Journal of Global Education and Research
ISSN 2577-509X (online) ISSN 2577-5081 (print)

Volume 8 | Issue 2 Article 3

July 2024

The relationship between physical activity level, digital game addiction, and academic success levels of university students

Aydin Ilhan
Pamukkale University, aydinilhan@pau.edu.tr

Recommended Citation

Ilhan, A. (2024). The relationship between physical activity level, digital game addiction, and academic success levels of university students. *Journal of Global Education and Research, 8*(2), 132-143. https://www.doi.org/10.5038/2577-509X.8.2.1301

The relationship between physical activity level, digital game addiction, and academic success levels of university students

Authors

Corresponding Author

Aydin Ilhan, Pamukkale Üniversitesi Spor Bilimleri Fakültesi Kınıklı, 20160 Pamukkale/Denizli, Turkiye

Abstract

This study examined the relationship between physical activity, digital game addiction, and academic success among university students. Participants were university 704 students from Turkiye who did physical activity and played digital games. The sample group consisted of 704 university students (342 women and 362 men), selected through random sampling. Data were collected using demographic information forms, a digital game addiction scale, and an international short-form questionnaire about physical activity. The data were analyzed using Pearson correlation, *t*-tests, one-way ANOVA, and post-hoc tests. The findings revealed a significant negative relationship between academic success and both physical activity and digital game addiction. Men exhibited higher levels of digital game addiction compared to women, but there was no significant gender difference in physical activity levels. Students who were categorized as academically successful had lower levels of both digital game addiction and physical activity.

Keywords

physical activity, digital game, academic achievement, young adults, internet

Revisions

Submission date: May 26, 2022; 1st Revision: May 30, 2023; 2nd Revision: Jun. 15, 2023; 3rd Revision: Jul. 7, 2023; 4th Revision: Oct. 13, 2023; Acceptance: Jun. 9, 2024

The Relationship Between Physical Activity Level, Digital Game Addiction, and Academic Success Levels of University Students

Aydin Ilhan

Faculty of Sport Science
Pamukkale University, Turkiye
aydinilhan@pau.edu.tr

Abstract

This study examined the relationship between physical activity, digital game addiction, and academic success among university students. Participants were university 704 students from Turkiye who did physical activity and played digital games. The sample group consisted of 704 university students (342 women and 362 men), selected through random sampling. Data were collected using demographic information forms, a digital game addiction scale, and an international short-form questionnaire about physical activity. The data were analyzed using Pearson correlation, *t*-tests, one-way ANOVA, and post-hoc tests. The findings revealed a significant negative relationship between academic success and both physical activity and digital game addiction. Men exhibited higher levels of digital game addiction compared to women, but there was no significant gender difference in physical activity levels. Students who were categorized as academically successful had lower levels of both digital game addiction and physical activity.

Keywords: physical activity, digital game, academic achievement, young adults, internet

Introduction

Developments in technology make our lives easier. Many tools create the opportunity for people to have more spare time for themselves. Despite this, people prefer a more sedentary life, resulting in health problems. Children and young people have mainly been unable to set down their tablets, computers, game consoles, smartphones, and similar technology products. This situation increases physical and mental disorders in children and young people and rapidly increases obesity, one of today's most important problems.

Regular physical activity reduces the risk of some health problems by lowering blood pressure and preventing obesity (Acikada, 2009). It plays a vital role in the growth and development of young people and is the basis of physical, mental, and psychological development (Hills et al., 2007). Excessive use of technological devices causes the growth of an asocial generation with poor personal communication and increased obesity (Urlu, 2014). Due to innate characteristics, people need to move constantly (Yengin, 2012). Inactivity creates serious health problems, such as cardiovascular disease, diabetes, and obesity. To prevent these problems and increase the quality of life, individuals should undertake consistent physical activity (Birinci et al., 2019; Marques et al., 2018).

Individuals with healthy body structures who use their time well significantly affect their academic success. Physical activity is one of the most effective ways to maintain health (Batoulia & Saba, 2017). It contributes significantly to everyone's physical and psychological development (Hills et al., 2007). Participating in physical activity helps build success, explore the environment, socialize, have a good time, and improve physical condition (Gill et al., 1983; Rickel et al., 2012; Sit & Lindner, 2007). Inactivity and a lack of knowledge, skills, attitudes, and behaviors that begin at a young age often continue into later years, resulting in insufficient physical activity (Freedman et al., 2007).

Physical activity must become a lifelong habit to benefit one's health. It should be part of daily life and become a lifestyle. Participation in physical activities strengthens self-confidence and sportsmanship in individuals and improves their success and social communication skills (Gur & Kucukoglu, 1992). Physical activity plays an important role in the growth of young people as healthy individuals. Insufficient physical activity is a risk factor for cardiovascular diseases, chronic diseases such as obesity and diabetes, and mental health issues (Danaei et al., 2009; Lee et al., 2012). Participation in physical activities is decreasing because adults are leaving traditional games for digital games. Reasons include busy working hours, use of modern transportation vehicles, use of communication tools, exam preparation periods for children and young people, and course intensity (Tekkursun Demir & Cicioglu, 2018).

Digital game addiction occurs with excessive use of computers and video games, which leads to emotional and social problems (Lemmens et al., 2009). It happens when digital game use negatively affects people's lives (Weinstein, 2010). The increase in applications to psychiatry clinics due to digital game addiction has raised concerns (Griffiths & Meredith, 2009). People with an addiction have difficulties managing their lives because of psychological and social problems (Kuss & Griffiths, 2012; Liu & Peng, 2009). As digital game addiction becomes a more severe problem, studies are increasing to understand addiction and reveal its causes and consequences (Bhagat et al., 2020).

The relationship between participation in physical activities and mental performance has been a topic of curiosity. While many studies have determined that participation in physical activities positively affects academic success, some have found a negative effect (Chuang & Chen, 2009). Academic success is defined as the skills developed through grades obtained in school courses (Good, 1973).

The number of digital players worldwide is increasing every year, especially among those aged 16-24 and 25-34 (Entertainment Software Association, 2015). A study within these age ranges found that university students often exhibit game addiction, spending at least one hour a day on gaming. For many university students, playing games is an indispensable part of life, leading to inefficient time use (Cavus et al., 2016). Consequently, digital game addiction may affect their educational life and their psychological, physiological, sociological, and academic success. Therefore, the aim of this study was to examine the relationship between the physical activity and digital game addiction levels of university students and their academic success.

Methods

Research Model

This study aimed to determine the relationship between physical activity, digital game addiction, and academic achievement levels of university students. It was conducted using the screening model. The instantaneous scanning approaches in the general scanning model and the relational scanning model were used. The relational screening method is a descriptive research method used to examine the co-variation between two or more variables. Instant scanning approaches determined a time frame, aiming to describe the existing situation as it is (Karasar, 2002).

Sample

The data sample consisted of students studying at universities in Turkiye who engage in physical activity and play digital games. Data were collected from state universities, including Istanbul University, Ankara University, Eskisehir University, Akdeniz University, Pamukkale University, Marmara University, and Ataturk University. The sample group comprised a total of 704 university students (342 women and 362 men) selected through a random sampling method. Participation in the study was voluntary.

Data Collection Tools

Demographic Information Form

The demographic information form, prepared by the researcher, collected information on age, gender, place of residence, university attended, academic success average, physical activity participation, involvement in a sports branch, use of digital devices, and whether games were played on these devices.

Digital Game Addiction Scale for University Students

The digital game addiction scale by Lemmens et al. (2009) was validated and adapted to Turkish by Hazar and Hazar (2019). The Cronbach's alpha internal consistency values for this study were: α = .90 for the excessive focus and procrastination sub-dimension; α = .90 for conflict, deprivation, and seeking sub-dimension; and α = .79 for emotion change and immersion sub-dimension. The total scale had a Cronbach's alpha value of α = .94. The overfocus and delay sub-dimension consists of items 1-11; the conflict, deprivation, and seeking sub-dimension consists of items 12-17; and the emotion change and immersion sub-dimension consists of items 18-21. The scale is a 5-point Likert type consisting of *strongly disagree* (1), *disagree* (2), *undecided* (3), *agree* (4), and *completely agree* (5). Scores range from 21 to 105, with 1-21 in the normal group, 22-42 in the low-risk group, 43-63 in the risky group, 64-84 in the dependent group, and 85-105 in the high-risk group (Hazar & Hazar, 2019).

International Physical Activity Questionnaire-Short Form

The International Physical Activity Questionnaire (IPAQ) was used to measure the physical activity levels of university students. This questionnaire, designed to assess the physical activity levels of individuals aged 15-65, has been validated in multiple countries (Craig et al., 2003).

Numerous studies have confirmed its validity and reliability (Chun, 2012; Craig et al., 2003; Dinger et al., 2006; Helou et al., 2018; Medina et al., 2013; Sember et al., 2020). In Turkiye, validity and reliability studies for the IPAQ were conducted by Ozturk in 2005 for university students and by Karaca and Turnagol in 2007 for employees. The Turkish-translated version of this questionnaire, containing seven questions about time spent walking, engaging in moderate and vigorous activities, and sitting, was used in this study. The total score was calculated by summing the duration (minutes) and frequency (days) of walking, moderate-intensity activity, and vigorous activity.

Standard metabolic equivalent of task (MET) values have been established to "estimate the amount and quality of physical activity accomplished" (Sartori et al., 2019, p. 137) and defined as "MET is defined as the ratio of the metabolic rate (the rate of energy consumption) during a specific physical activity to a reference metabolic rate" (p. 137). The MET serves as a metric for expressing the level of exertion and energy output of activities, allowing comparisons among individuals of varying body weights. Actual energy expenditure (e.g., in calories or joules) during an activity depends on the individual's body mass (Sartori et al., 2019). Consequently, the energy cost of the same activity will vary for individuals of different weights (Ekelund et al., 2006). The MET was calculated by IPAQ evaluation as follows (Ashok et al., 2017, p. 237):

- MET values and formula – minutes/week
    - Walking – MET minutes per week: 3.3 x walking minutes x walking days
    - Moderate – MET minutes/week: 4.0 x activity minutes x intensity day
    - Vigorous – MET minutes/week: 8.0 x activity minutes x intensity days

- Total physical activity MET minutes/week = walking + moderate + vigorous MET minutes/sum of points per week. Categories are determined as follows:
    - Category 1 (low): <600 MET minutes/week
    - Category 2 (moderate): 600 to <3000 MET minutes/week
    - Category 3 (high): >3000 MET minutes/week

Calculation and Classification of Academic Success Scores

The academic success classification of the students is as follows: An *unsuccessful student* has an overall grade point average (GPA) between 1.99 and below. A *conditionally passed student* has a cumulative GPA between 2.00 and 2.99. A *successful student* has a cumulative GPA between 3.00 and 3.49. An *honor student* has an overall GPA between 3.50 and 4.00 (Yildirim & Bayrak, 2019).

Data Collection

The scale form for data collection was administered by the researcher, with participants completing it in person. Data were collected face to face.

Analysis of Data

Quantitative data were expressed with mean and standard deviation values. The Kolmogorov-Smirnov normality test was used to examine the normal distribution of the data, which showed a normal distribution. Therefore, the Pearson correlation test was used to examine the relationships between student academic success and digital game addiction and physical activity. The level of

significance was set at $p < .05$. To analyze the digital game addiction and physical activity levels according to gender, an independent group t-test was used. One-way ANOVA analysis determine if there were significant differences in digital game addiction and physical activity levels according to academic success levels. In case of a significant difference, Fisher's least significant difference (LSD) post-hoc analysis was used to identify specific differences between academic success levels.

Findings

Table 1 shows that, based on MET scores calculated from the IPAQ, 36% of students fall into the low physical activity group, 49% into the moderate group, and 15% into the high physical activity group.

Table 1. Categorical Score-Wise Distribution of Students for Physical Activity in Study Population

Category	Result	*N*	*%*
1 – Low	Did not meet category 2 and 3	253	36
2 – Moderate	≥ 600 MET-minutes/week	345	49
3 – High	≥ 3000 MET-minutes/week	106	15
Total		704	100

Note. MET = Metabolic equivalent of task.

Table 2 presents the descriptive values for digital game addiction and physical activity levels by academic success and gender. The data show that digital game addiction scores are higher in students with lower academic success, particularly among males. Physical activity levels are relatively consistent across academic success categories, with no significant gender differences.

Table 2. Descriptive Values of the Participants of the Study

Variable	Gender	Unsuccessful $\bar{X} \pm SD$	Conditional Pass $\bar{X} \pm SD$	Successful $\bar{X} \pm SD$	Honor $\bar{X} \pm SD$
Digital Game	Female	62.98±3.05	62.06±4.07	42.84±4.45	42.53±4.26
Addiction	Male	62.41±4.85	62.09±3.75	52.28±4.41	44.54±3.90
Physical Activity	Female	27.33±5.86	26.45±5.43	26.57±4.58	25.34±6.57
	Male	27.53±4.83	25.69±5,.11	25.56±4.60	25.81±6.65
Total (704)		183	188	220	113

According to Table 3, there was a significant negative relationship between academic success and both physical activity levels and digital addiction levels among university students. Higher academic success was associated with lower physical activity levels and lower digital addiction levels.

Table 3. Pearson Correlation (*r*) Analysis Table Between Physical Activity Level, Digital Game Addiction, and Academic Success Levels

Variable	Statistic	Digital Game Addiction	Physical Activity
Academic Success	*R*	-0.68	-0.41
	P	0.01*	0.01*
Physical Activity	*R*	0.03	
	P	0.41	

Note. $p < .05$ significant relationship.*

Table 4 indicates a significant difference in digital game addiction levels according to gender. Men were in the risk group for digital game addiction, while the physical activity levels of women and men were similar, with no significant difference between them.

Table 4. *T*-Test Analysis of Digital Game Addiction and Physical Activity Levels in Independent Groups by Gender

Variable	Gender	*N*	$\bar{X}$	*SD*	*t-Test*	*P*
Digital Game Addiction	Female	342	42.63	4.01	1.030	.03*****
	Male	362	72.31	4.28		
Physical Activity	Female	342	26.21	5.50	0.097	.92
	Male	362	26.17	5.24		

Note. **p* < .05 significant difference.

Table 5 shows a significant difference in both digital addiction and physical activity levels according to academic success categories. Students with lower academic success had higher digital addiction levels. These students spent more time on digital platforms or engaged in physical activities compared to those with higher academic success.

Table 5. Digital Game Addiction and Physical Activity Level of Students by Academic Success Level One-Way ANOVA Analysis

Variable	Academic Status	*n*	$\bar{X}$	*SD*	*F*	*p*	Difference
Digital Game Addiction - Academic success	Unsuccessful	183	62.48	4.1	4.67	.00 *	Unsuccessful-Successful (*p* = .02) Unsuccessful-Honor (*p* = .00) Conditional Pass-Successful (*p* = .02) Conditional Pass-Honor (*p* = .03)
	Conditional Pass	188	62.08	3.89			
	Successful	220	47.56	4.44			
	Honor	113	43.53	4.06			
Physical Activity -Academic Success	Unsuccessful	183	27.43	5.32	2.83	.00 *	Unsuccessful-Conditional Pass (*p* = .04) Unsuccessful-Successful (*p* = .03) Unsuccessful-Honor (*p* = .04)
	Conditional Pass	188	26.07	5.26			
	Successful	220	26.06	4.58			
	Honor	113	25.60	6.59			

Note. **p* < .05 significant difference.

Discussion

The aim of the research was to examine the relationship between the physical activity and digital game addiction levels of university students and their academic success levels. According to the findings, there was a negative significant relationship between the academic success levels of university students, their physical activity levels, and digital game addiction levels (see Table 3). The literature showed different results according to physical activity levels. A study conducted in the Czech Republic supported our findings that students who were successful in school lessons did not engage in physical activity (Kudláček et al., 2016). In another study, the academic averages of students who did not do regular physical activity were higher than those who did (Unuvar, 2018). Contrary to these studies, some studies showed that physical activity did not affect academic success. In a study conducted in Australia, there was no change in the academic success of fitness students who worked out for 75 minutes every day at the end of 14 weeks (Dwyer et al., 1983). According to Yildiz (2017), the academic success values of the students who were on sports teams did not differ from those who were not on sports teams. In another study, physical activity level was not an important determinant of academic success (Parlaktas, 2018). Contrary to these studies,

there are studies that showed results that physical activity increased academic success. In a study conducted with students at the secondary education level, students who participated in school sports had higher grade point averages (Ocal & Kocak, 2010). A study conducted on eighth-grade students found a positive but weak relationship between the physical activity levels of the students and their academic success (Bilgin, 2017).

Studies on digital game addiction generally support our findings. Students who achieve high results in their academic studies spend little time playing digital games. Xu et al. (2012) showed that high school students with high academic success in China had a low addiction to digital games. Eldeleklioglu and Vural (2013) described that academic success differed according to the duration of internet use in Turkiye. They found that internet usage and shyness positively predicted internet addiction, which negatively affected academic success. Aksoy (2015) reported a negative correlation between the internet addiction levels of high school students in Turkiye and their academic success, with internet addiction increasing as social network use increased. Yavuz's (2018) study of adolescents in Turkiye found significant differences in weekly internet usage and internet addiction levels according to academic success levels. Adolescents with high academic success had lower weekly internet usage and internet addiction scores compared to those with medium and low levels. Atalan (2018) also found that internet addiction negatively affected academic success in adolescents.

Studies in Turkiye found that as digital game addiction levels increased, academic success levels decreased. Derin (2013) reported that internet addiction scores were higher in unsuccessful students compared to successful students. Kar's (2015) study with secondary school students revealed a positive relationship between academic success scores and high internet addiction. Academic success was negatively related to the total time spent on digital games. Anderson and Dill (2000) found that academic success was negatively related to the total time spent on digital games. However, some studies found no relationship between digital game addiction and academic success. Borzekowski & Robinson (2005) analyzed data from over 192,000 students in 22 countries and found that video game use had little effect on adolescent academic achievement. Drummond & Sauer (2014) also stated that video game use had minimal impact on academic performance. The physical activity levels of women and men were similar, with no significant differences (see Table 4)—gender-predicted digital game addiction, with men more at risk. Ciu et al. (2004) supported our study, finding a relationship between gender and digital game addiction. Morahan-Martin and Schumacher's (2000) study in the United States found that men were more interested in digital games and had higher addiction levels than women. This finding was supported by Canan's (2010) study in Turkiye, which showed that internet addiction was more common in male university students. Horzum et al. (2011) examined game addiction in secondary school students in Turkiye and found similar results. Li and Wang (2013) found that Chinese adolescent boys were at a greater risk of developing online game addiction than girls. Overall, the literature shows that men are more addicted to digital games than women and spend more time with computer games, which parallels the findings of this research (Cavus et al., 2016; Erboy, 2010; Gokcearslan & Durakoglu, 2014; Horzum et al., 2011; Kurtbeyoglu, 2018).

Regarding the academic success of university students, a significant difference was found between both digital addiction levels and physical activity levels. In digital addiction levels, significant differences were found between unsuccessful and successful students, unsuccessful and highly successful students, conditional pass and successful students, and conditional pass and high-

success students. Regarding physical activity levels, significant differences were found between unsuccessful and conditionally passed students, unsuccessful and successful students, and unsuccessful and highly successful students (see Table 5). These findings support Anand (2007), who found that digital games have a detrimental effect on the academic average. He discovered that those who play digital games have a lower academic average than those who do not (Wright, 2011). Elmas et al. (2015) also support this study, finding that playing games for a long time negatively affects school success and that reducing the duration of game playing could increase school success. The difference in physical activity levels and academic success showed that the physical activity average scores were close to each other. There was a significant difference between the physical activity levels of unsuccessful students and conditional pass students and between successful and high-achieving students. While many studies have found positive effects of physical activities on academic success, Whitley's (1999) U.S.-based study of 306 high school students concluded that the academic averages of student-athletes were higher than those of non-student athletes.

Whitley's (1999) study is supported by Lindner's (1999) Hong Kong-based study, which shows that individuals who perceive themselves as successful in academic fields have more motivation to participate in sports and physical activities. Ocal and Kocak (2010) conducted a study with 651 eighth-grade students randomly selected from primary schools in Turkiye and found that those who participated in school sports had higher levels of socialization, extroversion, responsibility, general behavior development, academic achievement, and less absenteeism than those who did not participate in school sports. This study also supports the current research. Singh et al.'s (2012) multi-national study, which conducted a systematic review of 14 schools (United States 12; Canada 1; South Africa 1), showed that academic achievement in children is positively related to physical activity.

Conclusions

This study determined the relationship between physical activity, digital game addiction levels, and academic success among university students. A significant negative relationship was found between academic success and both physical activity levels and digital addiction levels, according to the gender variable. There was a significant difference in digital game addition in favor of men, but no significant difference between men and women in physical activity levels. The results suggest that reducing time spent on digital games and adjusting participation in physical activities can positively affect academic success. Therefore, factors affecting academic success should be investigated in detail. Universities should offer psychological counseling and guidance services to inform students about ways to increase their success. Students should be made aware of their digital game addiction and the time they allocate to it. Planning participation in sports-based physical activities should be encouraged by providing training on the effective use of time.

References

Acikada, C. (2009). Bırakın çocuklar oynasın [Let the children play]. In M. Haberal (Ed.), *Fiziksel aktivite, beslenme ve sağlik kongresi* (pp. 42–43). Baskent University. https://www.sporbilim.com/dosyalar/FABSK_Bildiri_kitabi.pdf

Aksoy, V. (2015). İnternet bağımlılığı ve sosyal ağ kullanım düzeylerinin fen lisesi öğrencilerinin demografik özelliklerine göre değişimi ve akademik başarılarına etkisi [The degree of change of internet addiction and social network use according to the demographic features of science high school students and its effect upon their academic success]. *The Journal of Academic Social Science, 3*(19), 365–383. https://doi.org/10.16992/ASOS.874

Anand, V. (2007). A study of time management: The correlation between video game usage and academic performance markers. *Cyber Psychology and Behavior, 10*(4), 552–559.

Anderson, C. A., & Dill, K. E. (2000). Video games and aggressive thoughts, feelings and behavior in the laboratory and life. *Journal of Personality and Social Psychology*, *78*(4), 772–790. https://www.doi.org/10.1037//O022-3514.78.4.772

Ashok, P., Kharche J. S., Raju, R., & Godbole, G. (2017). Metabolic equivalent task assessment for physical activity in medical students. *National Journal of Physiology, Pharmacy, and Pharmacology, 7*(3), 236–239. https://www.njppp.com/fulltext/28-1472311600.pdf

Atalan, E. D. (2018). *Ergenlerde bağlanma, ana-baba aracılığı ve dürtüselliğin problemli internet kullanımı ile akademik başarıya etkisi* [Effect of attachment, parental mediation, impulsivity on problematic internet usage and academic achievement] [Doctoral dissertation, Ankara University, Turkiye]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/tezDetay.jsp?id=h-aU_O4E9-Yf0XlOQs3Mhw&no=NeHv7OZmhofvuZJeUuFzjg.

Batoulia, S. A. H., & Saba, V. (2017). At least eighty percent of brain grey matter is modifiable by physical activity: A review study. *Behavioral Brain Research, 332,* 204–217. https://doi.org/10.1016/j.bbr.2017.06.002

Bhagat, S., Jeong, E. J., & Kim, D. J. (2020). The role of individuals' needs for online social interactions and interpersonal incompetence in digital game addiction. *International Journal of Human–Computer Interaction, 36*(5), 449–463. https://doi.org/10.1080/10447318.2019.1654696

Bilgin, E. (2017). *Ortaokul öğrencilerinin fiziksel uygunlukları ve akademik başarıları arasındaki ilişkinin incelenmesi* [Investigation of relationship among middle school students' physical fitness and academic achievements] [Master's thesis, Hacettepe University, Turkiye]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=DPTyuy3wRPq_qvCPSqUB6_HX6S62sOeStLMqvo1uSDD3hNL0sOZrIlTROALAATev

Birinci, Y. Z., Sahin, S., Vatansever, S., & Pancar, S. (2019). Yaşlılarda fiziksel egzersizin beyin kaynaklı nörotrofik faktör (BDNF) üzerine etkisi: Deneysel çalışmaların sistematik derlemesi [The effect of physical exercise on brain-derived neurotrophic factor (BDNF) in elderly: A systematic review of experimental studies]. *Turkish Journal of Sports Medicine, 54*(4), 276–287. https://doi.org/10.5152/tjsm.2019.142

Borzekowski, D. L., & Robinson, T. N. (2005). The remote, the mouse, and the no. 2 pencil: The household media environment and academic achievement among third grade students. *Archives of Pediatrics and Adolescent Medicine, 159*(7), 607–613. https://doi.org/10.1001/archpedi.159.7.607

Canan, F. (2010). *Üniversite öğrencilerinde internet bağımlılığı, disosiyatif belirtiler ve sosyodemografik özellikler arasındaki ilişki* [The association between internet addiction, dissociation, and socio-demographic features among college students] [Specialization thesis in medicine, Duzce University, Turkiye]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=veR1mHu9yoWjwcVUjCEoPGTEHAgjrGZ5OdD3RzsWAzPvVnYnnIRvGDrhe_RBWmNF

Cavus, S., Ayhan, B., & Tuncer, M. (2016). Bilgisayar oyunları ve bağımlılık: Üniversite öğrencileri üzerine bir alan araştırması [Computer games and addiction: A field study on university students]. *Journal of Communication Theory and Research, 43,* 265–289. https://dergipark.org.tr/en/pub/ikad/issue/72974/992418#article_cite

Chiu, S., Lee, L. Z., & Huang, H. (2004). Video game addiction in children and teenagers in Taiwan. *Cyberpsychology & Behavior, 7*(5), 571–581. http://doi.org/10.1089/cpb.2004.7.571

Chuang, T. Y., & Chen, W. F. (2009). Effect of computer-based video games on children: An experimental study. *Educational Technology and Society, 12*(2), 1–10. https://www.jstor.org/stable/jeductechsoci.12.2.1

Chun, M. Y. (2012). Validity and reliability of Korean version of International Physical Activity Questionnaire short form in the elderly. *Korean Journal of Family Medicine*, *33*(3), 144–151. https://doi.org/10.4082/kjfm.2012.33.3.144

Craig, C. L., Marshall, A. L., Sjöström, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., Pratt, M., Ekelund, U., Yngve, A., Sallis, J. F., & Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine and Science in Sports and Exercise, 35*(8), 1381–1395. https://doi.org/10.1249/01.MSS.0000078924.61453.FB

Danaei, G., Ding, E. L., Mozaffarian, D., Taylor, B., Rehm, J., Murray, C. J., & Ezzati, M. (2009). The preventable causes of death in the United States: Comparative risk assessment of dietary, lifestyle, and metabolic risk factors. *PLoS Medicine, 6*(4), Article e1000058. https://doi.org/10.1371/journal.pmed.1000058

Derin, S. (2013). *Lise öğrencilerinde internet bağımlılığı ve öznel iyi oluş* [High school students internet addiction and subjective well-being] [Master's thesis, Hacettepe University, Turkiye]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/tezDetay.jsp?id=uPHUJA7FIQoIJsM2aED2xg&no=gFP8Iw2rIq2eZ9DWYzlYGQ

Dinger, K. M., Behrens, K. T., & Hanma, L. J. (2006). Validity and reliability of the International Physical Activity Questionnaire in college students. *American Journal of Health Education, 37*(6), 337–343. https://doi.org/10.1080/19325037.2006.10598924

Drummond, A., & Sauer, J. D. (2014). Videogames do not negatively impact adolescent academic performance in science, mathematics or reading. *PLoS One, 9*(4), Article 87943. https://doi.org/10.1371/journal.pone.0087943

Dwyer, T., Coonan, W. E., Leitch, D. R., Hetzel, B. S., & Baghurst, R. A. (1983). An investigation of the effects of daily physical activity on the health of primary school students in South Australia. *International Journal of Epidemiology*, 308–313. https://doi.org/10.1093/ije/12.3.308

Ekelund, U., Sepp, H., Brage, S., Becker, W., Jakes, R., Hennings, M., & Wareham, N. J. (2006). Criterion-related validity of the last 7-day, short form of the international physical activity questionnaire in Swedish adults. *Public Health Nutrition, 9*(2), 258–265. https://doi.org/10.1079/PHN2005840

Eldeleklioglu, J., & Vural, M. (2013). Predictive effects of academic achievement, internet use duration, loneliness and shyness on internet addiction. *Hacettepe University Jounal of Education*, *28*(1), 141–152. https://dergipark.org.tr/tr/download/article-file/87128

Elmas, O., Kete, S., Quicksoy, S. S., & Kumral, H. N. (2015). Teknolojik cihaz kullanım alışkanlıklarının okul başarısı üzerine etkisi [Effects of usage habits of technological devices to school success]. *Suleyman Demirel University the Journal of Health Science, 6*(2), 49–54. https://dergipark.org.tr/tr/download/article-file/196058

Entertainment Software Association. (2015). *The power of play.* https://www.theesa.com/

Erboy, E. (2010). *İlköğretim 4. ve 5. sınıf öğrencilerinin bilgisayar oyun bağımlılığına etki eden faktörler* [The factors which effect on computer game addiction of 4th and 5th grade primary students] [Master's thesis, Adnan Menderes University, Turkiye]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=RYan9_S-Z7Eir3xdWGXBiHLtsvva-L2LMyQ749SvYHfcn5DigtOX7oyCcK_c2AML

Freedman, D. S., Mei, Z., Srinivasan, S. R., Berenson, G. S., Sit, C., & Lindner, K. (2007). Achievement goal profiles, perceived ability and participation motivation for sport and physical activity. *International Journal of Sport Psychology*, 38(3), 283-303.

Gill, D. L., Gross, J. B., & Huddleston, S. (1983). Participation motivation in youth sports. *International Journal of Sport Psychology, 14*, 1–14.

Gokcearslan, S., & Durakoglu, A. (2014). Ortaokul öğrencilerinin bilgisayar oyunu bağımlılık düzeylerinin çeşitli değişkenlere göre incelenmesi [An analysis of video game addiction levels among secondary school students according to several variables]. *Journal of Dicle University Ziya Gokalp Faculty of Education, 23*(14), 419–435. https://dergipark.org.tr/tr/pub/zgefd/issue/47938/606448

Good, C. V. (Ed.). (1973). *Dictionary of education.* McGraw-Hill.

Griffiths, M., & Meredith, A. (2009). Videogame addiction and its treatment. *Journal of Contemporary Psychotherapy Therapy, 39*(4), 247–253. http://doi.org/10.1007/s10879-009-9118-4

Gur, H., & Kucukoglu, S., (1992). *Yaşlılık ve fiziksel aktivite* [Aging and physical activity]. Roche.

Hazar, Z., & Hazar, M. (2019). Digital game addiction scale for university students. *Journal of Sport Sciences Research, 4*(2), 308–322. https://doi.org/10.25307/jssr.652854

Helou, K., El Helou, N., Mahfouz, M., Mahfouz, Y., Salameh, P., & Harmouche-Karaki, M. (2018). Validity and reliability of an adapted Arabic version of the long International Physical Activity Questionnaire. B*MC Public Health, 18*, Article 49. https://doi.org/10.1186/s12889-017-4599-7

Hills, A. P., King, N. A., & Byrne, N. M. (Eds.). (2007). *Children, obesity and exercise: Prevention, treatment and management of childhood and adolescent obesity.* Routledge.

Horzum, M. B. (2011). İlköğretim öğrencilerinin bilgisayar oyunu bağımlılık düzeylerinin çeşitli değişkenlere göre incelenmesi [Examining computer game addiction level of primary school students in terms of different variables]. *Journal of Education and Science, 36*(159), 56–68. https://egitimvebilim.ted.org.tr/index.php/EB/article/view/268/238

Kar, B. (2015). *Ortaöğretim kurumlarında okuyan öğrencilerin interneti oyun ve sosyal ağ amaçlı kullanmaları ile akademik başarılarının arasındaki ilişkinin incelenmesi* [For the purposes of online gaming and social networking for students in secondary schools an examination of the relationship between academic achievements with their use] [Master's thesis, Istanbul Aydin University, Turkiye]. https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=X-M9ZoIuIoNTj2P7iY13hSMksPJkNlkyVuNs48IlhU5zGNqNlWigS4E9iP5hksUK

Karaca, A., & Turnagöl, H. H. (2007). Çalışan bireylerde üç farklı fiziksel aktivite anketinin güvenirliği ve geçerliği [Reliability and validity of three different physical activity surveys in working individuals]. *Spor Bilimleri Dergisi, 18*(2), 68–84. https://dergipark.org.tr/tr/pub/sbd/issue/16397/171441#article_cite

Karasar, N. (2002). *Bilimsel araştırma yöntemleri* [Scientific research methods] (16th ed.). Nobel.

Kudláček, M., Frömel, K., Jakubec, L., & Groffik, D. (2016). Compensation for adolescents' school mental load by physical activity on weekend days. *International Journal of Environmental Research and Public Health*, *13*(3), Article 308. https://doi.org/10.3390/ijerph13030308

Kurtbeyoglu, S. (2018). *Ortaokul öğrencilerinin demografik özelliklerinin oyun bağımlılığı ile ilişkisi* [Demographic characteristics relationship between game addiction of middle school students] [Master's thesis, Bahcesehir University, Turkiye]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=fS4sqEZr79C_n60Rk6MjFQyl_iYyzzf7hXA-0fh4lOKZ57SNxWAQO-yQAanYE14W

Kuss, D. J., & Griffiths, M. D. (2012). Internet gaming addiction: A systematic review of empirical research. *International Journal of Mental Health and Addiction, 10*(2), 278–296. https://doi.org/10.1007/s11469-011-9318-5

Lee, I. M., Shiroma, E. J., Lobelo, F., Puska, P., Blair, S. N., & Katzmarzyk, P. T. (2012). Effect of physical inactivity on major non-communicable diseases worldwide: An analysis of burden of disease and life expectancy. *Lancet, 380*(9838), 219–229. https://doi.org/10.1016/S0140-6736(12)61031-9

Lemmens, J. S., Valkenburg, P. M., & Peter, J. (2009). Development and validation of a game addiction scale for adolescents. *Media Psychology, 12*(1), 77–95. https://doi.org/10.1080/15213260802669458

Li, H., & Wang, S. (2013). The role of cognitive distortion in online game addiction among Chinese adolescents. *Children and Youth Services Review, 35*(9), 1468–1475. https://doi.org/10.1016/j.childyouth.2013.05.021

Lindner, K. J. (1999). Sport participation and perceived academic performance of school children and youth. *Pediatric Exercise Science, 11*(2), 129–143. https://doi.org/10.1123/pes.11.2.129

Liu, M., & Peng, W. (2009). Cognitive and psychological predictors of the negative outcomes associated with playing MMOGs (massively multiplayer online games). *Computers in Human Behavior, 25*(6), 1306–1311. https://doi.org/10.1016/j.chb.2009.06.002

Marques, A., Santos, D. A., Hillman, C. H., & Sardinha, L. B. (2018). How does academic achievement relate to cardiorespiratory fitness, self-reported physical activity and objectively reported physical activity: A systematic review in children and adolescents aged 6–18 years. *Journal of Sports Medicine, 52*(16), Article 1039. https://doi.org/10.1136/bjsports-2016-097361

Medina, C., Barquera, S., & Janssen, I. (2013). Validity and reliability of the International Physical Activity Questionnaire among adults in Mexico. *Rev Panam Salud Publica, 34*(1), 21–8.

Morahan-Martin, J., & Schumacher, P. (2000). Incidence and correlates of pathological Internet use among college students. *Computers in Human Behavior, 16*(1), 13–29. https://doi.org/10.1016/S0747-5632(99)00049-7

Ocal, K., & Kocak, M. (2010). Okul sporlarının orta öğretim öğrencilerinin akademik başarı ve davranış gelişimine etkisi [The effect of school sports on the academic success and behavioral development of secondary school students]. *Mediterranean Journal of Educational Research, 7*, 89–94.

Ozturk, M. (2005). *Üniversitede eğitim-ögretim gören öğrencilerde uluslararası fiziksel aktivite anketinin geçerliligi ve güvenirliği ve fiziksel aktivite düzeylerinin belirlenmesi* [A research on reliability and validity of international physical activity questionnaire and determination of physical activity level in university students] [Master's thesis, Hacettepe University, Turkiye]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/tezDetay.jsp?id=Wu5qsjV2YfPTDWxXR0fOAQ&no=rbo_gkFabWbA8zRjgtVmwQ

Parlaktas, Y. (2018). *Ortaokul 8. sınıf öğrencilerinde fiziksel aktivite düzeyi ile akademik başarı arasındaki ilişki* [The relationship between physical activity level and academic success in secondary school 8th grade students (Kirikkale Province example)] [Master's thesis, Kirikkale University, Turkiye]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=MzP7PYssFqdb3WIjlroAkaMDwmcGTEO5bsg4bgBHHeNpxo8AfV3EsU9uc0x61Fym

Rickel, K., Park, R. S., & Morales, J. (2012). Multiple groups confirmatory factor analysis of the motivational factors influencing individuals' decisions about participating in intramural sports. *Sport Management International Journal*, *8*(2), 69–79. https://doi.org/10.4127/ch.2012.0073

Sartori, F., Melen, R., Lombardi, M., & Maggiotto, D. (2019). Virtual round table knights for the treatment of chronic diseases. *Journal of Reliable Intelligent Environments, 5*, 131–143. https://doi.org/10.1007/s40860-019-00089-8

Sember, V., Meh, K., Sorić, M., Starc, G., Rocha, P., & Jurak, G. (2020). Validity and reliability of International Physical Activity Questionnaires for adults across EU countries: Systematic review and meta analysis. *International Journal of Environmental Research and Public Health, 17*(19), Article 7161. https://doi.org/10.3390/ijerph17197161

Singh, A., Uijtdewilligen, L., Twisk, J. W., van Mechelen, W., & Chinapaw, M. J. (2012). Physical activity and performance at school: A systematic review of the literature including a methodological quality assessment. *Archives of Pediatric Adolescent Medicine, 166*(1), 49–55. https://doi.org/10.1001/archpediatrics.2011.716

Sit, C., & Lindner, K. (2007). Achievement goal profiles, perceived ability and participation motivation for sport and physical activity. *International Journal of Sport Psychology, 38*(3), 283–303.

Tekkursun Demir, G. T., & Cicioglu, H. I. (2018). Fiziksel aktiviteye katılım motivasyonu ölçeği (FAKMÖ): Geçerlik ve güvenirlik çalışması [Motivation scale for participation in physical activity (MSPPA): A study of validity and reliability]. *Journal of Human Sciences, 15*(4), 2479–2492. https://www.j-humansciences.com/ojs/index.php/IJHS/article/view/5585

Unuvar, I. (2018). *Do students who engage in regular physical activity perform better in school? Implications for instruction* [Doctoral dissertation, Bilkent University, Turkiye]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/tezDetay.jsp?id=KzwCGFqx73Erk8yPNLIe6w&no=yeSQp9dTWpgg7MdikQ0wbA

Urlu, Y. (2014). *10-12 yaş grubu çocukların fiziksel aktivite düzeylerinin araştırılması (Antalya ili örneği)* [Research of 10–12-year-old children's physical activity levels (Sample of Antalya)] [Master's thesis, Balikesir University, Turkiye]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=1zw6GvYMe-q3Hf6HR-3US1iUv0XjSv17Wj6jMkZ4D654nJb59xV04d6HyZDhwcWT

Weinstein, A. M. (2010). Computer and video game addiction: A comparison between game users and non-game users. *The American Journal of Drug and Alcohol Abuse, 36*(5), 268–276. https://doi.org/10.3109/00952990.2010.491879

Whitley, R. L. (1999). Those dumb jocks are it again: A comparison of the educational performances of athletes and nonathletes in North Carolina high schools from 1993 through 1996. *High School Journal, 82*(4), 223–233. https://www.jstor.org/stable/40364479

Wright, J. (2011). The effects of video game play on academic performance. *Modern Psychological Studies, 17*(1), 37–44. https://scholar.utc.edu/mps/vol17/iss1/6

Xu, J., Shen, L. X., Yan, C. H., Hu, H., Yang, F., Wang, L., & Ouyang, F. X. (2012). Personal characteristics related to the risk of adolescent internet addiction: A survey in Shanghai, China. *BMC Public Health, 12,* Article 1106. https://doi.org/10.1186/1471-2458-12-1106

Yavuz, O. (2018). Ergenlik döneminde internet bağımlılığının okul başarısı üzerinde etkileri [The effects of internet addiction on school success during adolescence]. *OPUS International Journal of Society Research, 8*(15), 1056–1080. https://doi.org/10.26466/opus.426914

Yengin, D. (2012). *Dijital oyunlarda şiddet* [Violence in digital games]. Beta.

Yildirim, M., & Bayrak, C. (2019). Üniversite öğrencilerinin spora dayalı fiziksel aktivitelere katılımları ve yaşam kalitelerinin akademik başarı ve sosyalleşme üzerine etkisi (Eskişehir Osmangazi Üniversitesi örneği) [The participation of university students in physical activities based on sport and the effect of the students'quality of life on academic achievement and socialisation (Sample of Eskisehir Osmangazi University)]. *Hacettepe University Journal of Education, 34*(1), 123–144. http://www.efdergi.hacettepe.edu.tr/upload/files/2306-published.pdf

Yildiz, M. E. (2017). Ortaokul öğrencilerinde akademik başarı ile fiziksel aktivite ilişkisi [The relationship between academic achievement and physical activity in secondary school students]. *Journal of Social and Humanities Sciences Research,* 891–898. https://doi.org/10.26450/jshsr.168