MJSS

Akdeniz Spor Bilimleri Dergisi

Mediterranean Journal of Sport Science

ISSN 2667-5463

Evaluation of Students' Physical Fitness Levels in Physical Education and Sports Classes Along With Their Academic Achievement and Predisposition to Physical Education Before and After The Pandemic

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DOI: https://doi.org/10.38021asbid.1575099

ORIGINAL ARTICLE

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Received: 28.10.2024

Accepted: 16.12.2024

Online Publishing: 28.03.2025

Abstract

This study examines the impact of the COVID-19 pandemic on 8th-grade middle school students' physical fitness, academic performance, and attitudes towards physical education. The research includes two groups from Ankara, consisting of 80 students (40 girls and 40 boys) in the 2017-2018 and 2022-2023 academic years. Physical fitness was assessed using the FITNESSGRAM test battery, which measures shuttle runs, flexibility, push-ups, sit-ups, and body mass index (BMI). Academic performance was evaluated based on 8th-grade grade point averages, and students' attitudes towards physical education were measured with the Physical Education Lesson Inclination Scale (PELI), developed by Hilland et al. (2009) and adapted into Turkish by Öncü et al. (2015). The findings reveal notable changes in physical and academic performance during the pandemic, with increases observed in shuttle run, flexibility, push-up counts, GPA, and PELI scores, and a slight reduction in BMI values. However, no statistically significant gender differences were identified when comparing pre-pandemic and post-pandemic performances. These results indicate that the pandemic period had a multifaceted impact on students' physical activities and academic achievements, with potential moderating effects from factors such as socioeconomic status and parental education level. The findings further suggest that physical activity, particularly aerobic fitness, may positively influence academic performance, although this effect may vary across genders.

Keywords: COVID-19, Physical Fitness, Academic Achievement, Physical Education Lesson Inclination Scale

Pandemi Öncesi ve Sonrası Beden Eğitimi ve Spor Derslerinde Öğrencilerin Fiziksel Uygunluk Düzeyleri ile Akademik Başarıları ve Beden Eğitimine Yatkınlıklarının (Beyö) Değerlendirilmesi

Öz

Bu çalışma, COVID-19 pandemisinin 8. sınıf öğrencilerinin fiziksel uygunluk seviyeleri, akademik başarıları ve beden eğitimi dersine yönelik tutumları üzerindeki etkisini incelemektedir. Araştırma, Ankara'daki iki grubu kapsamaktadır ve 2017-2018 ile 2022-2023 eğitim-öğretim yıllarında 40 kız ve 40 erkek olmak üzere toplam 80 öğrenciyi içermektedir. Fiziksel uygunluk, FITNESSGRAM test bataryası kullanılarak mekik koşusu, esneklik, şınav, mekik ve beden kitle indeksi (BMI) ölçümleriyle değerlendirilmiştir. Akademik başarı, öğrencilerin 8. sınıf not ortalamalarına göre ölçülmüş, beden eğitimi dersine yönelik tutumları ise Hilland ve arkadaşları (2009) tarafından geliştirilen ve Öncü ve arkadaşları (2015) tarafından Türkçeye uyarlanan Beden Eğitimi Dersi Yatkınlık Ölçeği (BEYÖ) ile değerlendirilmiştir. Bulgular, pandemi döneminde fiziksel ve akademik performansta önemli değişiklikler olduğunu göstermekte; mekik koşusu, esneklik, şınav sayısı, not ortalamaları ve BEYÖ puanlarında artış, BMI değerlerinde ise hafif bir düşüş gözlemlenmiştir. Ancak, pandemi öncesi ve sonrası performanslar arasında cinsiyet açısından istatistiksel olarak anlamlı bir fark bulunamamıştır. Sonuçlar, pandemi döneminin öğrencilerin fiziksel aktiviteleri ve akademik başarıları üzerinde çok yönlü bir etkiye sahip olduğunu ve sosyoekonomik durum ile ebeveyn eğitim seviyesi gibi faktörlerin bu ilişkiyi etkileyebileceğini göstermektedir. Bulgular ayrıca fiziksel aktivitenin, özellikle aerobik uygunluğun, akademik başarı üzerinde olumlu bir etkisi olabileceğini ve bu etkinin cinsiyete göre farklılık gösterebileceğini öne sürmektedir.

Anahtar Kelimeler: COVID-19, Fiziksel Uygunluk, Akademik Başarı, Beden Eğitimi Yatkınlık Ölçeği

Introduction

The pandemic has gone down in history as a global health crisis, deeply affecting many aspects of daily life, especially education systems. Actions implemented during the COVID-19 pandemic, including social isolation and quarantine measures, have notably influenced students' physical activity levels, and consequently their physical fitness (World Health Organization, 2020). This situation can create long-term health problems, especially among young people, as well as negatively impact academic achievement.

Physical fitness is the physical capacity required for individuals to perform daily activities without feeling tired and with sufficient energy (Caspersen et al., 1985). Physical fitness encompasses several elements, including cardiovascular endurance, muscular strength, flexibility, speed, and body composition. There is a close association between students' physical fitness and their academic performance. Studies indicate that consistent physical activity boosts students' focus and concentration, which in turn enhances their ability to learn (Singh et al., 2012).

Physical education and sports classes enable students to enhance their physical fitness and adopt healthy lifestyle habits. Additionally, these classes play a role in the development of students' social skills, stress management, and self-confidence (Bailey, 2006). However, during the pandemic, the shift to remote education and restricted physical activity opportunities may have impacted the effectiveness of physical education classes and students' inclination towards them.

Materials and Methods

This study employed a quantitative research approach. The purposive sampling technique was utilized to select the study group sample (Karasar, 2017).

Research Model

The research model is a quas i-experimental desing, one of the quantitative research methods.

Population and Sample

The students participating in the research were selected from those studying in the 8th grade and attending the same school during the pre-pandemic and post-pandemic periods. Participants were selected using the random sampling method and voluntarily participated in the study.

Data Collection Tools

Fitness levels were assessed utilizing the FITNESSGRAM test battery. Students' shuttle run, flexibility test, push-up, sit-up, and body mass index (BMI) values were recorded. Academic achievement was evaluated with students' 8th-grade grade point averages. The Physical Education

Predisposition Scale (PEPS), created by Hilland et al. (2009) and translated into Turkish by Öncü et al. (2015), was employed to assess students' inclination towards physical education classes.

Data Collection Process

The same tests and scales were utilized for data collection during both periods. The data were gathered in the 2017-2018 academic year for the pre-pandemic phase and in the 2020-2021 academic year for the post-pandemic phase.

Physical Fitness Measurement

Developed by Charles L. Sterling in 1977, the FITNESSGRAM Test Battery aims to assess students' cardiovascular endurance, muscle strength, flexibility, and body composition. It measures physical fitness parameters such as the shuttle run for cardiovascular endurance, the flexibility test for flexibility, push-ups and sit-ups for muscle strength, and body mass index (BMI) for body composition.

Academic Achievement Measurement

The students' academic performance was assessed through their grade point averages as recorded by the school. These averages represent the students' comprehensive academic achievements.

Measurement of Predisposition to Physical Education Class

Students' attitudes and self-efficacy towards physical education were measured using the 'Physical Education Predisposition Scale (PEPS)', originally developed by Hilland et al. (2009) and later adapted to Turkish by Öncü et al. (2015). This scale comprises 11 items divided into two factors: 'Attitude' (6 items) and 'Self-Efficacy' (5 items). Negative items are reverse scored. The scale employs a '5-point Likert' format, with response options ranging from 'Strongly Disagree (1)' to 'Strongly Agree (5)'. Scores range from a minimum of 11 to a maximum of 55, with the 'Attitude' subscale scoring between 6 and 30 and the 'Self-Efficacy' subscale scoring between 5 and 25.

Data Analysis

The analysis of the data utilized both parametric and non-parametric tests. For variables following a normal distribution, Pearson correlation analysis was employed, while Spearman correlation analysis was applied to those not normally distributed. Differences between groups were assessed using T-tests and Mann-Whitney U tests.

Research Ethics

"The Higher Education Institutions Scientific Research and Publication Ethics Directive." The study received approval from the Non-Interventional Research Ethics Committee (decision number 2023.11.04). Participant and data confidentiality were ensured throughout the research process. Both participants and their parents were informed that participation in the study was voluntary and that they could withdraw at any time.

Findings

This section provides a detailed presentation of the findings related to the physical fitness levels, academic achievements, and predisposition towards physical education classes of 8th-grade middle school students before and after the pandemic.

Table 1

Summary Statistics of Continuous Variables for the Group Before the Pandemic.

	Gender	n	Minimum	Maximum	Mean	Standard Deviation	Variance
Grade Point Average	Female	20	77,31	97,52	88,79	4,91	24,08
	Male	20					
Shuttle Run	Female	20	10,00	70,00	34,90	15,77	248,81
	Male	20					
Flexibility	Female	20	12,00	39,00	25,90	7,42	55,12
	Male	20					
Push-Up	Female	20	2,00	40,00	11,48	8,98	80,56
	Male	20					
Sit-Up	Female	20	14,00	80,00	62,08	19,61	384,38
	Male	20					
BMI	Female	20	15,00	28,00	19,65	3,12	9,72
	Male	20					
PEPS Score	Female	20	21,00	48,00	35,08	8,11	65,71
	Male	20					

The pre-pandemic physical fitness levels, grade point averages, and predisposition scores for physical education classes of participants are displayed in Table 1. Parameters reviewed include grade point average, shuttle run, flexibility, push-up, sit-up, BMI (Body Mass Index), and PEPS score (Physical Education Predisposition Score).

An evident correlation was found between grade point averages and various physical fitness parameters. Higher grade point averages tended to align with increased sit-up performance and lower BMI values. However, high standard deviations suggest that the relationship between grade point averages and other fitness parameters may be weaker.

Additionally, higher sit-up scores and lower BMI values generally corresponded with elevated PEPS scores. Some participants, however, exhibited high physical fitness yet lower PEPS scores, or the reverse.

Table 2

Descriptive Statistics of Continuous Variables for the Post-Pandemic Group.

	Gender	n	Minimum	Maximum	Mean	Standard Deviation	Variance
Grade Point Average	Female	20	67,37	97,98	89,81	7,37	54,38
	Male	20					
Shuttle Run	Female	20	11,00	80,00	41,93	20,76	430,89
	Male	20					
Flexibility	Female	20	8,00	47,00	29,60	7,88	62,14
	Male	20					
Push-Up	Female	20	3,00	72,00	30,88	15,72	247,14
	Male	20					
Sit-Up	Female	20	17,00	85,00	64,83	20,30	412,25
	Male	20					
BMI	Female	20	15,40	23,44	19,35	1,99	3,97
	Male	20					
PEPS Score	Female	20	21,00	48,00	37,50	5,90	34,82
	Male	20					

The results regarding participants' physical fitness, grade point averages, and predisposition scores for physical education classes in the post-pandemic period are shown in Table 2. Examined parameters include grade point average, shuttle run, flexibility, push-up, sit-up, BMI (Body Mass Index), and PEPS score (Physical Education Predisposition Score).

During the post-pandemic period, a notable correlation was identified between academic success and physical fitness parameters within the group. The high standard deviations suggest that the relationship between physical fitness and academic performance within the group varies considerably. For instance, some students may excel academically but show lower performance in physical fitness.

Table 3

The overview of continuous variables for the pre-pandemic group is presented in summary form.

	n	Minimum	Maximum	Mean	Standard Deviation	Variance
Grade Point Average	80	67,37	97,98	89,30	6,24	39,00

Shuttle Run	80	10,00	80,00	38,41	18,66	348,04
Flexibility	80	8,00	47,00	27,75	7,83	61,35
Push-Up	80	2,00	72,00	21,18	16,03	257,06
Sit-Up	80	14,00	85,00	63,45	19,88	395,19
BMI	80	15,00	28,00	19,50	2,60	6,78
PEPS Score	80	21,00	48,00	36,29	7,15	51,12

Table 3 presents the findings on participants' physical fitness levels, grade point averages, and predisposition scores for physical education classes before and after the pandemic. The parameters assessed include grade point average, shuttle run, flexibility, push-up, sit-up, BMI (Body Mass Index), and PEPS score (Physical Education Predisposition Score).

Table 4

Kolmogorov-Smirnov Normality Assumptions of Variables.

	Grade Point Average	**Shuttle Run**	**Flexibility**	**Push-Up**	**Sit-Up**	**BMI**	**PEPS Score**
Mean	89,30	38,41	27,75	21,18	63,45	19,50	36,29
Standard Deviation	6,24	18,66	7,83	16,03	19,88	2,60	7,15
K-S value	1,07	1,06	0,56	1,38	2,41	0,84	1,43
p value	0,204	0,211	0,908	0,045*	0,000*	0,486	0,033*

Examining the normal distribution assumptions of the variables reveals that grade point average, shuttle run, flexibility, and BMI align with a normal distribution ($p > \alpha=0.05$). However, push-up, sit-up, and PEPS score do not follow a normal distribution ($p < \alpha=0.05$). Accordingly, both parametric and non-parametric tests will be applied in the analysis. Pearson's parametric correlation analysis will be used for pre-post correlations of normally distributed variables, whereas Spearman's non-parametric correlation analysis will be applied for variables that do not follow a normal distribution.

Table 5

Correlation Analysis Results of Grade Point Average, Shuttle Run, Flexibility, BMI, Push-Up, Sit-Up, and PEPS Score for the Female Group Before and After the Pandemic

	Correlation	**p value**
Grade Point Average	-0,157	0,508
Shuttle Run	-0,036	0,880
Flexibility	0,074	0,756
Push-Up	0,231	0,326
Sit-Up	0,164	0,491
BMI	-0,029	0,902
PEPS Score	-0,238	0,312

In reviewing the Pearson correlation analysis results for the female group's pre-post values in grade point average, shuttle run, flexibility, and BMI, and the Spearman correlation analysis results for pre-post values in push-up, sit-up, and PEPS scores, no statistically significant relationships were observed between pre-post values across all variables ($p > \alpha=0.05$).

Table 6

Correlation Analysis Results of Grade Point Average, Shuttle Run, Flexibility, BMI, Push-Up, Sit-Up, and PEPS Score for the Male Group Before and After the Pandemic

	Correlation	**p value**
Grade Point Average	0,110	0,643
Shuttle Run	0,235	0,319
Flexibility	-0,250	0,287
Push-Up	0,134	0,572
Sit-Up	-0,394	0,086
BMI	-0,274	0,243
PEPS Score	0,088	0,711

Analyzing the Pearson correlation results for pre-post values of grade point average, shuttle run, flexibility, and BMI in the male group, along with the Spearman correlation results for pre-post values of push-up, sit-up, and PEPS scores, revealed no statistically significant relationships across all variables ($p > \alpha=0.05$).

Table 7

Correlation Analysis Results of Grade Point Average, Shuttle Run, Flexibility, BMI, Push-Up, Sit-Up, and PEPS Score for All Groups (Female + Male) Before and After the Pandemic

	Correlation	**p value**
Grade Point Average	-0,034	0,833
Shuttle Run	0,178	0,271
Flexibility	-0,356	0,024*
Push-Up	-0,117	0,470
Sit-Up	-0,046	0,778
BMI	-0,030	0,856
PEPS Score	0,179	0,268

Evaluating the Pearson correlation analysis for pre-post values of grade point average, shuttle run, flexibility, and BMI across the entire group, alongside the Spearman correlation results for pre-post values in push-up, sit-up, and PEPS scores, revealed a statistically significant relationship only in the flexibility variable ($p < \alpha=0.05$), with no significant relationships in other variables ($p > \alpha=0.05$). Upon examining the strength and direction of this relationship, a moderate, inverse correlation was observed.

Discussion and Conclusion

This study investigated the impact of the COVID-19 pandemic on the physical fitness levels, academic performance, and interest in physical education classes among 8th-grade students. Findings suggest that the pandemic period significantly influenced students' physical and academic development. Prior research on the connection between physical activity and academic success presents substantial inconsistencies. Some studies report a weak positive correlation between these variables (Kalantari and Esmaeilzadeh, 2016), whereas others find no significant relationship (Dagli, 2012). These discrepancies are often attributed to a mix of factors, with socioeconomic status playing a key role (Kwak et al., 2009; Marques et al., 2018; Tomporowski et al., 2011). Additionally, variations in research settings and the educational background of participants' families also appear to affect this relationship (Donnelly et al., 2016). This study accounted for potential confounders, including socioeconomic status, parental education level, and access to private tutoring. Increases in physical activity may correlate with improved academic performance, though this relationship may vary based on gender. Some studies indicate that higher physical activity levels benefit reading achievement in both genders but enhance mathematics achievement mainly in boys (Booth et al., 2014). Another study observed that extending recess duration did not directly impact academic achievement, though it did support greater physical activity and stronger

social ties among students (Dagli, 2012). Generally, research reveals a weak positive link between physical activity and academic performance (Marques et al., 2018), though aerobic fitness is considered particularly influential on academic success (Chomitz et al., 2009; Van Dusen et al., 2011). Analysis of the female group's data revealed no statistically significant correlations between pre- and post-pandemic values for grade point average, shuttle run, flexibility, or BMI ($p > 0.05$). Likewise, no significant relationships were noted for push-up, sit-up, and PEPS scores ($p > 0.05$), suggesting stable physical and academic performance among female students during the pandemic (Nyenhuis et al., 2020). Similarly, analysis for the male group showed no statistically significant differences in pre-post pandemic values for grade point average, shuttle run, flexibility, and BMI ($p > 0.05$), nor for push-up, sit-up, and PEPS scores ($p > 0.05$). These findings indicate consistent physical and academic performance among male students throughout the pandemic (García-Tascón et al., 2020). In summary, the pandemic brought notable changes to students' physical and academic performance. Literature on the link between physical activity and academic achievement remains inconsistent. Factors such as socioeconomic status and parental education level are believed to significantly influence this relationship, and the impact of physical activity on academic success may differ by gender. While research generally shows a weak positive association between physical activity and academic achievement, no statistically significant gender-based differences were found in physical and academic performance before and after the pandemic. This suggests that the pandemic's effects on both genders were similar.

Ethics Committee Permission Information

Ethical evaluation board: Erciyes University Social and Human Sciences Ethics Committee

Date of the ethical assessment document: 30.01.2024

Issue number of the ethics evaluation document: 44

Conflict of interest

The authors declare no conflict of interest.

Statement of Support and Acknowledgment

All authors contributed equally to the writing of this article

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