigated the changes in physical activity, sitting time, and screen time as a result of COVID-19 public health restrictions, and their associations with mental health in 3052 US adults. The results of the study supported the mental health benefits of measures that promote physical activity while limiting screen time during periods of social modification due to the pandemic [45]. Another study showed that the level of physical activity decreased significantly during COVID-19 compared to pre-COVID-19 in both sexes and age groups in Qom, Iran. The results showed that the COVID-19 pandemic leads to a decrease in physical activity. Increased inactivity during the COVID-19 pandemic can have many negative effects. They recommended that health workers include physical activity promotion as a part of their follow-up after the pandemic [46]. Magueri et al. aimed to examine changes in the physical activity levels of 2524 Italian subjects during self-quarantine in Italy, and the impact of exercise on psychological health. An adapted version of the International Physical Activity Questionnaire measured the total weekly physical activity energy expenditure before and during quarantine and Psychological General Well-Being Index was used to assess their psychological well-being. Participants were divided into four age groups: young adults aged <21 ( $n=346$ ); young adults aged 21–40 ( $n=1178$ ); adults aged 41–60 ( $n=704$ ) and adults over 60 ( $n=296$ ). A significant positive correlation was found between the variation of physical activity and mental well-being, suggesting that a reduction in total physical activity is related to the worse status of psychological well-being ( $r=0.07541$ ,  $***p=0.0002$ ). The results showed that quarantine in Italy induced a significant reduction of total weekly physical activity energy expenditure in all age groups and especially in men,

and this reduction negatively affected psychological well-being. Physical activity had a profoundly positive impact on psychological health, by enhancing self-esteem and resilience to stress and reducing depression and anxiety [47].

Sarsak aimed to investigate the psychological effects of the COVID-19 pandemic on medical and rehabilitation sciences university students to determine the factors affecting the students and provide recommendations for their mental health. It has been determined that students are at risk for developing psychological and mental health problems during the COVID-19 pandemic. Similar to our conclusions, the author reported that some supportive measures should be implemented during and after the pandemic is over. Further research on the risk and preventive factors should be taken and developing proper mental health management guidelines and providing psychological support, psychosocial crisis prevention and counseling services should be considered for both the university students and the other community levels [48].

In our study, it was determined that there was weight gain in students during the pandemic period and that there was a relationship between weight gain and depressive symptoms. Declines in healthy eating behaviors were coincident with reductions in physical activity, and these negative behaviors were characteristic of individuals reporting weight gain in response to the pandemic outbreak. The relationships between anxiety, energy intake and food preference are a concern for future weight gain, particularly in individuals with obesity [12]. In Italy, 48.6% of 3533 respondents gained weight [49] and in this study, 54% of the participants reported increases in weight during the pandemic process. A study was designed to determine lifestyle changes, such as food habits and PA patterns (i.e., type of PA, time, duration, sedentary time), in Chilean population during the COVID-19 pandemic and to analyze its association with changes in body weight and physical status. Food habits, PA, and active breaks may be protective factors for weight increase during the COVID-19 pandemic [50].

Australia started online education on March 23, 2020 and there some restrictions were imposed on social life. To investigate the effect of the pandemic on diet and physical activity levels, 509 (19–27 years old) university students were included in a study. For students, the Automated Self-Administered Dietary Assessment Tool (ASA24 Australia-2016) and the Active Australia Questionnaire were used to assess 2018, 2019 and 2020 diet and physical activity levels.

As a result of the study, during the pandemic process, the energy intake and nutrition frequency of female students increased by 20% compared to the previous two years, and the number of students who reached sufficient physical activity level decreased by 30% compared to the last two years for both genders [51].

Boukrim et al. designed a study to evaluate the effect of confinement on the weight load, physical activity and dietary behavior of higher education students during the period of confinement. It showed a positive association between sex, diet, physical activity and stress [19].

Our study was solely based on self-reported questionnaires, and there was a possibility of memory bias. The other limitation of the study is that the evaluation of depressive mood was measured only once in a pandemic situation, so there is a limit in confirming the degree of change from the previous one.

## 5. Conclusion

The results of the study showed that the COVID-19 pandemic has a negative effect on the physical activity level, weight gain and mental health of university students. Also, an increase in depressive symptoms is related to higher levels of weight gain. Therefore, physical activity and mental health programmes should be offered to university students as an educational and health policy.

It is reasonable to assume that lockdowns lead to reduced levels of physical activity for all the people threatened by the COVID-19 pandemic. A current review summarizes the harmful effects of limited physical activity on mental and physical health due to social distancing and quarantine and highlights. Simple physical activity prescriptions counteract these detrimental effects, with a special emphasis on acute effects. Physicians and other health care professionals should use this time as a window of opportunity to provide physical activity counseling to their patients [52]. Chekroud et al. reported that physically active individuals generally experience less stress, depression and anxiety [38]. We recommend a national program to be applied to support students for home-based physical activities. Innovative policies, programs, and practices to promote student health and well-being need to be explored immediately. Determining the effects of the COVID-19 pandemic on weight gain, physical activity levels and depressive symptoms of university students will reveal that necessary measures should be taken in this regard.

## Ethical approval

Pamukkale University approved the study (01-E4341/05.01.2021).

## Informed consent

Informed consent was obtained from all subjects involved in the study.

## Conflict of interest

The authors declare no conflict of interest.

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