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THE EFFECT OF TENNIS EXERCISE PARTICIPATION ON STRESS LEVEL OF SECONDARY STUDENTS

VPLIV UDELEŽBE PRI TENIŠKI VADBI NA RAVEN STRESA SREDNJEŠOLCEV

ABSTRACT

During the COVID-19 disease process, studies on mental health have mostly been done on adults. This study aimed to examine the effect of secondary school students' participation in regular and moderate intensity tennis exercises on stress levels during the pandemic period. The research was carried out with an experimental method and sequential design. The study sample, 46 volunteer students, was divided into two groups as experimental and control groups. 'Personal Information Form' and 'Stress Scale' were administered to the students in both groups as a pre-test and 12 weeks later as a post-test. As a result of the normality tests (Skewness and Kurtosis), it was determined that the data met normal distribution assumption; thus, the Independent Sample T-Test and Paired Samples T-Test were applied. The significance level was accepted as $p < 0.05$. According to the study's findings, there was a statistically significant difference in the experimental group's stress levels between the pre-test (39.30 ± 10) and post-test (32.00 ± 6). At the same time, there was no statistically significant difference between the control group's pre-test (35.52 ± 9) and post-test (35.82 ± 9). Consequently, this study reveals that participation in 12 weeks of regular tennis exercise significantly reduces the stress level of secondary school students. Research reveals the importance of participation in physical activities in reducing stress. In this context, participation in tennis exercise seems to be an important way to protect and improve the mental health of mentally disadvantaged adolescents, especially during the pandemic period.

Keywords: Covid-19, regular exercise, secondary school, stress, student, tennis

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IZVLEČEK

Med pandemijo COVID-19 so bile študije o duševnem zdravju večinoma opravljene na odraslih. Namen te študije je bil preučiti vpliv udeležbe srednješolcev pri redni in vsaj zmerno intenzivni teniški vadbi na raven stresa v obdobju pandemije. Raziskava je bila izvedena z eksperimentalno metodo in sekvenčno zasnovo. Študijski vzorec je sestavljajo 46 dijakov prostovoljcev, ki so bili razdeljeni v eksperimentalno in kontrolno skupino. Dijaki so pred začetkom študije in 12 tednov pozneje po koncu študije izpolnili obrazec o osebnih podatkih in o lestvici stresa. Na podlagi testov normalnosti (asimetrije in sploščenosti) je bilo ugotovljeno, da podatki ustrezajo predpostavki o normalni porazdelitvi, zato sta bila uporabljena T-test za neodvisne vzorce in T-test za parne vzorce pri stopnji pomembnosti $p < 0.05$. Rezultati študije so pokazali, da prihaja do statistično pomembnih razlik v ravni stresa eksperimentalne skupine pred začetkom (39.30 ± 10) in po koncu študije (32.00 ± 6). Hkrati pa ni bilo statistično značilnih razlik med ravno stresa kontrolne skupine pred začetkom (35.52 ± 9) in po koncu študije (35.82 ± 9). Posledično ta študija razkriva, da udeležba na 12-tedenski redni teniški vadbi pomembno zmanjša raven stresa pri srednješolcih. V tem kontekstu se zdi, da je udeležba pri teniški vadbi pomemben način za zaščito in izboljšanje duševnega zdravja duševno prikrajšanih mladostnikov, zlasti v obdobju pandemije.

Ključne besede: Covid-19, redna telesna vadba, srednja šola, stres, dijak, tenis

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INTRODUCTION

It is seen that many definitions have been made for the concept of stress in the literature. According to Lecic-Tosevski (2011), stress is an adaptive response of the individual against internal or external threats. According to another definition, stress is an alarm response to new or threatening situations that results in arousal in the organism (Li and Graham, (2017). Stress is a normal response to daily pressure, and extreme stress has many harmful consequences on physical and mental health (Zhai et al., 2021). Adolescent students who are the subject of our research have also been associated with stress in many studies. Adolescence is a period when perceived stress and many other health problems increase (Frick, Meyer & Isaksson, 2022; Sawyer et al., 2012). Mainly when the coronavirus disease (COVID-19) emerged and news of closure and death started to come from many countries globally, it will not be difficult to predict the mental problems experienced by students in adolescence. It is known that Covid-19 disease causes cardiovascular disorders, respiratory failure, and in some cases, death (Chen et al., 2020; Huang et al., 2020). In addition, the lifestyle changes that occurred with the closure, during which both schools and gyms were evacuated, have caused increased stress in countries around the world (Salari et al., 2020; Moriarty et al., 2021; Xiong et al., 2020). It is estimated that this emerging stress situation may increase more in different age groups (Moriarty et al., 2021; Salari et al., 2020; Stanton et al., 2020; Xiong et al., 2020). It is known that adolescents exposed to traumatic events such as disasters are at high risk for many problems such as post-traumatic stress disorder or emotional or behavioral issues (Slone & Mann, 2016; Wolmer et al., 2017). Previous studies have shown that external stressors can cause stress, which may worsen children's well-being (Cobham et al., 2016; Masten & Motti-Stedanidi, 2020). However, most previous research has paid little attention to studies of adolescents, primarily focusing on the young adult period. As we mentioned before, considering the high prevalence of mental health problems in adolescence, it is surprising to focus more on adults (Achterberg et al., 2021; Sadler et al., 2018). In the literature, it has been emphasized that effective ways and strategies should predominantly be determined to improve adolescents' mental health and well-being in such periods (Wright et al., 2021). This situation has been the source of inspiration for our study, and it is thought that the findings will be essential and contribute to the literature.

When the level of participation in physical activity in children and adolescents before and during the pandemic is compared, the results obtained are striking. Studies conducted in China have revealed that physical inactivity, which was 21.3% before the pandemic, increased to 65.6% during the pandemic (Xie et al., 2020). In a study conducted in Turkey, physical activity

levels of adolescents decreased by 70.2% with the pandemic (Umac & Aydin, 2021). Similar results were obtained in Italy, Slovenia, Portugal, and Spain, with significant decreases in physical activity level compared to pre-pandemic (Branquinho et al., 2020; Orgiles et al., 2020; Pišot et al., 2022). During this period, increases were observed in food consumption, sleep duration and social media addiction. All these reasons have caused the mental health of adolescents to regress. Therefore, it is vital to protect adolescents from this pressure, both during disasters or pandemics affecting the world and during periods when they experience academic pressure and their stress levels increase (Wilson et al., 2021). One of these ways of protection is participation in physical activities; however, studies have revealed that physical activity decreases during such periods (Ismail et al., 2020; Kriaucioniene et al., 2020). Previous studies linking stress with physical activities suggest that individuals who are more physically active experience lower levels of anxiety, depression, and stress (Gianfredi et al., 2020; Jedel et al., 2021). Various studies report that physical activity contributes to lower anxiety, depression, and stress in individuals (Lesser and Nienhuis, 2020; Rodriguez-Rey et al., 2020). Physical activity has been reported to contribute to having a lower stress level; however, previous studies have some limitations. For example, Samuel et al. (2020) emphasized that more data is needed to determine the mental health characteristics of athletes. Does physical activity positively affect stress when it is done amateur level or for competitive purposes?

Again, different findings are needed to answer this question because studies are reporting that stress increases after high-intensity exercises (Bixby & Lochbaum, 2006), that stress is high before a competition (Souza et al., 2019), or that stress increases as one enters a competitive environment (Hamlin et al., 2019). It is also clear that the effects of physical activity on stress should be strengthened with data obtained from different societies. Findings obtained from countries like Turkey, where the rate of sports participation is low, and the incidence of depression and stress is high (Tatar, Astar & Turhan, 2018), make the relationship between stress and physical activity cases more important. Wright et al. (2021), data collected from cross-sectional studies are limited. Experimental studies and research on different ethnic origins will be exciting and critical. One of the limitations that Fetzner and Asmundson (2015) reported in their study is that in experimental studies, the groups participating in the research should be divided into experimental and control groups; that is, there should be an inactive group in the process. Thus, determining whether external influences cause participation in exercise will be one of the study's strengths. Carraca et al. (2021) reported that few studies examine the effects of practices on psychological states such as anxiety, body image, and stress, and the findings

observed from existing studies are also inconsistent. It was reported that there were only female participants in the study of Rocque et al. (2021), and the exercise duration was limited to 8 weeks. Therefore, it was stated that both a mixed group in terms of gender and a more extended exercise period would increase the importance of future studies. It was noted that only women participated in the research of Johnston et al. (2021), the data were collected during the academic period, and it was not possible to determine whether the 68 km distance given to the experiments was run. In our study, a mixed group was included in the experimental and control groups, and certified trainers supervised the process while the exercises were being applied. Therefore, it can be said that a more transparent result will emerge. Similarly, Schultchen et al. (2019) also emphasized that physical activities are evaluated subjectively, and it would be more interesting to have trainers observing the participants during physical activities for future research. It has been emphasized that there is a need for studies examining the difference and consistency between the subjective and objective evaluation of physical activity and its effect on stress.

To summarize, it is essential to protect and improve adolescents' mental health who are mentally disadvantaged during adolescence. Especially during the pandemic period, this situation has come to the fore even more. Therefore, there is a need for strategies to improve adolescents' mental health. One of them is physical activity. The relationship between the type, intensity, duration, and frequency of physical activities and stress is essential in literature. In addition, many limitations were noted in previous studies that correlated physical activities with stress. In this study, it is a vital issue to eliminate these limitations and bring them to the literature. Based on studies conducted before the pandemic period, we assume that tennis exercises performed 1.5 hours a day, five days a week, for 12 weeks will significantly reduce the stress level of students (Nixdorf, Frank, & Beckmann, 2016; Vella et al., 2017). For this reason, this research aims to determine the effect of regular tennis exercises at amateur level and moderate intensity on the stress level of secondary school students during the pandemic period.

METHODS

Participants

The population of the experimental group of the research consists of 290 secondary school students who participate as athletes in the sports activities carried out by Turkey's

Burdur/Bucak Youth and Sports District Directorate. The population of the control group of the study consists of 73 secondary school students studying at Burdur/Bucak Gündoğdu Secondary School in Turkey.

Table 1. Socio-demographic characteristics of the participants (n=46).

Characteristics		Frequency	%
Gender	Female	24	52,2
	Male	22	47,8
Age	10	6	13,0
	11	13	28,3
	12	15	32,6
	13	12	26,1
Grade	5. Grade	14	30,4
	6. Grade	16	34,8
	7. Grade	16	34,8

Study design and variables

This study was conducted in accordance with the Declaration of Helsinki. All participants were informed about the study processes, and an informed consent form was obtained from each participant. The experimental implementation phase of the research was carried out in the gym of the Burdur/Bucak Youth and Sports District Directorate for 12 weeks between December 2021 and March 2022. The first measurement was taken in December 2021, and the second measurement was conducted in the gym in March 2022. The scale application phase for the control group of the research was carried out in Burdur/Bucak Gündoğdu Secondary School classrooms. The scales were applied face to face with the students. The study, carried out in 2 sessions, started with the first measurement in December 2021 and ended with the last measurement in March 2022. In addition, the necessary permissions for the research were obtained from the Bucak Youth and Sports District Directorate (no: 92070095-100-1259915) and the Bucak District National Education Directorate (no: E-99848340-605.99-36435905).

The scale application phase for the experimental group was carried out in 2 sessions. After the informed consent form was obtained from the experimental group, the first scale application was made in the gym in December 2021. The experimental group then participated in a 12-week tennis exercise. After 12 weeks of tennis exercise, the final scale application was made in the gym in March 2022. There were no interruptions during the program. The attendance of the participants was noted by the instructors. The implementation phase continued for 12 weeks

between these dates. Individual 90-minute training sessions were conducted as follows: Physical activities were planned for 1.5 hours, five days a week, after the necessary safety precautions were taken, and were done in 3 parts. The first is the preparatory phase, which includes various educational games and warm-up exercises. The second phase is the primary phase, which contains loads that affect different motoric features. In the primary phase, basic techniques specific to the branch of tennis were applied. In tennis training; reaction time in tennis training studies, quickness studies, micro tennis studies, mini tennis skills development work, mini-midi tennis work on improving their knowledge and skills place of study for the development of tennis skills it was given. In addition, serve, forehand, backhand, volley and overhead exercises were performed. The third phase is the final phase, which includes cooling and recovery exercises. In any phase of physical activities, the loading intensity did not exceed 70%. The intensity of exercise was determined by the Rating of Perceived Exertion (RPE). In the warm-up and cool-down exercises, the exercise intensity did not exceed 50%. The perceived difficulty level of the participants for all protocols was determined by the Borg scale rated between 6-20. Participants were taught to rate their RPE using the Borg scale. For tennis exercises, physical activity intensity was chosen as medium intensity (average 12 degrees). Thus, the intensity did not decrease to 40% at any moment of the exercise and did not increase to 80%. Intensity was monitored by the trainer. The scale application phase for the control group of the research was carried out in Burdur/Bucak Gündoğdu Secondary School classrooms. The scales were applied face to face with the students. The study, carried out in 2 sessions, started with the first measurement in December 2021 ended with the last measurement in March 2022. Control group students were not included in any exercise program. They just participated in the scale implementation. A meeting was held with the students in the control group in the first week and their consent was obtained that they should not participate in any regular physical activity. The students in the control group continued their normal daily activities without participating in a structured exercise. To summarize the design of the study: Experimental and control group completed the stress scale in December 2021. Afterwards, the experimental group participated in a 12-week tennis exercise, but the control group did not participate in any regular exercise. At the end of 12 weeks, both the experimental group and the control group filled in the stress scale again.

Data Collection Tools

A 3-question “Personal Information Form” created by the researchers was used to determine the students' demographic characteristics (gender, age, and class). “Stress Scale for Secondary School Students” was used to determine the students' stress levels.

Stress Scale for Secondary School Students

The scale was developed by Kesici and Aşılıoğlu (2017) to measure the stress levels of middle school students. The scale is in 4-point Likert type and consists of 21 items. The answers to the scale questions are listed as “Never,” “Sometimes,” “Often,” and “Constantly.” Scale scoring is respectively “1”, “2”, “3”, and “4”. Points are added up and divided by the number of items. In this way, the level of stress perceived by the students is determined. The scale also consists of “Emotional depression,” “Physical complaints,” “Social symptoms,” and “Emotional intensity” sub-dimensions. A high total score from the scale indicates that the student has a high-stress level. The Cronbach alpha value of the scale was calculated as 0.91. In the confirmatory factor analysis performed to determine the suitability of the factor structure, the χ^2/sd value was 1.595; the RMSEA value was found to be 0.048. These values mean that the model has a perfect fit. In addition, GFI, AGFI, NFI, and CFI fit values were 0.90, respectively; 0.88; 0.86, and 0.94 were found. Therefore, these values obtained are at an acceptable level.

Statistical analyses

Statistical Package for Social Sciences (SPSS) 17.0 was used to analyze the obtained data. First, a descriptive statistical test was conducted to indicate the socio-demographic characteristics of the participants. Then, normality tests (Skewness and Kurtosis) were applied to determine whether the data met the normality assumption. As data met the assumption, the Independent Sample *t*-test was used to examine the differences between the two groups from parametric tests. Finally, the Paired Samples *t*-test was used to compare the differences between the two paired groups. The significance level was determined as $p < 0.05$.

RESULTS

This section presents the normality test, pre-and post-test scores, and the differences in tables.

Table 2. Normality test of pre-test and post-test scores obtained from the stress scale.

Test	Skewness		Kurtosis		Kolmogorov-Smirnov	
	Value	SE	Value	SE		
Pre-test	,335	,350	-1,137	,688	Statistic	,147
					Df	46
					P	,014
Post-test	,897	,350	,084	,688	Statistic	,136
					Df	46
					P	,033

The normality test was applied, and the skewness and kurtosis values were between -1.5 and +1.5. Therefore, if the skewness and kurtosis values are between -1.5 and +1.5, the scores are considered to be normally distributed (Tabachnick & Fidell, 2013). It is seen that the Kolmogorov-Smirnov test data are not normally distributed at the 0.05 significance level. However, since the group size was 20 and above, it was assumed that the data were normally distributed (Tabachnick & Fidell, 2013).

Table 3. Differences in the pre-test scores of the stress levels of the experimental and control groups.

Group	n	x	SD	df	t	p
Experimental	23	39,30	10,02	44	1,336	,188
Control	23	35,52	9,15			

$p > 0,05$.

When Table 3 is examined, it is seen that there is no significant difference ($p > 0,05$) between the pre-test scores of the stress levels of the experimental and control groups.

Table 4. Differences in the post-test scores of the stress levels of the experimental and control groups.

Group	n	x	SS	SD	t	p
Experimental	23	32,00	6,67	44	-1,574	,123
Control	23	35,82	9,55			

$p > 0,05$.

When Table 4 is examined, it is seen that there is no significant difference ($p > 0,05$) between the post-test scores of the stress levels of the experimental and control groups.

Table 5. Differences in the pre-test and post-test scores of the stress levels of the experimental and control groups.

Group	Test	n	x	SS	SD	t	p
Experimental	Pre-test	23	39,30	10,02	22	4,302	,000*
	Post-test	23	32,00	6,67			
Control	Pre-test	23	35,52	9,15	22	-,189	,852
	Post-test	23	35,82	9,55			

p < 0,05.

When Table 5 is examined, there is a significant difference between the pre-test (39.30 ± 10) and post-test (32.00 ± 6) scores of the experimental group ($p < 0.05$). However, there was no significant difference between the pre-test (35.52 ± 9) and post-test (35.82 ± 9) scores of the control group ($p > 0.05$).

The most important result obtained from the findings shows that 12-week regular tennis exercises significantly reduce the stress level of secondary school students.

DISCUSSION

The aim of the study was to determine the effect of secondary school students' participation in 12 weeks of regular tennis exercise on their stress levels. For this purpose, 46 (23 control, 23 experimental) secondary school students voluntarily participated in the study. According to the test findings conducted in line with the research hypothesis (Table 5), participation in the 12-week regular tennis exercise had a significantly positive effect on the stress levels of secondary school students. This finding reveals that participation in a 12-week regular tennis exercise program significantly reduces the stress levels of secondary school students. The result obtained in the study supports the hypothesis of the research. When the relevant literature is examined, it is seen that there are many study findings consistent with the results of the current study:

In the study conducted by Paolucci et al. (2018) with 55 university students aged 18-30, the students were divided into three groups those who do high-intensity exercise, those who do moderate-intensity exercise, and those who do not exercise. They are included in 18 exercise sessions for six weeks, three times a week. The findings obtained before and after the intervention showed that high-intensity exercises increase stress, but participation in moderate-

intensity regular tennis exercise positively affects stress and depression. Considering that the exercise intensity of the students who participated in regular tennis exercise in our study was not high, the findings support each other. Furthermore, they reveal that non-intensity practices are effective in reducing stress levels. Fetzner and Asmundson (2015), in their study with 33 individuals affected by post-traumatic stress disorder, reported that six sessions of stationary bicycle exercises lasting two weeks reduced the symptoms of individuals' stress levels. Heart rate varying between 60-80% was targeted as an exercise in the study, and each session consisted of 20 minutes. The results of this study, which are in line with the current study's findings, also support that moderate-intensity (aerobic) exercises have a positive effect on the stress level. In our research, moderate-intensity exercises reduced stress despite a shorter exercise duration. Fang et al. (2019) divided the workers into control and experimental groups in their study on overweight workers. They applied a 12-week exercise program to the experimental group, three sessions of 60 minutes per week, at medium intensity.

The study's findings revealed that 12-week exercises significantly reduced the stress level of employees. These results (Fang et al., 2019; Fetzner & Asmundson, 2015) show that exercises effectively reduce stress levels in individuals with different ailments. Since many factors can affect the stress level and the findings, we felt the need to address these factors in our discussion. Inadequate materials and physical conditions in schools, quality of life, workload, academic expectations, and economic difficulties are factors that put students under stress and tire them emotionally (Temiz & Sivrikaya, 2021). Therefore, many factors can trigger stress. Pengpid and Peltzer (2020), in a study examining the relationship between physical activity and stress, sleep, and mental health on students from 23 low- and middle-income countries, reported that students who exercised had lower perceived stress levels. This again supports the findings of our study and reveals the positive effect of exercise on reducing the stress level, although there are many factors affecting stress. The data collection process in our study was carried out during the academic period when stress was observed more intensely, and the stress level, which was high in the pre-test, was found to be significantly lower after 12 weeks of exercise.

There are also findings in the literature that are not consistent with the current study results. For example, the findings of a quasi-experimental study conducted by Johnston et al. (2021) with undergraduate students in China reported that physical activity alone does not help to improve anxiety and perceived stress. They stated that the reason for this was that the data were collected during the academic term, and a date was chosen especially close to the final exams. In the study, undergraduate students also attended a 90-minute class per week. In addition, they were

instructed to run 68 km in 12 weeks. The data in our study were also collected during the academic period. However, in our study, the duration of participation in sports is approximately 450 minutes per week, and students do not have any additional duties. In this case, it can be said that additional tasks and exercise duration have negative effects on stress. It is known that assigned homework and assignments adversely affect students (Yar Yıldırım, 2018). It has been reported that students at successful schools who deal with the tasks given during the day experience problems such as academic stress, health problems, and lack of vital balance (Galloway, Conner, & Pope, 2013). Therefore, inconsistencies between studies may have been caused by this reason. In addition, tennis is known as one of the best sports branches that challenges the technical, tactical, physiological and psychological abilities of the person and improves the person physically, mentally, spiritually and socially when done regularly (Haşıl & Ataç, 1998). The training and studies in tennis are constantly changing and therefore there is the opportunity to get to know many different studies (Unierzyski, 2003). This can make tennis more enjoyable than an ordinary aerobic run. Pageaux et al. (2014) found a positive relationship between high cognitive fatigue and 5km aerobic endurance running. The same relationship MacMahon et al. (2014)'s study was also obtained. Therefore, the result we obtained from the present study and literature; When tennis and running as an aerobic activity are compared, it can be interpreted that the effect of tennis in reducing stress is more than running.

Similarly, in Reyhan and Karaca's (2016) studies, no significant difference was found between the stress levels of students who do sports and those of sedentary students. In the study of Reyhan and Karaca (2006), it was shown that physical education students might be tired both physically and mentally in theoretical and applied courses because there was no significant difference.

Limitations of The Study

The type and intensity of exercise, and the biased responses they may have given to the scales are among the limitations of this study. Participants who gave incorrect answers to the rankings or for different purposes were excluded before statistical analysis and were not included in the analysis. It was assumed that all the remaining participants gave unbiased answers to the scales. The study was also restricted to secondary school students.

The following suggestions can be made for future studies: Current findings were obtained from Turkish secondary school students. Different studies are needed to generalize and expand the results. It is important whether participation in exercise is for the purpose of improving health

or for competition. Therefore, the effect of exercise on stress is comparable to health and competition purpose. The effect of different exercise durations and different sports branches on stress may allow clearer results to be revealed.

CONCLUSION

To sum up, the result of this study reports that participation in 12 weeks of regular tennis exercise significantly and positively affects the stress level of middle school students. This result reveals the importance of involvement in physical activities in reducing stress. Therefore, it supports and recommends physical activity participation to reduce stress. In addition, this study revealed that participation in amateur level and moderate intensity tennis is an effective strategy in improving the mental health of adolescents and reducing the stress level during the pandemic period. In the study, the participants were divided into a mixed group in terms of gender and also the participants were divided into two as the experimental and control groups. Certified experts supervised the participants. To the best of our knowledge, this is the first study to examine the effect of Turkish students' participation in tennis on stress during the pandemic period. These factors are also the strengths of the study.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

REFERENCES

- Achterberg, M., Dobbelaar, S., Boer, O. D. et al. (2021). Perceived stress as mediator for longitudinal effects of the COVID-19 lockdown on well-being of parents and children. *Sci Rep*; 11, 2971. Doi: <https://doi.org/10.1038/s41598-021-81720-8>.
- Bixby, W. R., & Lochbaum, M. R. (2006). Affect responses to acute bouts of aerobic exercise in fit and unfit participants: an examination of opponent-process theory. *Journal of Sport Behavior*, 29(2), 111–125.
- Branquinho, C., Kelly, C., Arevalo, L. C., Santos, A., & Gaspar de Matos, M. (2020). Hey, we also have something to say: A qualitative study of Portuguese adolescents' and young people's experiences under COVID-19. *Journal of Community Psychology*, 48(8), 2740-2752. Doi: <https://doi.org/10.1002/jcop.22453>.
- Carraça, E. V., Encantado, J., van Baak, M. A., et al. (2021). Effect of exercise training on psychological outcomes in adults with overweight or obesity: a systematic review and meta-analysis. *Obes Rev*; 22(Suppl 4): e13261. Doi: <https://doi.org/10.1111/obr.13261>.
- Chen, N., Zhou, M., Dong, X., Qu, J., Gong, F., Han, Y., Qiu, Y., Wang, J., Liu, Y. & Wei, Y. (2020). Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in wuhan, China: A descriptive study. *Lancet*; 395, 507–513. Doi: [https://doi.org/10.1016/S0140-6736\(20\)30211-7](https://doi.org/10.1016/S0140-6736(20)30211-7).
- Cobham, V. E., Mc Dermott, B., Haslan, D. & Sanders, M. R. (2016). The role of parents, parenting and the family environment in children's post-disaster mental health. *Curr. Psychiatry Rep.* 18, 53. Doi: 10.1007/s11920-016-0691-4.
- Fang, Y. Y., Huang, C. Y. & Hsu, M. C. (2019). Effectiveness of a physical activity program on weight, physical fitness, occupational stress, job satisfaction and quality of life of overweight employees in high-tech industries: a randomized controlled study. *Int J Occup Saf Ergon*; 25(4): 621- 629. Doi: <https://doi.org/10.1080/10803548.2018.1438839>.
- Fetzner, M. G. & Asmundson, G. J. G. (2015). Aerobic exercise reduces symptoms of post-traumatic stress disorder: a randomized controlled trial. *Cognitive Behaviour Therapy*; 44:4, 301-313. Doi: 10.1080/16506073.2014.916745.
- Frick, M. A., Meyer, J. & Isaksson, J. (2022). The role of comorbid symptoms in perceived stress and sleep problems in adolescent ADHD. *Child Psychiatry Hum Dev*. Doi: <https://doi.org/10.1007/s10578-022-01320-z>.
- Galloway, M., Conner, J. & Pope, D. (2013). Nonacademic effects of homework in privileged, high-performing high schools. *Journal of Experimental Education*, 81(4), 490–510. Doi: <https://doi.org/10.1080/00220973.2012.745469>.
- Gianfredi, V., Blandi, L., Cacitti, S., Minelli, M., Signorelli, C., Amerio, A., et al. (2020). Depression and objectively measured physical activity: a systematic review and meta-analysis. *Int. J. Environ. Res. Public Health*; 17:3738. Doi: 10.3390/ijerph17103738.
- Hamlin, M. J., Wilkes, D., Elliot, C. A., Lizamore, C. A. & Kathiravel, Y. (2019). Monitoring training loads and perceived stress in young elite university athletes. *Frontiers in Physiology*, 10, 34. Doi: 10.3389/fphys.2019.00034.
- Haşıl, N., & Ataç, H. (1998). Tenis alıştırma örnekleri. Akmat Akinoğlu Matbaacılık, Bursa. (In Turkish). [Examples of tennis exercises. Akmat Akinoglu Printing, Bursa].
- Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., Zhang, L., Fan, G., Xu, J., Gu, X. (2020). Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*; 395, 497–506. Doi: [https://doi.org/10.1016/S0140-6736\(20\)30183-5](https://doi.org/10.1016/S0140-6736(20)30183-5).
- Ismail, L. C., Osaili, T. M., Mohamad, M. N., Al Marzouqi, A., Jarrar, A. H., Zampelas, A. & Hasan, H. (2020). Assessment of eating habits and lifestyle during coronavirus pandemic in the mena region: A cross-sectional study. *British Journal of Nutrition*, 1-30. Doi: 10.1017/S0007114520004547.

- Jedel, E., Elfström, M. & Hägglin, C. (2021). Differences in personality, perceived stress and physical activity in women with burning mouth syndrome compared to controls. *Scandinavian Journal of Pain*, 21(1), 183-190. <https://doi.org/10.1515/sjpain-2020-0110>.
- Johnston, S. A., Roskowski, C., He, Z., Kong, L. & Chen, W. (2021) Effects of team sports on anxiety, depression, perceived stress, and sleep quality in college students, *Journal of American College Health*, 69:7, 791-797, Doi: 10.1080/07448481.2019.1707836.
- Kesici, A. & Aşlıoğlu, B. (2017). Developing stress scale for secondary school students: Reliability and validity study. *Kastamonu Education Journal*, 25 (6), 2413-2426. Retrieved from: <https://dergipark.org.tr/tr/pub/kefdergi/issue/31577/357245>.
- Kriaucioniene, V., Bagdonaviciene, L., Rodríguez-Pérez, C. & Petkeviciene, J. (2020). Associations between changes in health behaviours and body weight during the covid-19 quarantine in Lithuania: The Lithuanian covidiet study. *Nutrients*, 12(10), 3119. Doi: 10.3390/nu12103119.
- La Rocque, C. L., Mazurka, R., Stuckless, T. J. R., Pyke, K. & Harkness, K. L. (2021). Randomized controlled trial of bikram yoga and aerobic exercise for depression in women: Efficacy and stress-based mechanisms. *Journal of Affective Disorders*. 280-Part A, 457-466. Doi: <https://doi.org/10.1016/j.jad.2020.10.067>.
- Lecic-Tosevski, D., Vukovic, O. & Stepanovic, J. (2011). Stress and personality. *Psychiatriki*, 22 (4) (2011), pp. 290-297.
- Lesser, I. A., & Nienhuis, C. P. (2020). The impact of COVID-19 on physical activity behavior and well-being of Canadians. *Int. J. Environ. Res. Public Health* 17, 3899. Doi: 10.3390/ijerph17113899.
- MacMahon, C., Schücke, L., Hagemann, N., & Strauss, B. (2014). Cognitive fatigue effects on physical performance during running. *Journal of Sport and Exercise Psychology*, 36, 375-381. Doi: 10.1123/jsep.2013-0249.
- Masten, A. S. & Motti-Stefanidi, F. (2020). Multisystem resilience for children and youth in disaster: reflections in the context of COVID-19. *Advers. Resil. Sci.* 1, 12. Doi: <https://doi.org/10.1007/s42844-020-00010-w> (2020).
- Moriarty, T., Bourbeau, K., Fontana, F., McNamara, S. & Pereira da Silva, M. (2021). The relationship between psychological stress and healthy lifestyle behaviors during COVID-19 among students in a US Midwest University. *Int. J. Environ. Res. Public Health*, 18, 4752. Doi: <https://doi.org/10.3390/ijerph18094752>.
- Nixdorf, I., Frank, R. & Beckmann, J. (2016). Comparison of athletes' proneness to depressive symptoms in individual and team sports: Research on psychological mediators in junior elite athletes. *Frontiers in Psychology*, 7, 893. Doi: 10.3389/fpsyg.2016.00893.
- Orgilés, M., Morales, A., Delvecchio, E., Mazzeschi, C., & Espada, J. P. (2020). Immediate psychological effects of the COVID-19 quarantine in youth from Italy and Spain. *Frontiers in Psychology*, 11, 2986. Doi: <https://doi.org/10.3389/fpsyg.2020.579038>.
- Pageaux, B., Lepers, R., Dietz, K. C., & Marcora S. M. (2014). Response inhibition impairs subsequent self-paced endurance performance. *Eur J Appl Physiol*, 114(5), 1095-1105. Doi: 10.1007/s00421-014-2838-5.
- Paolucci, E. M., Loukov, D., Bowdish, D. M. E. & Heisz, J. J. (2018). Exercise reduces depression and inflammation but intensity matters. *Biological Psychology*, 133, 79-84. Doi: <https://doi.org/10.1016/j.biopsycho.2018.01.015>.
- Pengpid, S. & Peltzer, K. (2020). Vigorous physical activity, perceived stress, sleep and mental health among university students from 23 low- and middle-income countries. *International Journal of Adolescent Medicine and Health*, 32(2), 20170116. Doi: <https://doi.org/10.1515/ijamh-2017-0116>.
- Pišot, S., Šimunič, B., Gentile, A. et al. (2022). The differences of Slovenian and Italian daily practices experienced in the first wave of COVID-19 pandemic. *BMC Public Health*, 22, 326. Doi: <https://doi.org/10.1186/s12889-022-12664-5>.

- Reyhan, S. & Karaca, A. A. (2016). Comparison of perceived stress levels among students in school of physical education and sports and education faculty (Siirt university sample). *Journal of International Multidisciplinary Academic Researches*, 3(3), 26-35.
- Rodríguez-Rey, R., Garrido-Hernansaiz, H. & Collado, S. (2020). Psychological impact and associated factors during the initial stage of the coronavirus (COVID-19) pandemic among the general population in Spain. *Front. Psychol.* 11:1540. Doi: 10.3389/fpsyg.2020.01540.
- Sadler, K., Vizard, T., Ford, T., Marchesell, F., Pearce, N., Mandalia, D., et al. (2018). Mental health of children and young people in England, 2017. *Trends and characteristics*. Leeds, UK: NHS Digital.
- Salari, N., Hosseini-Far, A., Jalali, R., Vaisi-Raygani, A., Rasoulpoor, S., Mohammadi, M., Rasoulpoor, S. & Khaledi-Paveh, B. (2020). Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: A systematic review and meta-analysis. *Global Health*, 16, 1–11. Doi: <https://doi.org/10.1186/s12992-020-00589-w>.
- Samuel, R. D., Tenenbaum, G., & Galily, Y. (2020). The 2020 Coronavirus pandemic as a change-event in sport performers' careers: conceptual and applied practice considerations. *Front. Psychol.* 11:567966. Doi: 10.3389/fpsyg.2020.567966.
- Sawyer, S. M., Afifi, R. A., Bearinger, L. H., Blakemore, S.-J., Dick, B., Ezeh, A. C. et al (2012). Adolescence: a foundation for future health. *Lancet* 379(9826):1630–1640. Doi: 10.1016/S0140-6736(12)60072-5.
- Schultchen, D., Reichenberger, J., Mittl, T., Weh, T., Smyth, J. M., Blechert, J., & Pollatos, O. (2019). Bidirectional relationship of stress and affect with physical activity and healthy eating. *British Journal of Health Psychology*, 24(2), 315–333. Doi: <https://doi.org/10.1111/bjhp.12355>.
- Slone, M. & Mann, S. (2016). Effects of war, terrorism and armed conflict on young children: a systematic review. *Child Psychiatry Hum. Dev.* 47, 950–965. Doi: 10.1007/s10578-016-0626-7.
- Souza, R. A., Beltran, O. A. B., Zapata, D. M., Silva, E., Freitas, W. Z., Junior, R. V., da Silva, F. F. & Higino, W. P. (2019). Heart rate variability, salivary cortisol and competitive state anxiety responses during pre-competition and pre-training moments. *Biology of Sport*, 36(1), 39-46. Doi: 10.5114/biolport.2018.78905.
- Stanton, R., To, Q. G., Khalesi, S., Williams, S. L., Alley, S. J., Thwaite, T. L., Fenning, A. S. & Vandelanotte, C. (2020). Depression, anxiety and stress during COVID-19: associations with changes in physical activity, sleep, tobacco and alcohol use in Australian adults. *Int. J. Environ. Res. Public Health*, 17, 4065. Doi: 10.3390/ijerph17114065.
- Tabachnick, B. G. & Fidell, L. S. (2013). *Using multivariate statistics*. Boston, Pearson.
- Tatar, A., Astar, M. & Turhan, E. (2018). The relationship of sport, stress, anxiety and depression: preliminary study. *Nobel Med*; 14(3): 31-38. Turkish.
- Temiz, C. N. & Sivrikaya, A. H. (2021). Assessing the problems encountered in physical education and sport classes (a domestic and international evaluation). *Eurasian Journal of Sport Sciences and Education*, 3(1), 12-39. Doi: 10.47778/ejsse.891512.
- Umac, E. H., & Aydin, A. (2021). Health of adolescents in the COVID-19 outbreak: Perspectives from mothers. *Journal of Child*, 21(1):68-73. Doi: <https://doi.org/10.26650/jchild.2021.1.824786>.
- Unierzyski, P. (2003). Altyapı Çalışmalarında Modern Yaklaşımlar Konulu Uluslararası Antrenör Gelişim Semineri Notları. Ankara. (In Turkish).
- Vella, S. A., Swann, C., Allen, M. S., Schweickle, M. J. & Magee, C. A. (2017). Bidirectional associations between sport involvement and mental health in adolescence. *Medicine and Science in Sports and Exercise*, 49(4), 687–94. Doi: 10.1249/MSS.0000000000001142.
- Wilson, O. W., Holland, K. E., Elliott, L. D., Duffey, M., & Bopp, M. (2021). The impact of the COVID-19 pandemic on US college students' physical activity and mental health. *Journal of Physical Activity and Health*, 18(3), 272-278. Retrieved from: <https://journals.humankinetics.com/view/journals/jpah/18/3/article-p272.xml>.

Wolmer, L., Hamiel, D., Pardo-Aviv, L. & Laor, N. (2017). Addressing the needs of preschool children in the context of disasters and terrorism: assessment, prevention, and intervention. *Curr. Psychiatry Rep.* 19, 40. Doi: 10.1007/s11920-017-0792-8.

Wright, L. J., Williams, S. E. & Veldhuijzen van Zanten, J. J. C. S. (2021). Physical activity protects against the negative impact of coronavirus fear on adolescent mental health and well-being during the COVID-19 pandemic. *Front. Psychol.* 12:580511. Doi: 10.3389/fpsyg.2021.580511.

Xie, X., Xue, Q., & Zhou, Y. (2020). Mental health status among children in home confinement during the coronavirus disease 2019 outbreak in Hubei province, China. *JAMA Pediatr*, e201619. Doi:10.1001/jamapediatrics.2020.1619.

Xiong, J., Lipsitz, O., Nasri, F., Lui, L. M. W., Gill, H., Phan, L., Chen-Li, D., Iacobucci, M., Ho, R. & Majeed, A. (2020). Impact of COVID-19 Pandemic on mental health in the general population: a systematic review. *J. Affect. Disord.* 227, 55–64. Doi: 10.1016/j.jad.2020.08.001.

Yar Yıldırım, V. (2018). The opinions of the students, teachers and parents about the daily assignments given at secondary school level. *Milli Eğitim Dergisi*, 47 (220), 201-224. Retrieved from: <https://dergipark.org.tr/en/pub/milliegitim/issue/40715/489810>.

Yardımcı, F. B. & Kulunkoglu, B. (2022). The effect of gender on anxiety, depression and stress levels of athletes preparing for the Tokyo 2020 Paralympic Games. *Gazi Journal of Physical Education and Sports Sciences*. 27 (1), 89-100. Doi: 10.53434/gbesbd.987452.

Zhai, X., Wu, N., Koriyama, S., Wang, C., Shi, M., Huang, T., Wang, K., Sawada, S. S. & Fan, X. (2021). Mediating effect of perceived stress on the association between physical activity and sleep quality among Chinese college students. *Int. J. Environ. Res. Public Health*; 18(1), 289. Doi: <https://doi.org/10.3390/ijerph18010289>.