

## ORIGINAL ARTICLE

# Quality of life and related factors in university students during the coronavirus disease 2019 pandemic

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**Purpose:** The aims of this study were (1) to examine the quality of life, physical activity level, sleep quality, stress, anxiety, and depression levels, and (2) to determine the relationship between the quality of life, and these factors among university students during the coronavirus disease 2019 (COVID-19) pandemic.

**Methods:** The undergraduate physiotherapy students were invited in this cross-sectional survey. A total of 320 students responded to the online survey. Quality of life, physical activity level, sleep quality, stress, anxiety, and depression were assessed using the Short Form-36, International Physical Activity Questionnaire, Pittsburgh Sleep Quality Index, Perceived Stress Scale, Hospital Anxiety and Depression Scale, respectively.

**Results:** The overall prevalence of physical inactivity, sleep disorder, stress, anxiety, and depression were 36.6%, 27.5%, 100%, 88.1%, and 75.6%, respectively. The correlation analysis showed that the total physical activity level was associated with the mental health and general health domains ( $p<0.05$ ); the sleep quality and anxiety level were associated with all the sub-domains ( $p<0.05$ ); stress level was associated with all the sub-domains, except the physical functioning ( $p<0.05$ ); depression level was associated with the mental health sub-domains of quality of life ( $p<0.05$ ).

**Conclusion:** The prevalence of physical inactivity, stress, anxiety, and depression were high among university students during the COVID-19 pandemic. In addition, these factors were negatively related to the quality of life. Therefore, psychological support and staying physically active can help cope with these negative effects of the COVID-19 pandemic and improve the quality of life.

**Keywords:** COVID-19, Students, Quality of life, Physical activity, Mental health.

## Koronavirüs hastalığı 2019 salgını sırasında üniversite öğrencilerinde yaşam kalitesi ve ilişkili faktörler

**Amaç:** Bu çalışmanın amaçları (1) Koronavirüs hastalığı 2019 (COVID-19) salgını sırasında üniversite öğrencilerinde yaşam kalitesini, fiziksel aktivite düzeyini, uyku kalitesini, stres, kaygı ve depresyon düzeylerini incelemek ve (2) yaşam kalitesi ile bu faktörler arasındaki ilişkiyi belirlemektir.

**Yöntem:** Bu kesitsel ankete fizyoterapi bölümünde okumakta olan lisans öğrencileri davet edildi. Çevrimiçi anketi toplam 320 öğrenci yanıtladı. Yaşam kalitesi, fiziksel aktivite düzeyi, uyku kalitesi, stres, kaygı ve depresyon seviyeleri sırasıyla; Kısa Form-36, Uluslararası Fiziksel Aktivite Anketi, Pittsburgh Uyku Kalite İndeksi, Algılanan Stres Ölçeği, Hastane Anksiyete ve Depresyon Ölçeği kullanılarak değerlendirildi.

**Bulgular:** Fiziksel inaktivite, uyku bozukluğu, stres, anksiyete ve depresyonun genel prevalansı sırasıyla %36,6, %27,5, %100, %88,1 ve %75,6 idi. Korelasyon analizi, genel fiziksel aktivite düzeyinin yaşam kalitesinin ruh sağlığı ve genel sağlık alanlarıyla ( $p<0,05$ ); uyku kalitesi ve kaygı düzeyinin yaşam kalitesinin tüm alt alanlarıyla ( $p<0,05$ ); stres seviyesinin yaşam kalitesinin fiziksel işlevsellik dışındaki tüm alt alanlarıyla ( $p<0,05$ ); depresyon düzeyinin ise yaşam kalitesinin ruh sağlığı alt alanı ile ilişkili olduğunu gösterdi ( $p<0,05$ ).

**Sonuç:** COVID-19 salgını sırasında üniversite öğrencileri arasında fiziksel inaktivite, stres, kaygı ve depresyon prevalansı yüksekti. Ayrıca bu faktörler yaşam kalitesi ile olumsuz yönde ilişkiliydi. Bu nedenle, psikolojik destek ve fiziksel olarak aktif kalmak, COVID-19 pandemisinin bu olumsuz etkileriyle başa çıkmaya ve yaşam kalitesini iyileştirmeye yardımcı olabilir.

**Anahtar kelimeler:** COVID-19, Öğrenciler, Yaşam kalitesi, Fiziksel aktivite, Ruh sağlığı.

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The coronavirus disease 2019 (COVID-19) has affected people from many countries in the world. In March 2020, the World Health Organization (WHO) has declared the COVID-19 a global pandemic.<sup>1</sup> To reduce the spread of COVID-19, social isolation has become imperative.<sup>2</sup>

Pandemic causes fear, worry, stress, and thus depression, and anxiety due to both health-related threats and the uncertainty in social life.<sup>3</sup> At the same time, changes in daily life routines due to social isolation such as working from home, unemployment, distance education at home, and lack of physical contact and communication with family members/friends may negatively affect mental health and lead to disrupted sleep.<sup>4</sup>

Moreover, it is expected that physical inactivity would increase due to decreased outdoor activity, and increased screen time spent on computer, TV, or games during social isolation.<sup>3</sup> Therefore, there is concern about the increased risks of the disease associated with physical inactivity, such as metabolic and cardiological diseases.<sup>5-7</sup>

Taken together, all expected declines in both mental and physical health due to pandemic and social isolation may adversely affect the quality of life.<sup>8</sup> The previous studies conducted before COVID-19 reported that social isolation affected negatively mental health, physical health, and thus the quality of life.<sup>9</sup> However, not much is known yet about the effects of the COVID-19 pandemic on quality of life.<sup>10</sup> Current commentaries about COVID-19 have highlighted the need to investigate how the COVID-19 pandemic affects both physical and mental quality of life in healthy populations.<sup>3,4,8,11</sup> In particular, it is thought that young people may be more sensitive to the negative effects of social isolation due to several reasons such as the suspension of schools, social distance measures, and social communication limitations.<sup>9</sup>

A limited number of studies examined the mental health among university students during the COVID-19 pandemic in different countries, and these studies stated that stress, anxiety, and depression increased compared to previous historical data.<sup>12-15</sup> However, in these studies, sleep quality and physical activity level, which are the important determinants of quality of life, were generally neglected. In addition, no

study has yet been reported to examine the physical and mental health of university students during the COVID-19 pandemic in Turkey.

Therefore, the first aim of this study was to examine the quality of life, physical activity level, sleep quality, stress, anxiety, and depression levels among university students during the COVID-19 pandemic. The secondary aim was to determine the relationship between the quality of life, and physical activity level, sleep quality, stress, anxiety, and depression levels among university students during the COVID-19 pandemic.

## METHODS

### Participants

The undergraduate physiotherapy students at Gazi University were invited to this cross-sectional survey. The surveys were prepared using Google forms, and the relevant link was sent to all the students. The students read the informed consent form on the first page, and the volunteer students who agreed to participate in the study filled out the surveys between 18 May 2020 and 22 May 2020. Inclusion criteria were (1) age over 18 years, (2) a university student, and (3) willingness to participate in the survey. Exclusion criteria were having (1) any disease that prevents physical activity, or (2) a diagnosis of psychiatric disorder. The study protocol was approved by the Gazi University Ethics Commission (No:2020-241, date: 9th May 2020).

We calculated that the sample size should be over 138 based on the power analysis (G\*power version 3.1.9.2, Axel Buchner, Universität Kiel) with the power set at 0.95, alpha at 0.05 for detecting moderate effect size ( $\rho = 0.3$ ).

### Measurements

Quality of life was assessed using the Short Form-36 (SF-36). The SF-36 questionnaire consists of eight domains: physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health. Each domain is scored between 0 (the worst health status) and 100 (the best health status).<sup>16,17</sup>

Physical activity level was assessed using the Short Form-International Physical Activity Questionnaire (IPAQ). The IPAQ measures

vigorous-intensity activity, moderate-intensity activity, walking activity levels, and sitting time by calculating physically active time in regard to the number of days and average time per day in the last week. The activity levels are represented as a Metabolic Equivalent of Tasks (METs) which is the energy expended during sitting at rest. The total score of IPAQ indicates a low physical activity of fewer than 600 MET-minutes per week, moderate physical activity of more than 600 MET-minutes per week, and a high level of physical activity of at least 3000 MET-minutes per week.<sup>18,19</sup>

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). It differentiates "poor" from "good" sleep quality by measuring seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction. A total score of "5" or greater indicates poor sleep quality.<sup>20,21</sup>

Stress was assessed using the 10 item-Perceived Stress Scale (PSS). The scale assesses the extent to which participants perceived their lives as unpredictable, uncontrollable, and overloaded during the last month. A higher score indicates that the participants considered the situations in their life more stressful. PSS score can indicate low-stress (Score: 0-13), moderate stress (Score: 14-26), high stress (Score: 27-40).<sup>22,23</sup>

Anxiety and depression were assessed using the Hospital Anxiety and Depression Scale (HADS) including seven questions separately for anxiety and depression.<sup>24,25</sup> For both scales, the scores can be classified as none (Score <8), mild (Score: 8-11), moderate (Score: 11-14), and severe (Score: 15-21).<sup>26</sup>

#### Statistical analysis

Statistical analysis was performed by using the IBM Statistics SPSS v21.0. (IBM Corp. Armonk, NY, USA). The variables were determined by the measurement (histograms, Kolmogorov–Smirnov test) and expressed as the median and Interquartile Range (IQR) due to non-normal distribution. Categorical variables were expressed as a percentage. Based on the cut-off scores of the questionnaires, the participants were divided into groups according to their scores (3 groups for IPAQ, 2 groups for PSQI, 2 groups for PSS, 4 groups for HADS-anxiety, 3 groups for HADS-depression). A

Mann-Whitney U test was used to compare the values between two groups. A Kruskal-Wallis test was used to compare the values among three or more groups. When a significant difference among groups was observed while using the Kruskal-Wallis test, the Mann-Whitney U test was used to test the significance of the pairwise differences by using a Bonferroni correction to adjust for multiple comparisons. The error level was found as  $p < 0.017$  for the comparison of two groups with the Bonferroni correction in the groups of IPAQ (3 groups), and HADS-depression (3 groups). On the other hand, the error level was found as  $p < 0.008$  for the comparison of two groups with the Bonferroni correction in the groups of HADS-anxiety (4 groups). To decide on the factors associated with quality of life in participants, a Spearman correlation coefficient was performed. The correlation coefficient was classified as negligible (0-0.10), weak (0.10-0.39), moderate (0.40-0.69), strong (0.70-0.89), and very strong (0.90-1.00). The statistical significance level was  $p < 0.05$ .

## RESULTS

A total of 340 students responded to the survey. Following the exclusion of 20 students who did not fully answer the survey, the data of 320 students were analyzed. The power analysis by using G \* Power 3.1 showed that the post-hoc power was 0.99 using a two-tailed correlation test (alpha at 0.05) to detect a moderate effect size ( $\rho = 0.3$ ). The demographic characteristics of all the participants are shown in Table 1. A majority of the participants were female (84.4%); did not have any disease (92.5%); lived with their family (95.3%), and in the cities where weekend curfew was declared (72.8%). No participant was infected with COVID-19. However, two participants had relatives who were infected with COVID-19.

#### Physical activity level

Based on the cut-off scores of IPAQ, the participants were divided into 3 groups: low physical activity (36.6%), moderate physical activity (40.9%), high physical activity (22.5%) (Table 2). Comparison of the groups showed that the low physical activity group had lower mental health than both moderate and high activity groups, and also low physical activity

Table 1. Demographic characteristics of participants.

	Students (N=320)
Age (years)	21 (20-22)
Age groups	
<20 years	127 (39.7%)
20-22 years	128 (40%)
>22 years	65 (20.3%)
Gender	
Female	270 (84.4%)
Male	50 (15.6%)
BMI (kg/m <sup>2</sup> )	21.55 (19.6-23.5)
Year at university	
Freshman	91 (28.4%)
Sophomore	70 (21.9%)
Junior	55 (17.2%)
Senior	104 (32.5%)
Disease	
None	296 (92.5%)
Pulmonary or immunologic	12 (3.8%)
Other	12 (3.8%)
City	
Under curfew	233 (72.8%)
No curfew	87 (27.2%)
Persons living together	
Alone	6 (1.9%)
With family	305 (95.3%)
With relatives	5 (1.6%)
With friends	4 (1.3%)
Number of people living together	4 (3-4)

Data are presented as number (%) of participants or median (IQR).

group had lower general health than the high activity group ( $p<0.017$ , Table 3).

#### *Sleep quality*

Based on the cut-off scores of PSQI, the participants were divided into 2 groups: normal sleep quality (72.5%), poor sleep quality (27.5%) (Table 2). A comparison of the groups showed that the poor sleep quality group had lower quality of life in all the sub-domains of SF-36, except the physical functioning than the normal sleep quality group ( $p<0.05$ , Table 3).

#### *Stress*

Based on the cut-off scores of the PSS, the participants were divided into 2 groups: moderate stress (30.9%), and high stress

(69.1%). No person perceived low stress (Table 2). A comparison of the groups showed that the high-stress group had lower quality of life on all the sub-domains of SF-36, except the physical functioning than the moderate stress group ( $p<0.05$ , Table 3).

#### *Anxiety*

Based on the cut-off scores of the HADS-anxiety, the participants were divided into 4 groups: normal (11.9%), mild (39.7%), moderate (36.6%), severe (11.9%) (Table 2). A comparison of the groups showed that the severe anxiety group had lower quality of life in all the sub-domains of SF-36 than the normal and mild anxiety group ( $p<0.008$ , Table 4). In addition, the sub-domains of SF-36, except role-physical, and social functioning, were lower in the moderate anxiety group than normal and mild anxiety group ( $p<0.008$ , Table 4). The sub-domains of SF-36, except role-physical, social functioning, and bodily pain were lower in the severe anxiety group than the moderate anxiety group ( $p<0.008$ , Table 4).

#### *Depression*

Based on the cut-off scores of the HADS-depression, the participants were divided into 3 groups: normal (24.4%), mild (58.8%), and moderate (16.9%) (Table 2). A comparison of the groups showed that the moderate depression group had a lower mental health score of SF-36 than the normal and mild depression group ( $p<0.017$ , Table 4).

*Relationship between the quality of life, and physical activity level, sleep quality, stress, anxiety, and depression levels*

The correlation analysis showed that the total score of IPAQ was weakly but significantly and positively associated with the mental health and general health domains of SF-36 ( $p<0.05$ ); PSQI and HADS-anxiety were weakly to moderately correlated with all the sub-domains of SF-36 ( $p<0.05$ ); PSS was weakly to moderately correlated with all the sub-domains of SF-36, except the physical functioning ( $p<0.05$ ); HADS-depression was weakly and negatively correlated with the mental health sub-domains of SF-36 ( $p<0.05$ ) (Table 5).

## DISCUSSION

This study examined the quality of life, physical activity level, sleep quality, stress,

Table 2. Quality of life, physical activity level, sleep quality, stress, anxiety and depression levels of participants.

		Students (N=320)
SF-36	Physical functioning (score)	95 (86.25-100)
	Role-physical (score)	100 (50-100)
	Bodily pain (score)	90 (77.5-90)
	General health (score)	65 (55-75)
	Role-emotional (score)	33.33 (0-100)
	Vitality (score)	50 (40-65)
	Mental health (score)	60 (48-72)
	Social functioning (score)	50 (25-75)
IPAQ	Total activity (MET-minutes/week)	933 (320-2406)
Groups	Low/Moderate/High	240 (66-388)/ 1142 (840-1685)/ 6064 (3758.8-10362.8)
PSQI	Total score	3.88 (2.50-5.25)
Groups	Normal/Poor	3.13 (2.25-4)/ 6.38 (5.5-7.6)
PSS	Total score	29 (25-34)
Groups	Low/Moderate/High	-(0)/ 23 (20-25)/ 32 (29-36.5)
HADS-Anxiety	Total score	10 (9-13)
Groups	Normal/Mild/Moderate/Severe	7 (6-7)/9 (9-10)/12 (11-13)/15.5 (15-16.3)
HADS-Depression	Total score	9 (8-10)
Groups	Normal/Mild/Moderate/Severe	7 (6-7)/9 (8-10)/12 (11-12)/-(0)

Data are presented as median (IQR). HADS: Hospital Anxiety and Depression Scale, IPAQ: International physical activity questionnaire, PSS: Perceived stress scale, PSQI: Pittsburgh sleep quality index, SF-36: Short Form 36-Quality of life questionnaire.

Table 3. Comparison of participants' quality of life by physical activity level, sleep quality and stress level.

	IPAQ			p	PSQI		p	PSS		p
	Low (N=117)	Moderate (N=131)	High (N=72)		Normal (N=232)	Poor (N=88)		Moderate (N=99)	High (N=221)	
Physical functioning	95 (85-100)	95 (85-100)	95 (90-100)	0.298	95 (90-100)	95 (85-100)	0.150	95 (90-100)	95 (85-100)	0.069
Role-physical	100 (50-100)	100 (50-100)	100 (50-100)	0.093	100 (75-100)	75 (25-100)	0.001	100 (75-100)	100 (50-100)	<0.001
Bodily pain	80 (77.5-90)	77.50 (77.5-100)	90 (77.50-100)	0.427	90 (77.50-100)	77.50 (67.5-90)	<0.001	90 (77.5-100)	77.50 (77.5-90)	<0.001
General health	60 (55-75)	70 (60-80)	70 (60-75)	0.023 <sup>a,b</sup>	70 (60-75)	60 (50-70)	<0.001	75 (65-80)	65 (52.5-75)	<0.001
Role-emotional	33.33 (0-100)	33.33 (0-100)	33.33 (0-100)	0.628	33.33 (0-100)	0 (0-33.3)	<0.001	66.67 (33.3-100)	0 (0-66.7)	<0.001
Vitality	50 (35-60)	50 (40-65)	55 (40-65)	0.142	55 (40-65)	42.50 (30-55)	<0.001	60 (50-75)	45 (30-60)	<0.001
Mental health	56 (48-68)	64 (52-76)	64 (53-79)	0.005 <sup>a,b</sup>	64 (52-76)	52 (40-64)	<0.001	76 (60-84)	56 (44-66)	<0.001
Social functioning	50 (37.50-75)	50 (25-75)	50 (37.50-75)	0.752	62.50 (37.5-87.5)	37.50 (12.5-59.4)	<0.001	75 (50-87.5)	50 (25-75)	<0.001

Data are presented as median (IQR). \*p<0.05, Kruskal-Wallis test for difference among three groups; Mann-Whitney U Test for difference between two groups. <sup>a</sup>: difference between low and moderate activity level groups, <sup>b</sup>: difference between low and high activity level groups (p<0.017, Mann-Whitney U Test with Bonferroni correction). IPAQ: International physical activity questionnaire, PSS: Perceived stress scale, PSQI: Pittsburgh sleep quality index.

Table 4. Comparison of participants' quality of life by anxiety and depression levels.

	HADS-Anxiety				p	HADS-Depression			p
	Normal (N=38)	Mild (N=127)	Moderate (N=117)	Severe (N=38)		Normal (N=78)	Mild (N=188)	Moderate (N=54)	
Physical functioning	100 (93.8-100)	95 (90-100)	90 (85-100)	90 (85-95)	<0.001 <sup>b,c,e,f</sup>	95 (85-100)	95 (90-100)	95 (88.7-100)	0.918
Role physical	100 (75-100)	100 (75-100)	100 (50-100)	38 (0-100)	<0.001 <sup>c,e</sup>	100 (50-100)	100 (50-100)	100 (75-100)	0.391
Bodily pain	100 (79.4-100)	90 (77.5-100)	77.50 (72.5-90)	77.50 (67.5-90)	<0.001 <sup>b,c,d,e</sup>	90 (77.50-90)	78.75 (77.5-100)	90 (77.5-100)	0.904
General health	77.50 (65-80)	70 (60-80)	65 (50-70)	52.50 (40-65)	<0.001 <sup>b,c,d,e,f</sup>	70 (55-75)	65 (55-75)	65 (55-76.25)	0.634
Role emotional	100 (33.3-100)	33.33 (0-100)	0 (0-66.7)	0 (0-0)	<0.001 <sup>b,c,d,e,f</sup>	33.3 (0-100)	33.3 (0-100)	33.3 (0-100)	0.873
Vitality	65 (50-75)	60 (50-70)	45 (30-55)	30 (20-40)	<0.001 <sup>b,c,d,e,f</sup>	52.50 (40-65)	50 (40-65)	47.50 (35-60)	0.196
Mental health	72 (56-81)	68 (56-80)	56 (44-64)	42 (32-60)	<0.001 <sup>b,c,d,e,f</sup>	64 (48-77)	60 (52-72)	56 (44-68)	0.006 <sup>*,b,d</sup>
Social functioning	62.50 (34.4-100)	62.50 (37.5-75)	50 (25-75)	37.50 (12.5-50)	<0.001 <sup>c,e</sup>	62.50 (25-78.13)	50 (28.13-75)	50 (25-75)	0.694

Data are presented as median (IQR). \*p<0.05, Kruskal-Wallis test for difference among groups. <sup>a</sup>: difference between normal and mild groups, <sup>b</sup>: difference between normal and moderate groups, <sup>c</sup>: difference between normal and severe groups, <sup>d</sup>: difference between mild and moderate groups, <sup>e</sup>: difference between mild and severe groups, <sup>f</sup>: difference between moderate and severe groups (p<0.008, Mann-Whitney U Test with Bonferroni correction for 4 groups; p<0.017, Mann-Whitney U Test with Bonferroni correction for 3 groups). HADS: Hospital Anxiety and Depression Scale.

Table 5. Correlations between quality of life and physical activity level, sleep quality, stress, anxiety and depression levels.

		Physical functioning	Role physical	Bodily pain	General health	Role emotional	Vitality	Mental health	Social functioning
IPAQ-Total	r	0.071	0.027	0.043	0.110	0.017	0.095	0.170	0.022
	p	0.208	0.631	0.444	0.049*	0.764	0.089	0.002*	0.695
PSQI	r	-0.169	-0.199	-0.391	-0.326	-0.382	-0.415	-0.412	-0.353
	p	0.002*	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PSS	r	-0.099	-0.260	-0.285	-0.364	-0.491	-0.582	-0.529	-0.364
	p	0.076	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
HADS-Anxiety	r	-0.251	-0.219	-0.313	-0.357	-0.348	-0.544	-0.475	-0.246
	p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
HADS-Depression	r	0.005	0.022	-0.008	-0.073	-0.062	-0.110	-0.164	-0.066
	p	0.923	0.699	0.891	0.193	0.271	0.050	0.003*	0.236

\*p<0.05 (Spearman correlation). HADS: Hospital Anxiety and Depression Scale, IPAQ: International physical activity questionnaire, PSS: Perceived stress scale, PSQI: Pittsburgh sleep quality index.

anxiety, and depression levels among university students during the COVID-19 pandemic in Turkey. The results showed that the mental components of quality of life including role-emotional, vitality, mental health, and social functioning were relatively lower than the physical components of quality of life including physical functioning, role-physical, bodily pain, and general health. This finding indicated that

mental health in university students was more sensitive to the negative impacts of the COVID-19 pandemic than physical health.

This study demonstrated that the overall prevalence of stress (moderate to high), anxiety (mild to severe), and depression (mild to moderate) were 100%, 88.1%, and 75.6%, respectively. A previous cross-sectional survey in Turkish university students demonstrated

that the rates of stress, anxiety, and depression were 27%, 47.1%, and 27.1%, respectively.<sup>27</sup> The comparison of the results showed remarkable increases in the prevalence of stress, anxiety, and depression among university students during the COVID-19 pandemic.

So far, several studies have examined the mental health of university students during the COVID-19 pandemic. Odriozola-González et al. reported that moderate to extremely severe levels of stress, anxiety, and depression among university students in Spain were 28.14%, 21.34%, and 34.19%, respectively.<sup>14</sup> Suryadevara et al. showed that the prevalence of extremely severe stress, anxiety, and depression among university students in India were around 12.5%, 27.5%, and 18%, respectively.<sup>15</sup> Cao et al. demonstrated that anxiety levels were as follows: 21.3% mild, 2.7% moderate, and 0.9% severe among university students in China.<sup>12</sup> Elmer et al. found that levels of stress, anxiety, and depressive got higher during the COVID-19 pandemic compared to pre-pandemic terms among Swiss university students.<sup>13</sup> Overall, the prevalence of stress, anxiety, and depression in university students increased during COVID-19 in many countries although the quantitative values in the results were different possibly due to the use of different questionnaires in the surveys and the differences in the health behaviors.

To date, the studies examining the effects of the COVID-19 pandemic on mental health in the general population also reported that the prevalence and level of stress, anxiety, and depression increased. Zhang and Ma reported that the COVID-19 pandemic in China had a mild stressful impact on the general population, whose 31.6% were students, in early February.<sup>8</sup> In the Chinese general population, a survey by Huang and Zhao showed that the prevalence of anxiety and depression were 35.1%, and 20.1%, respectively, and the depression and anxiety symptoms were higher in young people than older people.<sup>28</sup> In late March and early April 2020, a cross-sectional study across the United States, Canada, and Europe found that current anxiety and depression levels were higher in the general population compared to historical norms.<sup>29</sup> Similarly, the prevalence study in the UK indicated higher levels of anxiety and depression in late March 2020 compared to previous population studies. They stated that

the rates of anxiety and depression were 49.2% in 18-24 ages.<sup>30</sup> All aforementioned studies showed that the COVID-19 pandemic affected mental health negatively in the general population, and young people were more sensitive to these negative effects. In addition, Yuan et al. reported that anxiety affected negatively the quality of life.<sup>31</sup> Similarly, this study demonstrated that levels of stress, depression, and especially anxiety were negatively associated with quality of life in university students.

Regarding these negative effects, it was reported that pre-existing health conditions, economic concerns, physical and social isolation, social media exposure, increased screen time during the COVID-19 pandemic affected the mental health of the general population negatively, especially of the young people.<sup>29,30</sup> In addition to these factors, two studies stated that the suspending of the university and academic concerns in university students could increase these negative effects whereas family income stability, and living with parents could reduce these effects.<sup>12,13</sup> As of May 25, 2020, schools have been suspended in 153 countries, and education life has been going on with distance education programs. Thus, it is estimated that 68.5% of the enrolled learners worldwide are affected by this suspending.<sup>32</sup> As a result of the inclusion of universities among the suspended schools, uncertainties occurred both in the educational life and in the career plans of university students. Therefore, university students may have felt more stressed, anxious, and depressed.

Moreover, a recent review reported that sleep habits changed and sleep disorders increased during the pandemic.<sup>33</sup> Huang and Zhao showed that the prevalence of sleep disorder was 18.2% in the Chinese general population during the pandemic.<sup>28</sup> Marelli et al. found an increase in bedtime hour, sleep latency, and wake-up time during the pandemic among university students in Italy.<sup>34</sup> In this study, the prevalence of sleep disorder was 27.5% among university students. Although the prevalence of sleep disorder was not so high, the correlation analysis revealed that sleep quality had a weak to moderate relationship with all the domains of quality of life.

The WHO reported that 31% of people aged 15 and over were insufficiently active, and about

3.2 million deaths per year were associated with physical inactivity. For this reason, physical inactivity was also defined as a global public health problem.<sup>35</sup> Staying at home has been encouraged by COVID-19 pandemic measures in many countries.<sup>5</sup> Therefore, it is thought that these measures may promote physical inactivity. This study demonstrated that physical activity levels among university students were as follows: 36.6% low, 40.9% moderate, 22.5% high. In Turkey, previous population studies by Savci et al. reported that physical activity levels in university students were as follows: 15% low, 68% moderate, and 18% high physical activity.<sup>36</sup> A comparison of the results showed an increasing tendency in low physical activity levels among students. In line with our results, Huckins et al. reported that the university students in Winter 2020 were more inactive, anxious, and depressed compared to previous academic terms across the United States.<sup>37</sup>

The present study showed that there was an increase in the prevalence of sleep disorder and physical inactivity as well as anxiety, depression, and stress during the COVID-19 pandemic. A curfew was declared for people younger than 20 years of age in Turkey on April 3, 2020. In this study, 39.7% of the students were younger than 20 years of age and also 72.8% of the students lived in the cities which were under curfew for weekends. Due to the curfew or voluntary social isolation, the students stayed at home. Therefore, the physical activity level in university students decreased at home, and this decrease affected their mental and general health negatively, as we have shown in our study. In addition, increases in screen time spent on computers, TV, or games during social isolation were reported.<sup>8</sup> Thus, university students may have exposed to more and more news that may cause anxiety and depression in social media. In addition, a previous study before COVID-19 demonstrated that increased screen time was associated with increased physical inactivity, sleep disturbance, anxiety, and depression in university students.<sup>38</sup>

This study revealed that increased physical inactivity, sleep disturbance, stress, anxiety, and depression negatively affected the quality of life in university students. Especially, sleep quality, stress, and anxiety level had weak to moderate relationship with almost all the

domains of quality of life among university students. Therefore, these related factors need to be improved to increase the quality of life in university students. To manage stress, anxiety, and depression during social isolation, a current meta-analysis suggested some interventions such as cognitive behavioral therapy, mindfulness, exercise, and music via smartphone and online applications.<sup>39</sup> In addition, it is necessary to keep active as high as possible for mental and physical health while staying at home. WHO recommends at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical activity, or a combination of both per week for adults. In order to achieve this goal, the following are suggested during the COVID-19 pandemic: taking short active breaks during the day such as dancing, playing with children, and performing domestic chores; performing exercise via YouTube or different smartphone fitness applications; walking at home, or walking outside while maintaining at least a 1-meter distance from other people; standing up every 30 minutes. In addition, while sitting, performing mental tasks such as reading and puzzles, and relaxation techniques such as meditation and deep breathing are recommended for the protection of mental health.<sup>40</sup> Even if it is difficult to prevent many factors that are caused by COVID-19 pandemic and negatively affect mental health, staying active can help minimize these negative effects.

#### **Limitations**

This study provides information about the current effects of the COVID-19 pandemic that is still ongoing and gives an idea about possible future effects. However, this study has some limitations. This cross-sectional study was carried out in physiotherapy students at Gazi University in Turkey. Thus, it may not reflect the overall student profile worldwide. In addition, there is no data obtained from the same students before the suddenly developing pandemic. Thus, we could not make a definitive comment about how much share COVID-19 pandemic has on the current situation of students.

#### **Conclusion**

The present study showed that the prevalence of physical inactivity, stress, anxiety, and depression were high among university students during the COVID-19 pandemic.

Furthermore, the higher levels of physical inactivity, sleep disturbance, stress, anxiety, and depression were associated with lower quality of life. Therefore, psychological support by families and educators can help cope with these negative effects of the COVID-19 pandemic on mental health. In addition, physical activity, essential for both mental and physical health, should not be neglected, and staying active should be encouraged while maintaining social isolation.

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## REFERENCES

1. Organization WH. WHO Director-General's opening remarks at the media briefing on COVID-19-11 March 2020. World Health Organization. 2020. [Internet]. [Access date 02 June 2020]. Access address: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>.
2. Organization WH. Overview of public health and social measures in the context of COVID-19. World Health Organization. 2020. [Internet]. [Access date 02 June 2020]. Access address: <https://www.who.int/publications-detail/overview-of-public-health-and-social-measures-in-the-context-of-covid-19>.
3. Balanza-Martinez V, Atienza-Carbonell B, Kapczinski F, et al. Lifestyle behaviours during the COVID-19 - time to connect. *Acta Psychiatr Scand.* 2020;141:399-400.
4. Banerjee D, Rai M. Social isolation in Covid-19: The impact of loneliness. *Int J Soc Psychiatry.* 2020;66:525-527.
5. Hall G, Laddu DR, Phillips SA, et al. A tale of two pandemics: How will COVID-19 and global trends in physical inactivity and sedentary behavior affect one another? *Prog Cardiovasc Dis.* 2020;S0033-0620(20)30077-3.
6. Lippi G, Henry BM, Sanchis-Gomar F. Physical inactivity and cardiovascular disease at the time of coronavirus disease 2019 (COVID-19). *Eur J Prev Cardiol.* 2020;27:906-908.
7. Pecanha T, Goessler KF, Roschel H, et al. Social isolation during the COVID-19 pandemic can increase physical inactivity and the global burden of cardiovascular disease. *Am J Physiol Heart Circ Physiol.* 2020;318:H1441-H1446.
8. Zhang Y, Ma ZF. Impact of the COVID-19 Pandemic on mental health and quality of life among local residents in Liaoning Province, China: A cross-sectional study. *Int J Environ Res Public Health.* 2020;17:2381.
9. Hammig O. Health risks associated with social isolation in general and in young, middle and old age. *PLoS One.* 2019;14:e0219663.
10. Lee J. Mental health effects of school closures during COVID-19. *Lancet Child Adolesc Health.* 2020;4:421.
11. Pfefferbaum B, North CS. Mental health and the Covid-19 pandemic. *N Engl J Med.* 2020;383:510-512.
12. Cao W, Fang Z, Hou G, et al. The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Res.* 2020;287:112934.
13. Elmer T, Mepham K, Stadtfeld C. Students under lockdown: Assessing change in students' social networks and mental health during the COVID-19 crisis. *PLoS One.* 2020;15:e0236337.
14. Odriozola-González P, Planchuelo-Gómez Á, Irurtia MJ, et al. Psychological effects of the COVID-19 outbreak and lockdown among students and workers of a Spanish university. *Psychiatry Res.* 2020;290:113108.
15. Suryadevara V, Adusumalli C, Adusumilli PK, et al. Countrywide quarantine only mildly increased anxiety level during COVID-19 outbreak in China. *MedRxiv.* 2020;doi: 10.1101/2020.04.01.20041186.
16. Kocyigit H. Kisa Form-36 (KF-36) nin Turkce versiyonunun guvenirligi ve gecerliligi.[Validity and reliability of Turkish version of SF-36]. *J Drug Ther.* 1999;12:102-106.
17. Ware Jr JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36): I. Conceptual framework and item selection. *Med care.* 1992;30:473-483.
18. Booth M. Assessment of physical activity: an international perspective. *Res Q Exercise Sport.* 2000;71:114-120.
19. Saglam M, Arikan H, Savci S, et al. International physical activity questionnaire: reliability and validity of the Turkish version. *Percept Mot Skills.* 2010;111:278-284.
20. Ağargün M, Kara H, Anlar O. Pittsburgh uyku kalitesi indeksinin geçerliği ve güvenirligi. *Turk Psikiyatri Derg.* 1996;7:107-115.

21. Buysse DJ, Reynolds CF, Monk TH, et al. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res.* 1989;28:193-213.
22. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav.* 1983;24:385-396.
23. Eskin M, Harlak H, Demirkıran F, et al. Algılanan stres ölçeğinin Türkçeye uyarlanması: güvenilirlik ve geçerlik analizi. *Yeni Symp.* 2013;51:132-140.
24. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand.* 1983;67:361-370.
25. Aydemir O. Hastane anksiyete ve depresyon ölçeği Türkçe formunun geçerlilik ve güvenilirliği. *Türk Psikiyatri Derg.* 1997;8:187-280.
26. Stern AF. The hospital anxiety and depression scale. *Occup Med (Lond).* 2014;64:393-394.
27. Bayram N, Bilgel N. The prevalence and socio-demographic correlations of depression, anxiety and stress among a group of university students. *Soc Psychiatry Psychiatr Epidemiol.* 2008;43:667-672.
28. Huang, Y., Zhao, N. Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 outbreak in China: a web-based cross-sectional survey. *Psychiatry Res.* 2020;288:112954.
29. Nelson BW, Pettitt A, Flannery JE, et al. Rapid assessment of psychological and epidemiological predictors of COVID-19. *Int J Meth Psych ReS.* 2020;21:169-184.
30. Shevlin M, McBride O, Murphy J, et al. Anxiety, depression, traumatic stress, and COVID-19 related anxiety in the UK general population during the COVID-19 pandemic. *BJPsych Open.* 2020;6:e125.
31. Yuan S, Liao Z, Huang H, et al. Comparison of the indicators of psychological stress in the population of Hubei Province and non-endemic provinces in China during two weeks during the coronavirus disease 2019 (COVID-19) outbreak in February 2020. *Med Sci Monit.* 2020;26:e923767.
32. UNESCO. COVID-19 educational disruption and response. 2020. [Internet]. [Access date 02 June 2020]. Access address: <https://en.unesco.org/covid19/educationrespons>.
33. Altena E, Baglioni C, Espie CA, et al. Dealing with sleep problems during home confinement due to the COVID-19 outbreak: Practical recommendations from a task force of the European CBT-I Academy. *J Sleep Res.* 2020;29:e13052.
34. Marelli S, Castelnuovo A, Somma A, et al. Impact of COVID-19 lockdown on sleep quality in university students and administration staff. *J Neurol.* 2020;11:1-8
35. Kohl 3rd HW, Craig CL, Lambert EV, et al. The pandemic of physical inactivity: global action for public health. *Lancet.* 2012;380:294-305.
36. Savci, S, Ozturk, M, Arikan, H. Üniversite öğrencilerinin fiziksel aktivite düzeyleri. *Türk Kardiyol Dern Ars.* 2006;34:166-172.
37. Huckins J, Hedlund EL, Rogers C, et al. Mental health and behavior during the early phases of the COVID-19 pandemic: A longitudinal mobile smartphone and ecological momentary assessment study in college students. *J Med Internet Res.* 2020;22:e20185.
38. Feng Q, Zhang QL, Du Y, et al. Associations of physical activity, screen time with depression, anxiety and sleep quality among Chinese college freshmen. *PLoS One.* 2014;9:e100914.
39. Fischer R, Karl J, Bortolini T, et al. Rapid review and meta-meta-analysis of self-guided interventions to address anxiety, depression and stress during COVID-19 social distancing. *Front Psychol.* 2020;11:563876.
40. Organization WH. Stay physically active during self-quarantine. 2020. [Internet]. [Access date 02 June 2020]. Access address: <http://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/technical-guidance/stay-physically-active-during-self-quarantine>.