



INVESTIGATION OF THE PHYSICAL ACTIVITY, SLEEP QUALITY, DEPRESSION AND LIFE SATISFACTION OF UNIVERSITY STUDENTS ON COVID-19: A YEAR FOLLOW UP STUDY

Tuğba GÖNEN^{1*}, Elif DİNLER¹, Deniz KOCAMAZ¹, Yavuz YAKUT¹


¹Hasan Kalyoncu University, Faculty of Health Science, Department of Physiotherapy and Rehabilitation, 27010, Gaziantep, Turkey


Abstract: The aim of this study is to investigate physical activity, sleep quality, depression and life satisfaction in university students as a result of long-term follow-up in the COVID-19 process. This is a prospective one year follow-up study with 146 university students (98 female, and 48 male) who agreed to participate in the study voluntarily. The mean age of the students was 21.72±1.89 years. The International Physical Activity Questionnaire, Pittsburgh Sleep Quality Index, Beck Depression Scale, Life Satisfaction Questionnaire was applied to students. Physical activity, sleep quality, depression, and life satisfaction were compared after one year with the same inventories. Physical activity levels showed similarity at the end of a one-year follow-up ($P > 0.05$). It has been found to increase sleep quality ($P < 0.05$). While there was no significant difference between depression levels and life satisfaction at the end of one year ($P > 0.05$). While the time they allocated for themselves decreased with the process, their sitting time increased ($P < 0.05$). The findings from this longitudinal study showed that physical activity levels, depression, and life satisfaction of university students did not change during the one year of social isolation due to COVID-19. However, it was observed that the spent in sleep and sleep quality of the individuals increased in the ongoing process.


Keywords: COVID-19, Physical activity, Sleep quality, Depression, Longitudinal study


*Corresponding author: Hasan Kalyoncu University, Faculty of Health Science, Department of Physiotherapy and Rehabilitation, 27010, Gaziantep, Turkey

E mail: tugba.badat@hku.edu.tr (T. GÖNEN)

Tuğba GÖNEN  <https://orcid.org/0000-0002-0484-0221>

Elif DİNLER  <https://orcid.org/0000-0003-0198-1456>

Deniz KOCAMAZ  <https://orcid.org/0000-0002-0611-7686>

Yavuz YAKUT  <https://orcid.org/0000-0001-9363-0869>

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1. Introduction

COVID-19 and physical activity there are many studies in the literature. Studies demonstrated a change in physical activity, sleep quality, depression, and life satisfaction of university students during the COVID-19 pandemic process (Roma et al., 2020; Gencalp, 2020; Ciddi and Yazgan, 2020). Therefore, it is of paramount importance to monitor how the social isolation relating to COVID-19 has affected physical activity, sleep quality, psychological distress levels, and life satisfaction in the university student population. However, our social and behavioral strategies are closely related to our self-awareness (Diener and Wallbom, 1976).

In a study investigating the level of physical activity in university students during the COVID-19 process, it was found that the level of physical activity decreased and the general tendency to physical inactivity increased accordingly (Karuc et al., 2020). When we looked at another study conducted during the pandemic process, the researchers examined the relationship between the level of physical activity and quality of life in-home quarantine. They emphasized that during the quarantine process, healthy people had a low level of physical

activity and this affected the health-related quality of life, physical function, pain, and general health perception (Tural, 2020). However, no long-term follow-up studies that monitor physical activity and explain its effects were found in the literature.

Previous research has discovered that acute infectious diseases, such as SARS, can induce anxiety, depression, and stress in both survivors and non-infected individuals (Hawryluck et al., 2004). Traumatic events like the COVID-19 outbreak can cause psychological distress and anxiety symptoms, which can affect sleep quality (Brooks et al., 2020). A recent study by the European of Cognitive Behavioural Therapy for Insomnia (CBT-I) Academy on sleep issues during home confinement due to the COVID-19 outbreak based on sleep and insomnia. Cellini et al. looked at improvements in sleep patterns, sense of time, and usage of electronic devices in 1310 young adults (workers and university students) and discovered that digital media use increased in the evenings before bedtime. Furthermore, they discovered that people went to bed and woke up later, spent more time in bed, and had worse sleep quality (Marelli et al., 2021).

The life satisfaction of the individuals was evaluated in



the study aiming to evaluate the health and well-being of the individuals on 369 adult individuals within a month after the pandemic started. The results of the study generally suggested that the lives of the individuals were severely interrupted and the violence of COVID-19, the chronic illness and exercise habits of the individuals in the city where the individuals live affect their life satisfaction (Zhang et al., 2020). Another research on life satisfaction in the elderly found that the youth population had lower well-being and life satisfaction than adults and the elderly. While there is research in the literature on the life satisfaction of young and old people in the COVID-19 process, there is none on the long-term effects of this process (Bidzan-Bluma et al., 2020).

The purposes of our study:

- 1) Investigation of the physical activity, sleep quality, depression, and life satisfaction of university students as a result of long-term follow-up in the COVID-19 process.
- 2) Follow-up of physical and cognitive parameters determined from the eyes of the student in one year.

2. Materials and Methods

2.1. Study Design

This study is a prospective and longitudinal study (one year follow-up) of descriptive-analytic and survey-based study. All participants were properly informed about the study. All measurements were completed on the online platform. The evaluations were administered by authors who are physiotherapists.

2.2. Participants

All participants were students in Hasan Kalyoncu University, Faculty of Health Sciences, and Department of Physiotherapy and Rehabilitation in Gaziantep. This is a one-year longitudinal study of investigation to pandemic process in university students. The first evaluation was conducted between April to July 2020. Participants have applied the same questionnaires in the current study between April to July 2021 as a second evaluation. The questionnaires to be applied to the participants were prepared on the "Google Form". An online questionnaire link was sent to participants via social networks. Participants were eligible for the study if they (a) were from 18 to 30 years of age, and (b) had no previous history of depression. Participants who underwent had a positive diagnosis of COVID-19 and contacted people with COVID-19 were excluded from the study. The risk status of the students was checked by the Life Fits into Home application.

Students were invited to participate in the study in 3 different periods. Students were asked to be included voluntarily in the study. The participants were motivated as they have an important contribution to the development of the pandemic process.

2.3. Evaluation Methods

The demographic characteristics including age, gender, height, weight were recorded. Patients completed

standard and non-standardized instruments. All participants completed standard instruments included physical activity (International Physical Activity Questionnaire-Short Form IPAQ-SF), sleep quality (Pittsburgh Sleep Quality Index-PSQI), depression (Beck Depression Inventory-BDI), and life satisfaction (Satisfaction with Life Scale-SWLS) questionnaires.

The IPAQ-SF has been recommended as a cost-effective method to assess physical activity for the last 7 day's report (Lee et al., 2011). The Turkish version was done by Savcı et al. (2006). The PSQI is a self-rating questionnaire resulting in a global score between 0 and 21 higher scores indicating worse sleep quality (Mollayeva et al., 2016). The Turkish reliability and validity are completed by Agargün et al. (1996). The BDI is a 21-item self-reporting inventory for evaluating depression in normal and psychiatric populations (Jackson Koku, 2016). The Turkish validity and reliability studies of the questionnaire were completed by Hisli (1988). The SWLS is a well-known and well-used instrument of the cognitive-judgmental component of subjective well-being. The coefficients alpha of SWLS has ranged from 0.79 to 0.89 (Lorenzo-Seva et al., 2019). The Turkish version was done by Çivitci (2007).

There were 14 questions asked by the student with the non-standardized instrument. It was used as the guideline for this study designed to collect data on the views about the pandemic process on physiotherapy students. Data were obtained by a questionnaire, prepared by the researchers (they have 5-10-35 years of experience in physiotherapy and rehabilitation) according to the literature. The questionnaire was edited and confirmed by a professional department in terms of terminology and expression. The Likert-type scale, which is used to evaluate students' self-awareness during their daily life activities during the COVID-19 period, consists of 14 questions (1 strongly disagree 5 completely agree) as I completely agree, agree, have no idea, disagree, and strongly disagree. It was optional for students to write their identity for the reliability of the feedback (Dinler et al., 2020).

2.4. Statistical Analysis

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS Version 22, Armonk, NY: IBM Corp.). The variables were investigated by visual (histograms, probability plots) and analytical methods (Shapiro-Wilk test) to determine whether they were normally distributed. Descriptive statistics were calculated for all variables, and the data were shown as mean \pm standard deviation ($X \pm SD$), median (minimum-maximum), frequencies, and percentages. Demographic data of students were compared using an independent sample test and expressed a 95% confidence interval (CI). Since data (depression, physical activity, and sleep quality) were analyzed Wilcoxon test. In case of a significant difference, pairwise comparisons were carried out using the post-hoc Wilcoxon test. The significance level was accepted $P < 0.05$.

3. Results

A total of 200 (133 females, 67 male) students voluntarily participated in the study in 2020. This longitudinal study (one-year follow-up) includes 146 university students (98 females and 48 males); the mean age was 22.49 ± 1.88 years and the mean Body Mass Index (BMI) was 22.91 ± 3.71 kg/m². 96 (65.8 %) of the students in the participant did not smoke. Students were called into the study in 3 different periods. In the first call, 92 (63 %) students, in the second call 36 (25 %) students, and in the last call 18 (12 %) students completed the online form. The consolidated standards of reporting trials table depicts student flow throughout the study (Table 1).

According to the result of the Likert-type scale, which evaluated the views of the students during the pandemic process; the answers to the Q3 and Q8 were found to be statistically significant. The answers are given by the

students to the Q3 "I started taking more time for myself during the pandemic." (3.60 ± 1.11) and the Q8 "I spent less time sitting during the pandemic" (2.15 ± 1.25) was found statistically significant ($P < 0.05$). There was no difference between the other questions about the students' self-awareness ($P > 0.05$) (Table 2).

Table 1. Consolidated standards of reporting trials

1. Assessed for eligibility	n=200
2. Enrollment	n=37 does not return the calls n=19 missing data
3. Lost The follow-up	n=8
4. One year follow up	n=146

Table 2. The questionnaire items and the student's results about pandemic process

Questions	Before		After		WSRT	
	Min-Max	X±SD	X±SD	z	p	
Q1-My sleep pattern was disturbed during the pandemic.	1-5	3.86±1.20	3.84±1.24	-0.129	0.879	
Q2- I spent more time sitting during the pandemic.	1-5	4.43±0.91	4.39±0.96	-0.347	0.729	
Q3-I started taking more time for myself during the pandemic.	1-5	3.83±0.96	3.60±1.11	-2.049	0.040*	
Q4-I began spending more time with my loved ones during the pandemic.	1-5	3.82±1.13	3.65±1.18	-1.432	0.152	
Q5- I learned new things during the pandemic.	1-5	3.60±1.01	3.62±1.15	-0.163	0.871	
Q6-My physical activity level increased during the pandemic.	1-5	2.38±1.24	2.61±1.23	-1.655	0.098	
Q7- The time I spent doing sports increased during the pandemic.	1-5	2.59±1.32	2.68±1.26	-0.715	0.475	
Q8- I spent less time sitting during the pandemic.	1-5	1.79±1.01	2.15±1.25	-2.810	0.005*	
Q9- I encouraged my family to actively participate in home exercises during the pandemic.	1-5	2.77±1.35	2.82±1.22	-0.157	0.875	
Q10- I enjoyed the time doing exercises with my family at home.	1-5	2.90±1.43	3.12±1.40	-1.513	0.130	
Q11- My parents were enthusiastic about doing home exercises during the pandemic.	1-5	2.68±1.33	2.84±1.35	-1.308	0.191	
Q12- I encouraged my parents to do breathing exercises at home during the pandemic	1-5	2.73±1.44	2.77±1.40	-0.153	0.878	
Q13-I had my parents to do relaxation exercises during the pandemic.	1-5	2.71±1.38	2.87±1.34	-1.121	0.262	
Q14- I had my parents to do aerobic exercise (e.g. dancing, step) at home during the pandemic.	1-5	2.56±1.47	2.75±1.30	-1.325	0.185	

WSRT= Wilcoxon signed rank test, *P < 0.05

According to the results of our longitudinal study; the physical activity (International Physical Activity Questionnaire-IPAQ) levels of the students were similar at the end of one year ($P > 0.05$). Considering the sleep quality (Pittsburg Sleep Quality Index-PSQI), it was determined that there was a significant increase at the end of the follow-up period ($P < 0.05$). Although the depression (Beck Depression Inventory-BDI) level of the

students was similar to the first data ($P > 0.05$); Results were found to decrease in 37 people, increase in 46 people, and similar results in 63 people. It was observed that the student's life satisfaction (Satisfaction with Life Scale- SWLS) was high during the pandemic and the results were similar at the end of one year ($P > 0.05$), (Table 3 and Table 4).

Table 3. The physical activity, sleep quality, depression and life satisfaction results of students.

Scales	Before	After	Wilcoxon signed rank test	
	X±SD	X±SD	z	p
IPAQ Total	1561.79±2096.67	1565.15±1264.88	-1.270	0.204
PSQI Total	7.94±3.48	6.82±3.33	-3.002	0.003*
BDI Total	15.47±10.66	16.16±10.48	-1.021	0.307
SWLS Total	25.42±6.87	24.96±7.4	-0.573	0.567

* $P < 0.005$, IPAQ= international physical activity questionnaire, PSQI: Pittsburgh sleep quality index, BDI: Beck depression inventory, SWLS: satisfaction with life scale.

Table 4. Depression severity outcomes of students according to BDI.

BDI (severity)	Before		After	
	n	%	n	%
Minimal	48	32.9	45	30.8
Mild	38	26	40	27.4
Moderate	46	31.5	43	29.5
Severe	14	9.6	18	12.3
Total	146	100	146	100

4. Discussion

The study is a unique longitudinal study aiming to examine the level of physical activity, sleep quality, depression severity, and life satisfaction of university students in the one-year follow-up of the ongoing pandemic process. Looking at the results of the study; the level of physical activity, the severity of depression, and life satisfaction were found to be similar. In addition, it is among the results that sleep quality increases. At the end of 1 year, it was observed that the time students allocated for themselves decreased and the sitting time increased. COVID-19 pandemic, which has affected the whole world, has affected university students significantly due to isolation periods, decreased social communication, and changes in the education system. Even if various evaluation studies have been carried out in university students since the beginning of the pandemic period, there are few long-term follow-up

studies because the process is new.

Although there are various investigate studies conducted on university students before, the aim of this study is to a result of long-term follow-up during the COVID-19 process.

Our study aimed to investigate awareness, the physical activity level, sleep quality, depression severity, and life satisfaction of university students as a result of 1-year follow-up in the COVID-19 process. In addition, the change in physical and cognitive parameters over 1 year was observed.

Since the pandemic and the new normalization process, which has an impact all over the world, has not been experienced before, there is no measurement tool for the evaluation of this period. Our study makes a significant contribution to the literature with this aspect. With the semi-structured scale developed, university students' level of self-awareness about physical activity level and sleep quality was revealed.

Studies on coping techniques with COVID-19 highlight the importance of home exercises. World Health Organization (WHO) recommends at least 150 minutes of exercise a week, preferably at a moderate- and high-intensity (Ferreira et al., 2018; WHO, 2010).

In a 2-month follow-up study conducted during the pandemic period, it revealed that the physical activity level of individuals decreased with restrictions (Martínez-de-Quel et al., 2021). Again, in a 10-day follow-up study on the lifestyle of young adults during the pandemic period, physical activity levels were found to decrease (Zheng et al., 2021). In our study, however, the level of physical activity was similar as a result of 1-year follow-up. The reason for this may be the determination of various normalization steps within 1 year and the exercise awareness of the individuals participating in the study due to being physiotherapy and rehabilitation students. Given the results and the importance of physical activity, a personalized exercise program can be created by physiotherapists, and individuals can learn their exercises and continue under the supervision of the physiotherapist. We believe that this is very important to maintain public health.

In a 1-month follow-up study evaluating the sleep quality of mothers and children in the literature, a significant decrease in sleep quality was found in mothers and children (Martínez-de-Quel et al., 2021). According to preliminary data from another ongoing study, individuals' sleep quality was compared in lockdown and post-lockdown processes during the pandemic period. Individuals' sleep latency after lockdown decreased sleep efficiency and the use of medical support for sleep transition. Sleep quality has improved (Alfonsi et al., 2021). In our study, it was also observed that the quality of sleep of individuals increased during long follow-up. This may be due to the reduction of panic and anxiety at the beginning of the pandemic in the process, getting used to the new regulations.

In a study conducted in China at the beginning of the pandemic, the depression and anxiety of university students were evaluated before and after the 2-week isolation due to the pandemic. As a result, it was found that there was an increase in the depression and anxiety levels of the students after the isolation (Li et al., 2020). In our 1-year follow-up study, no significant change was observed in the depression levels of the students compared to 1 year ago. But depression decreased in 37 of the people involved in the study, increased in 46, and did not change in 63 people. This distribution suggested that individuals were affected by the process differently. At the same time, some of the participating students have graduated and some are preparing for graduation. In this case, it may have affected the students in terms of economic anxiety and business life.

Many studies conducted during the COVID-19 outbreak have shown that exercise also increases life satisfaction (Zhang et al., 2020). It has been demonstrated that increased exercise time during the day increases life

satisfaction (Zhang et al., 2020). In our study, when the exercise patterns, exercise awareness, exercise levels, and life satisfaction of the students were examined, it was seen that life satisfaction increased as they devoted more time to exercise. Once again, this indicates that long-term adherence to personalized exercise programs is important these days when there are various restrictions due to COVID-19. No change in life satisfaction was observed as a result of 1-year follow-up. This is consistent with the fact that the level of depression, one of the factors affecting life satisfaction, did not change.

In the studies that included the students, questionnaires that can be scored with a Likert scale are frequently preferred (Croasmun and Ostrom, 2011). In our study, the effects of the pandemic process were evaluated with the semi-structure 5-Likert scale with non-standard instruments.

The awareness survey found that the students did not show any significant change in the other questions except Q3 and Q8 during the follow-up period. In addition, Q3 (during the pandemic, I began to devote more time to myself) increased. It found that students spare more time for themselves in this period. This may be due to the increased time spent at home.

In Q8, which asked about the sitting time of students, a change was observed as a result of follow-up. According to the results of students 1 year ago, the sitting time decreased. This is also in line with the increase in the time allocated to it taken in Q3. This may be due to increased normalization in this process.

In our study, it was found that as a result of 1-year follow-up, students' physical activity, depression, and life satisfaction did not change, but their sleep quality increased. It found that students devote more time to themselves and their sitting time decreases.

The individual exercise programs support increased self-awareness in students. Individual exercise programs will be especially important social isolation continues and, on the days, when students continue their education by distance education/online.

In addition to all these, the effects of the pandemic are decreasing thanks to the increase in vaccination all over the world. We think that there will be more improvement in the parameters we are investigating due to the pandemic in a longer period. Also, this process reminded people once again of the importance of health and physical activity. In line with this, individuals need to make exercise programs prepared by a physiotherapist a habit to protect and maintain health.

The main limitation of the study is, the unique source of university students is dependent on only one department.

5. Conclusion

This longitudinal study indicates that free time at the home of students was increased in the lockdown period due to COVID-19. However, they stated that they did not

spend quality time. While the time spent in sleep and sleep quality increased, the parameters of physical activity, depression, and life satisfaction did not change at the end of one year. It is recommended to increase the physical activity level of young individuals and to improve the conditions that predispose them to depression, together with ensuring social development and healthy aging. We think that supporting the young population with individual exercise programs will reduce the negative effects of the COVID-19 pandemia.

The findings of the current study will hopefully contribute to the literature and improvement of public health in a time of pandemic in which individuals spend longer time at home, go through a multitude of emotional changes, the education model changed (e-learning, online and distance education) and experience reduced physical activity.

Author Contributions

T.G.: Literature search, design and writing study E.D.: writing study and data collection. D.K.: Writing Study and critical review. Y.Y.: Statistical analysis.

Conflict of Interest

All authors have no conflicts of interest concerning the data collected and procedures used within this study. Authors declare that they have no sponsor in the study design, collection, analysis, interpretation of data, writing of the manuscript, and decision to submit the manuscript for publication.

Ethical Approval/Informed Consent

Ethics approval was obtained from the Local Ethical Committee (date-decision no: 24/04/2020-2020/20). The study was conducted by the principles of the Declaration of Helsinki.

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