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Academic and Emotional Implications of COVID-19 on University Students: Changes in Three Periods

KOVİD-19'un Üniversite Öğrencileri Üzerindeki Akademik ve Duygusal Etkileri: Üç Zamandaki Değişimler

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Özet

Bu çalışmanın amacı, KOVİD-19 salgınının Türkiye'deki üniversite öğrencileri üzerindeki uzun vadeli akademik ve duygusal etkilerini iki yıllık zaman dilimi içerisinde incelemektir. Araştırma ardışık bağımsız örneklemler deseni kullanılarak yürütülmüştür. Kolay örnekleme yöntemi ile seçilen katılımcılardan ile Mayıs 2020 ile Mayıs 2022 arasında 12 ay arayla üç kez veri toplanmıştır. Araştırmaya 1. Zamanda (Z1) toplam 375 öğrenci, 2. Zamanda (Z2) 243 öğrenci ve 3. Zamanda (Z3) 454 öğrenci katılmıştır. Veri toplamak için yedi bölümden ve 77 sorudan oluşan KOVİD-19 Uluslararası Üniversite Öğrencileri İyilik Hali Anketi kullanılmıştır. Sonuçlar Z2'deki KOVİD-19 endişesinin, Z1 ve Z3'teki KOVİD-19 endişesinden anlamlı olarak daha yüksek olduğunu göstermiş, ancak Z1 ile Z3 arasında anlamlı bir farklılık bulunmamıştır. Ayrıca Z1'deki akademik stres düzeyinin, Z2 ve Z3'ten ve Z2'deki akademik stres düzeyinin Z3'ten önemli ölçüde daha yüksek olduğu görülmüştür. Katılımcıların psikolojik iyi oluş puanları ise Z3'te Z1 ve Z2'den anlamlı olarak daha yüksek bulunmuş, ancak Z1 ve Z2 puanları anlamlı bir farklılık göstermemiştir. Akademik memnuniyet ortalamanın biraz üzerinde kalmış ve zaman içinde herhangi bir değişiklik göstermemiştir. KOVİD-19'un üniversite öğrencileri üzerinde uzun süreli önemli etkileri olduğunu gösteren bu bulguların, sağlık iletişimi ve eğitim uygulamaları açısından yol gösterici olacağı düşünülmektedir.

Anahtar Sözcükler: Akademik Stres, Akademik Memnuniyet, KOVİD-19 Endişesi, Psikolojik Iyilik Hali, Üniversite Öğrencileri

Abstract

The aim of this study is to investigate the long-term academic and emotional effects of the COVID-19 pandemic on university students in Türkiye over a two-year period. A successive independent samples study design was used. Data were from the participants who were selected through convenience sampling at three times 12 months apart between May 2020 and May 2022. 375 students participated at Time 1, 243 students at Time 2, and 454 students at Time 3. COVID-19 International University Students Well-Being Study survey, consisting of seven domains and 77 questions, was used to collect data. The results showed that the COVID-19 worry at T2 was significantly higher than the COVID-19 worry at T1 and T3, but no significant difference was found between T1 and T3. In addition, the academic stress level at T1 was significantly higher than T2 and T3, and the academic stress level at T2 was significantly higher than T3. Psychological well-being scores of the participants were found to be significantly higher at T3 than T1 and T2, but T1 and T2 scores did not show a significant difference. Academic satisfaction remained slightly above the average and showed no change in time. These results of this study, showing the significant long-term effects of the pandemic on university students, are expected to guide social politics on health and education practices.

Keywords: Academic Stress, Academic Satisfaction, COVID-19 Worry, Psychological Well-Being, University Students

COVID-19 emerged in Wuhan, China in the last days of 2019 and spread widely all over the world including Türkiye. According to World Health Organization Situation Report (WHO, 2020) on May 23rd, 2020, the number of cases in the first five months of the pandemic was over five million and the mortality was over three hundred thousand. After one year, at the end of May 2021, about 170 million infected cases were reported with over three and a half million deaths because of the virus all around the world (WHO, 2021). However, the next year (World Health Organization Situation Report, 25 May 2022) over 522 million confirmed cases and over six million deaths have been reported worldwide (WHO, 2022). At that point, parallel to the increase in those numbers, promising developments such as release of different vaccinations were announced, and people started to get vaccinated.

COVID-19 Pandemic in Türkiye

In May 2020, the number of reported cases was around one hundred and fifty thousand (average 1,410 daily cases) and the mortality numbers were around four thousand (average 44 daily deaths). In May 2021, confirmed cases increased over five million (average 13,832 daily cases) and number

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Yükseköğretim Dergisi / TÜBA Higher Education Research/Review (TÜBA-HER), 13(2), 179–189. © 2023 TÜBA
Geliş tarihi / Received: Ocak / January 05, 2023; **Kabul tarihi / Accepted:** Haziran / June 28, 2023
Bu makalenin atıf künyesi / How to cite this article: Ergül Topçu, A., Altınoğlu Dikmeer, İ., Karaaslan, C. & Koçak Çapkın, M. (2023). Academic and Emotional Implications of COVID-19 on University Students: Changes in Three Waves. *Yükseköğretim Dergisi, 13*(2), 179–189. doi: 10.53478/yuksekogretim.1229921

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of deaths up to fifty thousand (average 238 daily deaths). In May 2022, total number of cases were reported as around fifteen million (average 1,311 daily cases) and total number of deaths around hundred thousand with an average number of 6 deaths daily in that month (Turkish Republic Ministry of Health Statistics, 2022).

Three weeks after the first infected COVID-19 case was detected on March 11th, 2020, a complete lockdown was announced in the entire country, hence universities were closed, and students had to leave the campus environment. They continued with online education and completed the spring semester of 2019-2020 academic year with online exams. As of June 2020, lockdown was over and restricted social life was put in action with precautions including mandatory mask wearing and an obligation to present official proof of COVID free QR code upon entry to shopping malls, airports, government buildings, etc.

In the 2020-2021 academic year, universities continued online education in both Fall and Spring semesters therefore the students remained in their current locations, mostly at family homes. Meantime, in January 2021 healthcare providers were the first group to be vaccinated against coronavirus. Starting from elderly and patients with chronic diseases, public vaccination was administered, and it was June 2021 when university students were eligible for vaccination. With the effects of public vaccination, in July 2021, restrictions on social life were removed (e.g., restaurants, cinemas were opened). The 2021-2022 academic year started with face-to-face education with 40% of classes being online. Finally, in the middle of May 2022, COVID-19 pandemic measures were terminated (except for the use of masks in transportation and health institutions) and the normalization process started.

COVID-19's Implications on University Students

During the pandemic period as a global health threat, besides the physical harm, many people suffered from the social, economic, and psychological negative effects of the Coronavirus (Long et al., 2022; Pak et al., 2020; Wu et al., 2021). University students are amongst the most affected groups in terms of mental health, remote education, academic success, uncertainty in their social and academic lives, economic challenges, and risks for future career opportunities etc. (Alghamdi, 2021; Almomani et al., 2021; Aristovnik et al., 2020; Moawad, 2020; Sundarasen et al., 2020). Even though the children and adolescents were believed to be safe from the virus, at the very early stages of the pandemic (e.g., Bialek et al., 2020; Bulut & Kato, 2020), the course of the pandemic showed quite the opposite. Turkish Republic Ministry of Health Reports (2020a) indicated the ratio of cases between ages 15-24 to be the 14% of the total cases between June and October 2020. In addition, COVID-19 infection rates have increased significantly worldwide due to increased contact as a result of switching to face-to-face or hybrid education (e.g., Andersen et al., 2020; Leeman et al., 2022).

Immediate short-term academic and emotional effects of the pandemic is very well documented in the literature for university students (e.g., Debowska et al., 2020; Hassan et al., 2021; Moawad, 2020; Savage et al., 2020; Tasso et al., 2020; Wang et al., 2020). After about three years, long term effects are not clear to our knowledge. Within this context, we aimed to investigate changes in academic and emotional implications of COVID-19 in two-year period for university students in three waves.

Academic Implications Related to COVID-19

During the pandemic, in order to control the spread of the virus, universities started online education (also known as remote education, virtual education or distance education) immediately all around the World. This rapid and unexpected transition from traditional classroom type of education to online education affected not only the students but academicians and other staff as well. The university students had to leave the campus life and move back to family homes and follow their courses online. The difficulties caused by this rapid transition are reported as one of the main risk factors for the perceived stress among university students (Wang et al., 2020). Extended academic workload due to online education and being apart from social contacts are related to high levels of perceived stress (Yang et al., 2021). Moawad (2020) stated that the online exams, the type and the amount of the assignments, course length, the unsuitability of home environment for education, lack of technology or internet at family homes to follow online classes, uncertainty about the fairness of the grading system at online education and worries about not being able to comprehend online classes were among the academic stressors that were reported by the university students. In a comprehensive study conducted by Karadağ et al. (2021), distance education capacities of universities in Türkiye were found to be low and insufficient in terms of human resources, hardware, software and assessment infrastructures and capacities, content production capacities, and budgets. In addition, students stated that distance education was not as effective as formal education, the information learned through distance education was quickly forgotten. They also had problems in communicating to the instructors and in reaching the necessary materials for applied courses, had difficulties in performing some skills required by the course, and stated that they experienced technical problems during the training and felt that they were left behind in education (Altun Ekiz, 2020; Kahraman, 2020; Keskin & Özer Kaya, 2020).

The self-efficacy and cognitive engagement that the university students felt, decreased during the pandemic compared to pre-pandemic life (Aguilera-Hermida, 2020). Academic negative perceptions about online education (such as increased perceptions of workload and low technical support) effected course satisfaction of university students negatively (Hassan et al., 2021). On the other hand,

positive academic satisfaction perceived by the students is found to be a protective factor for psychological well-being among university students (Ergül-Topçu et al., 2021). The students who experienced high academic stress and low academic satisfaction showed more depression symptoms and reported more loneliness (Solomou et al., 2021).

Emotional Implications Related to COVID-19

Upon the shift to online education in the 2020 Spring semester, university students reported more anxiety after the pandemic, related to online education, extended academic overload and uncertainties in the new academic life (Tasso et al., 2020). Early studies showed that anxiety levels of university students increased due to their problems with online classes, concerns about academic performance and future jobs (Arënliu et al., 2021; Plakhotnik et al., 2021; Son et al., 2020). Students' satisfaction with online learning showed significant relations with experiencing depression, anxiety and stress symptoms (Fawaz & Samaha, 2021), in other words, having low grades led to an increase in depression symptoms of students (Nakhostin-Ansari et al., 2020).

The depressive symptoms of the university students also seem to be related to the anxiety for COVID-19 disease. Taylor et al. (2020) stated that, anxiety related to COVID-19 includes fear of getting infected, economic consequences of pandemic and long-term lockdown, fear of strangers who might be virus carriers, compulsive checking and reassurance behaviors and post-traumatic stress symptoms (e.g., nightmares, intrusive thoughts). Having any relatives or friends who are infected is found to be a risk factor for the increased worry among university students (Akman et al., 2020; Cao et al., 2020). Contact with an already infected person, having any family member or close friend who is sick with the coronavirus, any stranger in the same environment showing symptoms such as high fever, cough etc., people talking about how contagious and dangerous the disease is, and cancellation of the planned activities (e.g., family vacations) due to the pandemic were reported as the stress factors related to COVID-19 (Li, X et al., 2020). Fear of being infected by coronavirus affected the mental well-being of students negatively (Ergül-Topçu et al., 2021; Tang et al., 2020).

The Aim of the Study

Early studies on the effects of COVID-19 pandemic on the university students highlighted negative outcomes in terms of academic and emotional domains. Longitudinal studies showed an increase in perceived stress and sedentary behaviors (Savage et al., 2020), negative effects (Li, H. Y et al., 2020) as well as depression and anxiety symptoms (Debowska et. al., 2020; Zimmermann et al., 2020), and decrease in the amount and quality of sleep of university students due to the news about high COVID-19 mortality rates (Zhang et al., 2020). Study results on Turkish university population in the early phases of the pandemic showed that the worry about COVID-19 and academic stress had a negative impact on the psychological well-being (Ergül-Topçu et al., 2021). Other studies showed that perceived stress and depressive symptoms (Bayar et al., 2021) as well as the intolerance to uncertainty and the fears about COVID-19 (Duman, 2020) were positively related, while perceived loneliness was negatively related, with psychological resiliency (Çetin & Anuk, 2020). However, the long-term academic and emotional effects of the pandemic on university students in Türkiye are unknown to our knowledge. It is important to highlight the long-term effects of COVID-19 on university students to initiate intervention programs in health and education services during the later phases of the pandemic or similar crises in the future. The findings obtained from this study will provide an opportunity to determine how the academic stress and academic satisfaction levels of university students and their well-being change depending on the course of the infection and related regulations over time and will guide in case of a pandemic similar to the COVID-19. In that sense, this study aims to investigate the change in the academic and emotional effects of COVID-19 pandemic on university students in a two-years period in three waves, between May 2020 and May 2022. In the study, students' perceived worries about COVID-19 and psychological well-being are studied as emotional factors in addition to academic stress and satisfaction as academic factors. Relations between perceived worries of students about COVID-19, their psychological well-being, their academic stress and satisfaction were also investigated.

Method

Participants and Procedure

The universe of this research consists of public universities in central Anatolia. The research was carried out in different colleges and faculties of a university in central Anatolia. The result of the power analysis conducted on G*Power v.3.1.9.7 with a medium-sized effect estimation showed that 252 participants would be required for one-way ANOVA (Faul et al., 2007). The participants were reached with the convenience sampling method, which is the most common type of non-probability sampling approach (Shaughnessy et al., 2000). 375 students (294 females and 81 males) participated in the study at T1 (M_{age} = 21.60, SD = 2.55, range = 18-45 years). 243 students (174 females and 69 males) participated in the study at T2 (M_{age} = 22.85, SD = 3.64, range = 18-42 years). 454 students (294 females and 160 males) participated in the study at T3 (M_{age} = 22.31, SD = 3.03, range = 18-44 years).

Written permission and non-invasive clinical research ethics committee approval were obtained from the institution where the study was conducted (Çankırı Karatekin University, approval no. 52133317-605-E.9167).

Table 1. Demographic characteristics of the participants.

		Time 1 (May 2020)		Time 2 (May 2021)		Time 3 (May 2022)	
Variables	**Category**	**n**	**(%)**	**n**	**(%)**	**n**	**(%)**
Gender	Female	294	78.4	174	71.6	294	64.8
	Male	81	21.6	69	28.4	160	35.2
COVID-19 infection	Yes, a lab confirmed	0	0.0	34	14.0	90	19.7
	Yes, a health professional confirmed	1.0	0.3	23	9.5	42	9.2
	Yes, but not confirmed	10	2.7	21	8.6	39	8.6
	No	364	97.1	165	67.9	285	62.5
Place of Residence before and during COVID-19*	With parents	120 *340*	32 *90.7*	88 *198*	36.2 *81.5*	240 *95*	52.9 *20.8*
	Students' hall	173 *7*	46.1 *1.9*	99 *4*	40.7 *1.6*	151 *270*	33.3 *59.2*
	Accommodation with others	44 *9*	11.7 *2.4*	30 *8*	12.3 *3.3*	31 *42*	6.8 *9.2*
	Accommodation alone	14 *7*	3.7 *1.9*	9 *13*	3.7 *5.3*	8 *20*	1.8 *4.4*
	Other	24 *12*	6.4 *3.2*	17 *20*	7.0 *8.2*	24 *29*	5.3 *6.4*
To what degree do you adhere to COVID-19 measures currently implemented by the government?	1= totally not 10= very strictly	M=8.84 SD=1.84		M=8.18 SD=2.44		M= 5.03 SD=3.16	

*Place of Residence during COVID-19 shown in italics.

In all waves, all participants obtained informed consent before the study. Students from all levels of the university who were willing to participate and signed the informed consent form, constituted the study sample. The questionnaire was sent via the online message system of the Department of Student Affairs to independent samples from the same university 3 times.

Data for the first period (T1) was collected in the 2019-2020 academic year between 11- 23rd of May 2020, T2 data was collected in the 2020-2021 academic year between May 17-28th, 2021, whereas T3 data was collected in the 2021-2022 academic year between May 25-30th, 2022. T2 data was collected from sophomores and above and the latest data (T3) was collected from the 3rd year and above students as the first two-year students were high school students and had different social and academic conditions when the pandemic started. Information about the descriptive characteristics of the study participants was demonstrated in Table 1.

Data Collection Tools

The survey used in this study was prepared specifically for the COVID-19 outbreak by the executive team of the COVID-19 International University Students Well-Being Study-C19-ISWS. The questionnaire is published with the study protocol (Van de Velde et al., 2021). The survey was translated into Turkish by two researchers who were in the Turkish research team in the original C19-ISWS and feedback from the other team members (including the first two authors of this study) finalized the survey. Each team used the survey in studies in line with their research focus (Erden et al., 2022; Erden et al., 2023; Yorguner et al., 2021). The survey consists of seven domains including (1) sociodemographic information, (2) study-related information, (3) before and during the COVID-19 outbreak, (4) COVID-19 diagnosis, symptoms and perceived worries, (5) stressors, informal support, and mental well-being, (6) student-specific questions and concerns, and (7) COVID-19 knowledge and information and 77 (67 normal and 10 filters) questions. In this study we only used sociodemographic questions and three scales within the survey (COVID-19 Perceived Worry Scale, Psychological Well-being Scale, and University Life Scale). T1 data proved the reliability and validity of those scales.

Sociodemographic Questions. The sociodemographic questions used in the research consisted of the students' gender, COVID-19 infections, place of residence during COVID-19, and compliance with the measures taken by the government.

COVID-19 Perceived Worry Scale. Participants rated their COVID-19 worries on a 10-point Likert type scale (1 = not at all worried and 10 = very worried) with 6 items (e.g., How worried are you to get infected?). Higher scores indicate higher levels of worry. In this study, Exploratory Factor Analysis (EFA) of the COVID-19 Perceived Worry Scale pointed to a single factor that explained the 58.54% of the total variance (eigenvalue = 3.51) and had a Cronbach alpha internal consistency level of .86.

Psychological Well-being Scale. The psychological well-being level of the participants was evaluated by a 4 -point Likert type self-report scale (1 = never or almost never and 4 = always or almost always) with 14 items (e.g., During the past week how much did you feel frustrated in general). After 11 negative statements in the scale were reverse coded, a total score was obtained. Higher scores indicate higher levels of psychological well-being. In this study, EFA of the Psychological Well-being Scale pointed to a single factor that explained the 43.66% of the variance (eigenvalue = 6.11) and had a Cronbach alpha level of .90.

University Life Scale. University Life Scale has eight 5-point Likert type self-report items (1 = strongly agree and 5 = strongly disagree). Higher scores of factors indicate higher levels of academic stress and academic satisfaction. In this study, EFA of University Life Scale provided two factors that explained 55% of the total variance. The first factor (labeled as academic stress) including 5 items explained the 30.24% of the variance (eigenvalue = 2.42) and internal consistency Cronbach alpha coefficient was found .74 (e.g., "The change in teaching methods resulting from the COVID-19 outbreak has caused me significant stress"). The second factor (labeled as academic satisfaction) including 3 items explained the 24.76% of the variance (eigenvalue = 1.98) and internal consistency Cronbach alpha coefficient was found .68 (e.g., "I am satisfied with the way my university/college has implemented protective measures concerning the COVID-19 outbreak").

Research Design and Statistical Analyses

A successive independent samples study design was used with a convenience sampling method (Shaughnessy et al., 2000). Data from three time periods were compared to investigate the effects of COVID-19 on the academic and emotional aspects of university students. The data were collected during the same time period of the year (end of May) in all three waves to eliminate the confounding effect of Spring or Fall semester and to be sure it was not the exam week in order to control the stress related to the exams. To examine the changes in COVID-19 worry, academic stress, academic satisfaction, and psychological well-being in three time periods (T1, T2 and T3), the data were analyzed using one-way ANOVA. The relations among the variables were analyzed via Pearson's correlation analysis. IBM SPSS Statistics Version 23.0 was used for all analyses.

Results

Descriptive statistics showed that the ratio of the students who lived with their parents before the pandemic was 32% at T1, 36,2% at T2 and 52,9% at T3 where the rates has changed during the pandemic in to 90,7%, 85,1% and 20,8% respectively. The ratio of the students who stayed in the dormitory before the pandemic was 46,1% at T1, 40,7% at T2 and 33,3% at T3. The numbers showed a dramatic fall during pandemic at T1 (1,9%) and T2 (1,6%) where the students returned to their dormitories at T3 (33,3%). At the time of data collection at T1, none of the students were infected by coronavirus, where at T2 14% and at T3 19,7% reported lab confirmed infection.

Table 2. Comparison of the COVID-19 worry, academic stress, academic satisfaction, and psychological well-being by Time.

Variables	Time	M	SD	F(2, 945)	η2	Median	Skewness	Kurtosis
COVID-19 worry	Time 1	29.43	15.51	24.94*	.050	30.00	-.20	-.78
	Time 2	36.95	14.07			39.00	-.63	-.05
	Time 3	28.11	14.95			28.00	.02	-.82
Academic Stress	Time 1	19.50	3.94	25.58*	.046	20.00	-.60	-.01
	Time 2	18.24	4.44			18.00	-.15	-.94
	Time 3	17.32	4.65			17.00	-.09	-.51
Academic Satisfaction	Time 1	10.36	2.65	.44	.001	11.00	-.38	-.06
	Time 2	10.32	3.06			11.00	-.22	-.66
	Time 3	10.51	2.94			11.00	-.30	-.21
Psychological well-being	Time 1	33.83	8.08	24.49*	.044	34.00	-.08	-.43
	Time 2	33.83	9.39			36.00	-.27	-.54
	Time 3	37.42	7.85			39.00	-.45	-.12

*p < .001

The average scores of the participants to comply with the COVID-19 measures implemented by the government were 8.84 (SD = 1.81), 8.22 (SD = 2.24) and 5.03 (SD = 3.16) for T1, T2 and T3 respectively.

Since the variances of the groups compared were not homogeneous, Tamhane's T2 multiple comparison results were reported. The fact that the median and arithmetic mean values are close to each other, and the skewness and kurtosis values are within the limits of ±1.5 indicate that the distribution of the data is normal (Tabachnick & Fidell, 2013). The values of normal distribution and one-way ANOVA results to examine the changes in COVID-19 worry, academic stress, academic satisfaction, and psychological well-being in three time periods (T1, T2 and T3) are displayed in Table 2.

Multiple Comparisons results indicated a significant higher level of COVID-19 worry at T2 (M = 36.95, SD = 14.07) than T1 (M = 29.43, SD = 15.51) and T3 (M = 28.11, SD = 14.95) and a size effect close to medium (F (2, 945) = 24.94, p = 000, η^2 = .050). No significant difference between T1 and T3 was detected. The academic stress levels of the students changed overtime with an effect size close to medium (F (2, 945) = 25.58, p = .000, η^2 = .046), but no significant change was observed for academic satisfaction (F (2, 945) = .44, p = .646, η^2 = .001). The academic stress level at T1 (M = 19.50, SD = 3.94) was significantly higher than at T2 (M = 18.24, SD = 4.44) and T3 (M = 17.32, SD = 4.65) and at T2 (M = 18.24, SD = 4.44) than at T3 (M = 17.32, SD = 4.65). Psychological well-being scores of the participants also changed overtime with an effect size close to medium F (2, 945) = 24.49, p = .000, η^2 = .044). The scores were higher at T3 (M = 37.42, SD = 7.85) than T1 (M = 33.83, SD = 8.08) and T2 (M = 33.83, SD = 9.39), where T1 and T2 scores did not differ significantly. The figures of the mean values mentioned above are as follows (Figures 1-4):

Figure 1. Perceived COVID-19 Worry by Time.

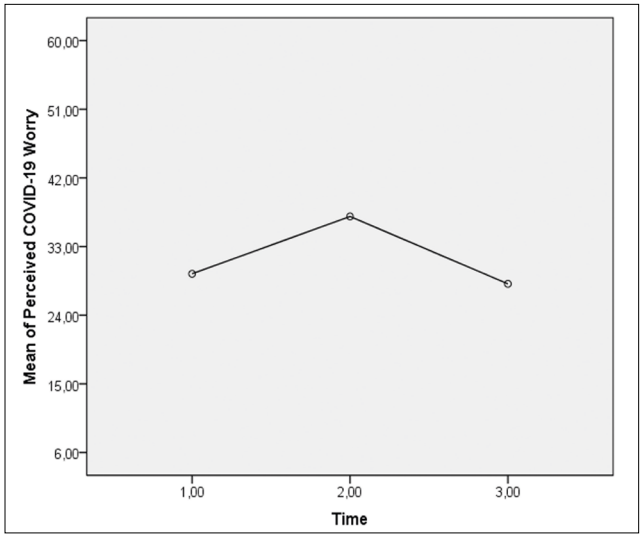

Figure 2. Academic Stress by Time.

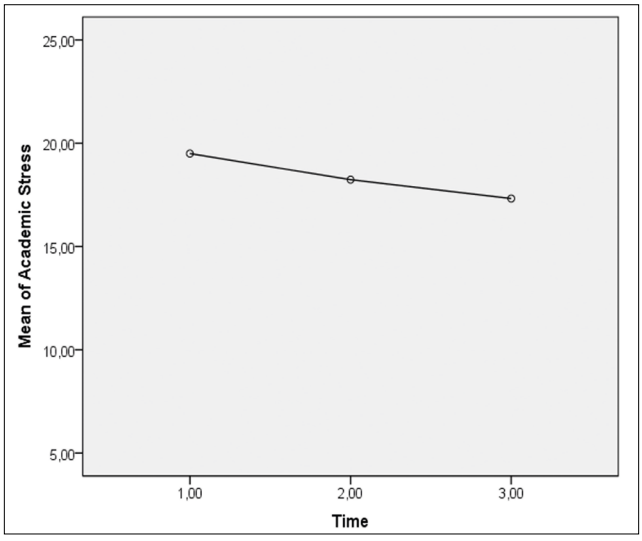

Figure 3. Academic Satisfaction by Time.

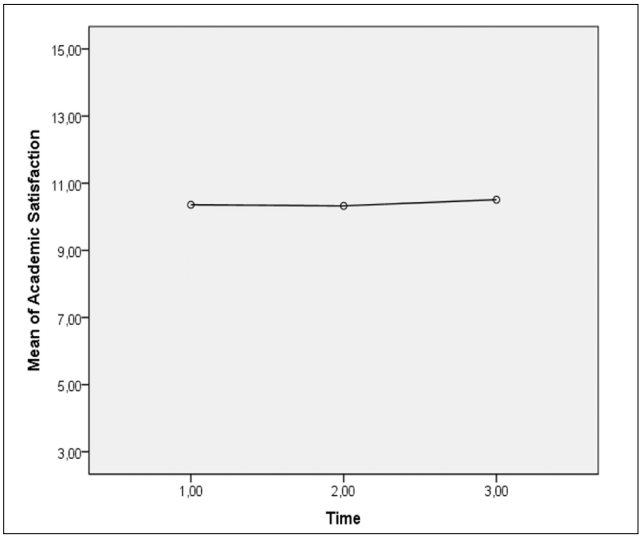

Figure 4. Psychological Well-being by Time.

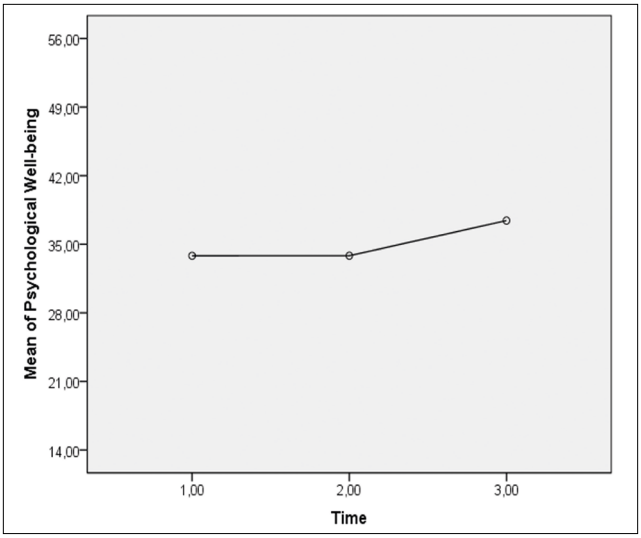

Table 3. Correlations between COVID-19 worry, academic stress, academic satisfaction, and psychological well-being.

Variables	Time 1			Time 2			Time 3		
	2	3	4	2	3	4	2	3	4
1. Worry about COVID-19	.13*	-.07	-.27**	-.04	-.10	-.24**	-.02	-.01	-.11*
2. Academic Stress	-	-.21**	-.28**	-	.10	-.26**	-	.46**	-.10*
3. Academic Satisfaction		-	.25**		-	.26**		-	.01
4. Psychological well-being			-			-			-
*p< .05, **p< .01									

The examination of the relations between variables (see Table 3) indicated a decrease in psychological well-being with an increase in COVID-19 worry at all times (at T1, r = -.27, p < .01; at T2, r = -.24, p < .01 and at T3, r = -.11, p < .05). COVID-19 worry is also positively related with academic stress at T1(r = .13, p < .05). At all times, when the academic stress is increased, psychological well-being is decreased (at T1, r = -.28, p < .01; at T2, r = -.26, p < .01; and at T3, r = -.10, p < .05). Academic satisfaction is positively related with psychological well-being at T1 (r = .25, p < .01) and T2 (r = .26, p < .01).

Discussion

This study aimed at investigating the change in the academic and emotional effects of COVID-19 pandemic on university students in a two-years period in three waves, between May 2020 and May 2022. In addition, the relations between the perceived worries of students about COVID-19, their psychological well-being, their academic stress and satisfaction are also examined. Results showed important effects of COVID-19 on students' academic lives and psychological well-being and the changes within two-years period.

Students reported a medium level of COVID-19 worry at T1. It was a time when number of infected cases and deaths were quite high, where uncertainty about the course of the virus and social lives was at top. Medium level of worry of the university students can be related with the statements that the virus was affecting the elderly more than the younger population unless they have a severe chronic disease (Turkish Republic Ministry of Health, 2020b). Another factor might be the feelings of trust and security related to the full lockdown in the country. A mandatory stay at home might make them feel safe about being infected. The medium level of COVID-19 worry at T1 sharply increased at T2 and decreased slightly under the level at T1 (see Figure 1). At T2, infection and mortality numbers increased significantly in Türkiye in parallel to the rest of the world and it was seen that not only elderly and chronically ill people, but also young and healthy ones were also at risk. This would explain the significant increase in worry levels at T2. Furthermore, the number of cases significantly dropped in late Summer of 2021, right after T2 due to the positive effects of rigid precautions and public vaccination, leading to a gradual normalization. As an important step of normalization in public life, fall semester started at classrooms in-person (or hybrid in some universities). Coherent to the drop in case numbers and gradual normalization in social life, the COVID-19 worry at T3 significantly decreased under the initial level at T1.

The findings about the psychological well-being of the students showed a different pattern. According to the results, the medium level psychological well-being at T1, remained the same at T2 but had an incline at T3 (see Figure 4). Analyses among the variables showed a significant negative relation between COVID-19 worry and psychological well-being at all times. This finding is parallel to many other study results indicating a relation between COVID-19 related anxiety and psychological well-being (e.g., Bayar et al., 2021; Debowska et al., 2020; Tang et al., 2020; Taylor et al., 2020). Our results showed that the strength of the relation gets weaker from T1 to T3, meaning that the impact of COVID-19 on psychological well-being still persists in time despite the changing course of the pandemic.

The pandemic brought many difficulties to the academic lives of the students in addition to the psychological stress about the disease itself. Many studies reported the negative effects of pandemic on the emotional, social, economic, and academic lives of the university students (e.g., Alghamdi, 2021; Almomani et al., 2021; Aristovnik et al., 2020; Moawad, 2020; Sundarasen et al., 2020). Our results also indicated similar results. Although there was a decline from T1 to T3 in the academic stress level of the students, the scores at all times were above average (see Figure 2). Also, we found that psychological well-being scores significantly dropped with an increase in academic stress in three-time measures. Academic stress is found to be positively related with COVID-19 worry at T1, but this relationship was not observed at T2 and T3. Despite the disappearance of the relationship, the students have above average level of academic stress at T2 and T3. The initial academic stress might be a result of the uncertainty created by the COVID-19 pandemic in the education process and social relations. As shown in the literature, academic uncertainty of the university life at the initial phase of the pandemic, gave way to stress based on the fast and

unprepared transition to remote education and lack of social relations due to moving back to family homes (Moawad, 2020; Wang et al., 2020; Yang et al., 2021). However, the high level of academic stress independent from COVID-19 worry might be explained by the difficulties in adapting to remote education at T2 and to hybrid education at T3. So, research revealed that COVID-19 negatively affected university students due to difficulties in managing workload and limited interaction with other student and lecturers, problems with internet access and hardware, lack of internal motivation and discipline and difficulty to understand the lessons (Aristeidou & Cross, 2021; Tengilimoğlu et al., 2021; Yang et al., 2021).

On the contrary, academic satisfaction scores were slightly above the average at all times and did not show any change within time. Psychological well-being increased with academic satisfaction at T1 and T2, a parallel finding to the study showing the relation between the academic satisfaction and depression and feelings of loneliness (e.g., Solomou et al., 2021). However, we believe academic satisfaction remaining the same over time where academic stress has changed, might be due to the method of evaluating academic satisfaction. In this study, the academic satisfaction was mostly about the efficacy and speed of the measures taken by the universities to cope with the uncertainty of the pandemic (e.g., satisfaction about the announcements of the university about the changes in education due to pandemic; satisfaction about the university's implementation of the COVID-19 precautions). In other words, the academic satisfaction presented in this study did not include the education methods used after the initial uncertainty and the process of adaptation to these methods. Considering the efforts of universities to effectively reduce the impact of the pandemic in line with the explanations and sanctions of the health authorities, it is reasonable that the level of academic satisfaction has not changed over time.

This study appears to be the first attempt in investigating the effects of COVID-19 on university students in Türkiye comparing three time periods. The results of our study indicated that the COVID-19 pandemic has important academic and emotional effects on university students and those effects are spread overtime parallel to the course of pandemic around the world. Despite this important feature, our study has some limitations. Firstly, the samples of the three waves are independent. It is not possible to see how individuals have changed over time with successive independent samples (Shaughnessy et al., 2000), instead, we can see the differences on the population over time if our sample is good enough to represent the population. We put an effort to have participants from the same population with similar demographic characteristics at three times, to enhance the power of the independent samples to represent the population. Even though the participants are the students coming from different parts of Türkiye, the data was collected at the same university. Finally, nonprobability sampling procedure might weaken the representative power of the sample. Considering these limitations, planning further studies that collect data from the same students at different universities by using probability sampling procedure will have more opportunity to have strong representative power and strength for casual inferences.

Conclusion

In summary, the COVID-19 worry that increased over time deepened the psychological problems of university students. The significant relation between worry about COVID-19 and psychological well-being indicates the importance of preventive steps against high levels of anxiety among university students. Apart from the impact on psychological well-being, the COVID-19 worry seems dysfunctional for preventive health behaviors. Can et al. (2022) found that people with low and moderate anxiety levels of COVID-19 were more likely to comply with preventive health behaviors than those with high anxiety levels. In that regard, it is essential for the health authorities to refrain from using anxiety provoking language to encourage people complying with the preventive measures and to protect their psychological well-being.

Despite the decrease in COVID-19 worry within time, academic stress did not decline, holding the high-level position at three times. This shows that the students could not adapt themselves to the changes in academic life in time. This result becomes even more important, considering our finding that the decrease in well-being was significantly related to the increase in academic stress in all three times. In that context, it seems like new steps need to be taken by the university authorities to reduce the academic stress of students. These steps can include the re-arrangement of the workload of the students considering the psychological and physical effects of the illness, not to make significant procedural changes during the semester and to clarify the expectations from the students in advance. Also enhancing the technological infrastructure to enable the students to reach study material online would make it easier for students to adapt remote education.

References

Aguilera-Hermida, A. P. (2020). College students' use and acceptance of emergency online learning due to COVID-19. International *Journal of Educational Research Open*, *1*,100011. https://doi.org/10.1016/j.ijedro.2020.100011

Akman, Ö., Yıldırım, D., & Sarıkaya, A. (2020). The effect of COVID-19 pandemic on nursing students' anxiety levels. *İstanbul Gelişim Üniversitesi Sağlık Bilimleri Dergisi*, *12*, 379-397. https://doi.org/10.38079/igusabder.757110

Alghamdi, A. A. (2021). Impact of the COVID-19 pandemic on the social and educational aspects of Saudi university students' lives. *Plos One*, *16*(4), 1-18. https://doi.org/10.1371/journal.pone.0250026

Almomani, E. Y., Qablan, A. M., Atrooz, F. Y., Almomany, A. M., Hajjo, R. M. & Almomani, H. Y. (2021). The influence of coronavirus diseases 2019 (COVID-19): Pandemic and the quarantine practices on university students' beliefs about the online learning experience in Jordan. *Frontiers in Public Health*, *8*, 1-13. https://doi.org/10.3389/fpubh.2020.595874

Andersen, M. S., Bento, A. I., Basu, A., Marsicano, C., & Simon, K. (2020). College openings, mobility, and the incidence of COVID-19 cases. *MedRxiv*, *10*(2020.09), 22-20196048.

Arënliu, A., Bërxulli, D., Perolli-Shehu, B., Krasniqi, B., Gola, A., & Hyseni, F. (2021). Anxiety and depression among Kosovar university students during the initial phase of outbreak and lockdown of COVID-19 pandemic. *Health Psychology and Behavioral Medicine*, *9*(1), 239-250. https://doi.org/10.1080/21642850.2021.1903327

Aristovnik, A., Keržic, D., Ravšelj, D., Tomaževic, N. & Umek, L. (2020). Impacts of the COVID-19 pandemic on life of higher education students: A global perspective. *Sustainability*, *12*(20), 8438. https://doi.org/10.3390/su12208438

Bayar, B. D., Can, S. Y., Erten, M., & Ekmen, M. (2021). COVID-19 pandemi sürecinde üniversite öğrencilerinin depresyon ve stres düzeylerinin belirlenmesi [Determination of Depression and Stress Levels of University Students in the Covid-19 Pandemic Process]. *Paramedik ve Acil Sağlık Hizmetleri Dergisi*, *2*(1), 12-25. https://dergipark.org.tr/en/pub/pashid/issue/59582/867591

Bialek, S., Boundy, E., Bowen, V., Chow, N., Cohn, A., Dowling, N., Ellington, S., Gierke, R., Hall, A., MacNeil, J., Patel, P., Peacock, G., Pilishvili, T., Hilda Razzaghi, N., Reed, N., Ritchey, M., & Sauber-Schatz, E. (2020). Severe Outcomes Among Patients with Coronavirus Disease 2019 (COVID-19) — United States, February 12–March 16, 2020. *Morbidity and Mortality Weekly Report*, *69*(12): 343–346. https://doi.org/10.15585/mmwr.mm6912e2

Bulut, C., & Kato, Y. (2020). Epidemiology of COVID-19. *Turkish Journal of Medical Sciences*, *50*(9), 563-570. https://doi.org/10.3906/sag-2004-172

Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., & Zheng, J. (2020). The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Research*, *287*, 112934. https://doi.org/10.1016/j.psychres.2020.112934

Can, F., Ergül-Topçu, A., & Topçu, G. (2022). Health Beliefs in Association with Behaviors in Compliance with COVID-19 Public Health Guidelines: A Cross-sectional Study. *Social Work in Public Health*, *37*(1), 14-27. https://doi.org/10.1080/19371918.2021.1965938

Çetin, C., & Anuk, Ö. (2020). COVID-19 pandemi sürecinde yalnızlık ve psikolojik dayanıklılık: Bir kamu üniversitesi öğrencileri örneklemi [COVID-19 Pandemic Process and Psychological Resilience: Sample of Students from a Public University]. *Avrasya Sosyal ve Ekonomi Araştırmaları Dergisi*, *7*(5), 170-189. https://dergipark.org.tr/en/pub/asead/issue/54658/733121

Debowska, A., Horeczy, B., Boduszek, D., & Dolinski, D. (2022). A repeated cross-sectional survey assessing university students' stress, depression, anxiety, and suicidality in the early stages of the COVID-19 pandemic in Poland. *Psychological Medicine*, *52*(15), 3744-3747. https://doi.org/10.1017/S003329172000392X

Duman, N. (2020). Üniversite öğrencilerinde COVID-19 korkusu ve belirsizliğe tahammülsüzlük [COVID-19 fear and Intolerance to Uncertainty in University Students]. *The Journal of Social Science*, *4*(8), 426-437. https://doi.org/10.30520/tjsosci.748404

Erden, G., Çoksan, S., Özdoğru, A.A., Ergül-Topçu, A., Azak, Y., Kıral-Uçar, G., Ögel-Balaban, H., Altınoğlu-Dikmeer, İ. & Yasak, Y. (2023). Turkish university students' social support, daily activities, self-supportive and health risk behaviors during COVID-19 pandemic. *Polish Psychological Bulletin*, *54*(1), 37–47. https://doi.org/10.24425/ppb.2023.143371

Erden, G., Özdoğru, A.A., Çoksan, S., Ögel-Balaban, H., Azak, Y., Altınoğlu-Dikmeer, İ., Ergül-Topçu, A., Yasak, Y., Kıral-Uçar, G., Oktay, S., Karaca-Dinç, P., Merdan-Yıldız, E.D., Eltan, S., Kumpasoğlu, G.B. & Baytemir, G. (2021). Social Contact, Academic Satisfaction, COVID-19 Knowledge, and Subjective Well-being Among Students at Turkish Universities: A Nine-University Sample. *Applied Research Quality Life*,*17*, 2017-2039. https://doi.org/10.1007/s11482-021-10019-7

Ergül-Topçu, A., Yasak, Y., Kalafat, T., & Altınoğlu-Dikmeer, İ. (2021). COVID-19 sürecinde demografik, sosyal, akademik ve hastalıkla ilgili faktörlerin üniversite öğrencilerinin psikolojik iyi oluşları ile ilişkisi [The Relationship between Psychological Well-being of University Students and Demographic, Social, Academic and Disease Related Factors During COVID-19 Pandemic]. *Eğitimde Kuram ve Uygulama*, *17*(1), 67-83. https://doi.org/10.17244/eku.926595

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175-191.https://doi.org/10.3758/BF03193146

Fawaz, M., & Samaha, A. (2021). E-learning: Depression, anxiety, and stress symptomatology among Lebanese university students during COVID-19 quarantine. *In Nursing Forum*, *56*(1), 52-57. https://doi.org/10.1111/nuf.12521

Hassan, S. N., Algahtani, F. D., Zrieq, R., Aldhmadi, B. K., Atta, A., Obeidat, R. M., & Kadri, A. (2021). Academic Self-perception and course satisfaction among university students taking virtual classes during the COVID-19 pandemic in the Kingdom of Saudi-Arabia (KSA). *Education Sciences*, *11*(3), 1-14. https://doi.org/10.3390/educsci11030134

Kahraman, M. E. (2020). COVID-19 Salgınının Uygulamalı Derslere Etkisi ve Bu Derslerin Uzaktan Eğitimle Yürütülmesi: Temel Tasarım Dersi Örneği [The Effect of COVID-19 Epidemic on Applied Courses and the Implementation of These Courses by Distance Education: Example of Basic Design Course]. *Medeniyet Sanat Dergisi*, *6*(1), 44-56. https://doi.org/10.46641/medeniyetsanat.741737

Karadağ, E., Çiftçi, S. K., Ramazan, G. Ö. K., Ahmet, S. U., Ergin-Kocatürk, H., & Çiftçi, Ş. S. (2021). COVID-19 pandemisi sürecinde üniversitelerin uzaktan eğitim kapasiteleri [Distance education capacities of universities during the COVID-19 pandemic process]. *Üniversite Araştırmaları Dergisi*, *4*(1), 8-22. https://dergipark.org.tr/en/pub/uad/issue/60894/874799

Keskin, M. & Özer Kaya, D. (2020). COVID-19 sürecinde öğrencilerin web tabanli uzaktan eğitime yönelik geri bildirimlerinin değerlendirilmesi [Evaluation of students' feedbacks on web-based distance education in the COVID-19 process]. *İzmir Katip Çelebi Üniversitesi Sağlık Bilimleri Fakültesi Dergisi*, *5*(2), 59-67. Retrieved from https://dergipark.org.tr/en/pub/ikcusbfd/issue/55773/754174

Leeman, D., Flannagan, J., Chudasama, D., Dack, K., Anderson, C., Dabrera, G., & Lamagni, T. (2022). Effect of Returning University Students on COVID-19 Infections in England, 2020. *Emerging Infectious Diseases*, *28*(7), 1366-1374. https://doi.org/10.3201/eid2807.212332

Li, X., Wu, H., Meng, F., Li, L., Wang, Y., & Zhou, M. (2020). Relations of COVID-19-related stressors and social support to Chinese college students' psychological response during the COVID-19 epidemic. *Frontiers in Psychiatry*, *11*, 1084. https://doi.org/10.3389/fpsyt.2020.551315

Li, H. Y., Cao, H., Leung, D. Y., & Mak, Y. W. (2020). The psychological impacts of a COVID-19 outbreak on college students in China: A longitudinal study. I*nternational Journal of Environmental Research and Public Health*, *17*(11), 3933. https://doi.org/10.3390/ijerph17113933

Long, E., Patterson, S., Maxwell, K., Blake, C., Pérez, R. B., Lewis, R., ... & Mitchell, K. R. (2022). COVID-19 pandemic and its impact on social relationships and health. *J Epidemiol Community Health*, *76*(2), 128-132. http://dx.doi.org/10.1136/jech-2021-216690

Moawad, R. A. (2020). Online learning during the COVID-19 pandemic and academic stress in university students. *Revista Românească pentru Educatie Multidimensionala*, *12*(1 Sup2), 100-107. https://doi.org/10.18662/rrem/12.1sup2/252

Nakhostin-Ansari, A., Sherafati, A., Aghajani, F., Khonji, M. S., Aghajani, R., & Shahmansouri, N. (2020). Depression and anxiety among Iranian medical students during COVID-19 pandemic. *Iranian Journal of Psychiatry*, *15*(3), 228-235. https://doi.org/10.18502/ijps.v15i3.3815

Pak, A., Adegboye, O. A., Adekunle, A. I., Rahman, K. M., McBryde, E. S., & Eisen, D. P. (2020). Economic consequences of the COVID-19 outbreak: The need for epidemic preparedness. *Frontiers in Public Health*, *8*, 241. http://dx.doi.org/10.3389/fpubh.2020.00241

Plakhotnik, M. S., Volkova, N. V., Jiang, C., Yahiaoui, D., Pheiffer, G., McKay, K., ... & Reißig-Thust, S. (2021). The perceived impact of COVID-19 on student well-being and the mediating role of the university support: Evidence from France, Germany, Russia and the UK. *Frontiers in Psychology*, *12*, 1-13. https://doi.org/10.3389/fpsyg.2021.642689

Savage, M. J., James, R., Magistro, D., Donaldson, J., Healy, L. C., Nevill, M. ve Hennis, P. J. (2020). Mental health and movement behaviour during the COVID-19 pandemic in UK university students: Prospective cohort study. *Mental Health and Physical Activity*, *19*, 100357. https://doi.org/10.1016/j.mhpa.2020.100357

Shaughnessy, J. J., Zechmeister, E. B. & Zechmeister, J. S. (2000). *Research methods in psychology* (10th ed.). McGraw-Hill.

Solomou, I., Constantinidou, F., Karekla, M., Psaltis, C., & Chatzittofis, A. (2021). The COVID-19 International Student Well-Being Study (C-19 ISWS): The Case of Cyprus. *European Journal of Psychology Open*, *5*, 1-12. https://doi.org/10.1024/2673- 8627/a000014

Son, C., Hegde, S., Smith, A., Wang, X., & Sasangohar, F. (2020). Effects of COVID-19 on college students' mental health in the United States: Interview survey study. *Journal of Medical Internet Research*, *22*(9), e21279. https://doi.org/10.2196/21279

Sundarasen, S., Chinna, K., Kamaludin, K., Nurunnabi, M., Baloch, G. M., Khoshaim, H. B., Hossain, S. F. A. & Sukayt, A. (2020). Psychological impact of COVID-19 and lockdown among university students in Malaysia: Implications and policy recommendations. *International Journal of Environmental Research and Public Health*, *17*(17), 6206. https://doi.org/10.3390/ijerph17176206

Tang, W., Hu, T., Hu, B., Jin, C., Wang, G., Xie, C., Chen, S., & Xu, J. (2020). Prevalence and correlates of PTSD and depressive symptoms one month after the outbreak of the COVID-19 epidemic in a sample of home-quarantined Chinese university students. *Journal of Affective Disorders*, *274*, 1-7. https://doi.org/10.1016/j.jad.2020.05.009

Tabachnick, B. G. & Fidell, L. S. (2013). *Using Multivariate Statistic*s, (7th ed). Pearson.

Tasso, A. F., Hisli Şahin, N. & San Roman, G. J. (2021). COVID-19 Disruption on college students: Academic and socioemotional Implications. *Psychological Trauma: Theory Research*, *Practice*, *and Policy*, *13*(1), 9-15. http://dx.doi.org/10.1037/tra0000996

Taylor, S., Landry, C. A., Paluszek, M. M., Fergus, T. A., McKay, D., & Asmundson, G. J. (2020). Development and initial validation of the COVID Stress Scales. *Journal of Anxiety Disorders*, 72, 102232. https://doi.org/10.1016/j.janxdis.2020.102232

Turkish Republic Ministry of Health Statistics (2022). *Genel Koronavirüs Tablosu*. https://covid19.saglik.gov.tr/TR-66935/genel-koronavirus-tablosu.html

Turkish Republic Ministry of Health (2020a). *COVID-19 Situation Report Turkey between 29.06.2020-05.07.2020 and 19.10.2020-25.10.2020*. https://sbsgm.saglik.gov.tr/TR,66560/haftalik-rapor--weekly-report.html

Turkish Republic Ministry of Health (2020b). *COVID-19 (SARS-CoV-2 Enfeksiyonu) Genel Bilgiler*, *Epidemiyoloji ve Tanı*. https://covid19.saglik.gov.tr/TR-66300/covid-19-nedir-.html

Van de Velde, S., Buffel, V., Bracke, P., Van Hal, G., Somogyi, N. M., Willems, B., Wouters, E., & C19 ISWS consortium. (2021). The COVID-19 international student well-being study. *Scandinavian Journal of Public Health*, *49*(1), 114-122. https://doi.org/10.1177/1403494820981186

Wang, X., Hegde, S., Son, C., Keller, B., Smith, A., & Sasangohar, F. (2020). Investigating mental health of US college students during the COVID-19 pandemic: Cross-sectional survey study. *Journal of Medical Internet Research*, *22*(9), e22817. http://dx.doi.org/10.2196/22817

World Health Organization. (2020). *Coronavirus disease 2019 (COVID-19) situation report (Report No. 124)*. https://www.who.int/docs/defaultsource/coronaviruse/situation-reports/20200523-covid-19-sitrep-124.pdf?sfvrsn=9626d639_2

World Health Organization. (2021). *Weekly operational update on COVID-19 31 May 2021 (Issue No. 57)*. https://www.who.int/publications/m/item/weekly-operational-update-on-covid-19-31-may-2021

World Health Organization. (2022). *Weekly operational update on COVID-19 25 May 2022 (Edition 93)*. https://www.who.int/publications/m/item/weekly-epidemiological-update-on-covid-19---25-may-2022

Wu, T., Jia, X., Shi, H., Niu, J., Yin, X., Xie, J., & Wang, X. (2021). Prevalence of mental health problems during the COVID-19 pandemic: A systematic review and meta-analysis. *Journal of Affective Disorders*, *281*, 91-98. https://doi.org/10.1016/j.jad.2020.11.117

Yang, C., Chen, A., & Chen, Y. (2021). College students' stress and health in the COVID-19 pandemic: The role of academic workload, separation from school, and fears of contagion. *PloS one*, *16*(2), e0246676. https://doi.org/10.1371/journal.pone.0246676

Yorguner, N., Bulut, N. S., & Akvardar, Y. (2021). COVID-19 Salgını sırasında üniversite öğrencilerinin karşılaştığı psikososyal zorlukların ve hastalığa yönelik bilgi, tutum ve davranışlarının incelenmesi [An analysis of the psychosocial challenges faced by the university students during COVID-19 pandemic, and the students? Knowledge, attitudes, and practices toward the disease]. *Archives of Neuropsychiatry*, *58*, 3-10. https://doi.org/10.29399/npa.27503

Zhang, Y., Zhang, H., Ma, X., & Di, Q. (2020). Mental health problems during the COVID-19 pandemics and the mitigation effects of exercise: A longitudinal study of college students in China. *International journal of Environmental Research and Public Health*, *17*(10), 3722. https://doi.org/10.3390/ijerph17103722

Zimmermann, M., Bledsoe, C., & Papa, A. (2020). The impact of the COVID-19 pandemic on college student mental health: A longitudinal examination of risk and protective factors. *PsyArxiv*, *17* June, 1-30. https://doi.org/10.31234/osf.io/2y7hu 17