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Derleme Makalesi

Video Oyunlarından Akademik Başarıya Giden Yol: Öğrencilerin Nefes Alacakları Bir Vaha Mı, Yollarını Kaybetmelerine Neden Olan Bir Serap Mı?

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Öz: Video oyunları, kırk yılı aşkın bir süredir hayatımızda bulunmaktadır. Video oyunlarıyla ilgili literatürün son zamanlarda geliştiği görülmektedir. Ancak, video oyunları ve akademik başarı arasındaki ilişki üzerine yapılan mevcut araştırmalar çelişkili bulgular ortaya koymaktadır. Bu ilişki ile ilgili olarak üç veri tabanında (PubMed/MEDLINE, ScienceDirect ve Scopus) bir inceleme yapılmıştır. Literatürdeki konuyla ilgili tüm çalışmaların bir arada değerlendirilmesi, tartışmalı bir konu olan video oyunları ile akademik başarı arasındaki farklı dinamiklerin yorumlanmasına olanak sağlaması açısından kritik öneme sahiptir. Dolayısıyla, bu derleme çalışması mevcut literatürü dikkate alarak video oyunlarının akademik başarıyı nasıl etkilediğini araştırmayı amaçlamaktadır. Bulgular, video oyunlarına harcanan fazla zamanın, tüm sınıf seviyelerinden öğrenciler için düşük akademik başarı ile ilişkili olduğunu göstermiştir. İnternette oyun oynama bozukluğu ve bağımlılık eğilimleri de düşük akademik başarı ile ilişkili bulunmuştur. Sonuç olarak, video oyunu oynamanın aşırı ve bağımlılık yapıcı hale gelmesi akademik başarının önünde bir engeldir. Diğer taraftan, dengeli olduğu sürece öğrencilerin akademik çıktılarına olumlu etkileri olabileceği bulunmuştur.

Anahtar kelimeler:
Video Oyunları,
Akademik Başarı,
Akademik Performans

The Path from Video Games to Academic Achievement: An Oasis for Students to Breathe or A Mirage That Makes Them Lose Their Way

Abstract: Video games have been in our lives for no longer than four decades. Literature on video games has recently thrived. However, existing research on the relationship between video games and academic achievement revealed ambiguous findings. A review study into this association was carried out in three databases (PubMed/MEDLINE, ScienceDirect, and Scopus). Evaluating all relevant studies in the literature together is critical in terms of allowing the interpretation of different dynamics in the relationship between video games and academic achievement, which is a controversial issue. This review study aims to investigate how video games affect academic achievement by considering the existing literature. Findings demonstrated that excess time spent on video games was associated with poor academic achievement for students from all grade levels. Internet gaming disorder and addiction tendencies were also related to low academic achievement. When video game playing becomes excessive and addictive, it is an obstacle to academic achievement. Therefore, as long as it is balanced, it can have positive effects on students' academic outcomes.

Key Words:
Video games,
Academic achievement,
Academic performance

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INTRODUCTION

Video games are becoming increasingly important for students (Garakani et al., 2021). Because the video game market is a rapidly growing field that impacts almost all age groups, researchers consider various aspects of video games, including their relationship with school outcomes (Khorsandi & Li, 2022). Video games mainly aim to entertain all players (Kim, Han & Han, 2018). When students spend their time playing video games, they should maintain balance because video games attract their attention and stimulate them to play more (Corder et al., 2015; Rahmawati et al., 2022). At this point, the role of video games has long been a matter of curiosity. Is the path from video games to academic achievement an oasis for students to breathe or a mirage that makes them lose their way? This question will be addressed throughout this review study.

Before discussing the relationship between video games and academic achievement, it is crucial to describe video game features to get a comprehensive understanding of the platforms, types, and aims of video games according to current circumstances. Video games are computer programs handled by the player through various platforms, such as computers, mobile phones, or consoles (Aguado-Delgado et al., 2020). Also, educational video games and exergames are significant types of video games. Educational video games are designed as a teaching tool in order to promote students' learning, while exergames entail the physical activity of the player (Mack et al., 2017; Staiano, 2020). Video games always require the use of a screen. Nonetheless, the content and aim of video games differ significantly. Thus, the variety of video games according to their content, aim, and usage leads to the emergence of different opinions from the players' surrounding environment.

Parents and educators are critical in controlling and regulating what kind of video games students play and how much time they spend on them. Parents and educators often make exaggerated claims about the negative impact of video games on academic achievement (Hartanto, Toh & Yang, 2018). On the contrary, some studies put forward the beneficial effects of video games. For example, Wack and Tantleff-Dunn (2009) indicate that the frequency of play is not associated with the grade point average. Moreover, they emphasize that video games are crucial for coping with stress and loneliness because students socialize and relax by playing. Similarly, Cardoso-Leite et al. (2021) reveal that playing video games is associated with faster responding for students. Furthermore, they suggest that video games can help to improve students' mental health. Likewise, several studies demonstrate that students playing video games have better visual spatial skills, such as mental rotation, visual tracking, and target localization (Jackson et al., 2011b; Kühn, Gallinat & Mascherek, 2022; Schmidt & Vandewater, 2008). Also, educational video games are found as effective in enhancing students' learning performance by decreasing cognitive load (Hwang, Chien & Li, 2021). Correspondingly, Benzing and Schmidt (2017) point out exergaming which is effective at improving executive functions. Because exercise enhances students' sustained attention, exergaming can be beneficial in promoting greater academic achievement (Serrano et al., 2021; Silva et al., 2015).

On the other hand, a number of studies have reported that video games lead to worse academic performance combined with various risk factors. According to Ferguson (2015), video games are correlated with decreased prosocial behavior, increased aggression, and depressive symptoms. Ferguson also states that video games with violent content are a popular leisure choice, but they may result in worse academic outcomes and more difficulties in learning. Similarly, Estévez, Jáuregui & Aurrekoetxea-Casaus (2020) claim that abuse may be associated with types of video games. Results related to video game abuse reveal that Fortnite players are at risk of substance abuse, while FIFA players experience early signs of gambling disorder. Thus, the content and aim of video games can create different narratives.

Playing video games may have a considerable impact on the lifestyle of students depending on increased inactivity. Video games increase screen time, and this leads to a more sedentary lifestyle (Gill et al., 2021). Likewise, academic achievement is negatively related to screen time and a sedentary lifestyle (Alhusaini, Buragadda & Melam, 2020; Hunter, Leatherdale & Carson, 2018; Marciano & Camerini, 2021). At this point, it is crucial to consider how much time students spend on the screen and whether they can maintain an active lifestyle when playing video games. Although students mostly expose to the screen with video games, there are various activities causing more screen time. Especially using a mobile phone and watching TV are among them. However, viewing TV and using a mobile phone are also associated with playing video games (Rowntree & Feeney, 2019; Sharma et al., 2017). Therefore, research on students' screen time is crucial to the relationship between video games and academic achievement.

Screen time is among the factors influencing the students' lifestyle. Screen time replaces healthy habits and lifestyle, and this results in reduced sleep and physical activity (Pandya & Lodha, 2021). Students playing

video games tend to sleep less due to undesirable psychological states and unhealthy habits (Adelantado-Renau et al., 2019; Yland et al., 2015). Also, they are likely to have improper eating habits, such as skipping breakfast and snacking at night (Yan et al., 2017). Similarly, Husarova et al. (2018) report more energy drink consumption and reduced sleep regarding excessive time spent on video games. Sleep time and academic performance are directly related to each other (Arora et al., 2018; Peiró-Velert et al., 2014). Hence, factors affecting sleep time and quality of students are the object of video game research.

An increasing number of studies proving the impact of video games on students' outcomes suggest the significance of measures by countries to regulate the usage of video games. In the world, there is an effort by several countries to develop policies preventing the adverse effects of video games (Saunders & Vallance, 2017). For instance, the South Korean government started implementing an online game shutdown policy to improve student outcomes. Restriction lasted from 12:00 to 06:00 am every day. However, this shutdown policy was not beneficial in decreasing time spent on video games and increasing sleeping hours (Choi et al., 2018). On the other hand, another study was conducted in the Gyeonggi province of South Korea. Gyeonggi province schools decided to implement the 9 O'clock Attendance Policy. Delayed school start times to 9 o'clock increased sleep time and decreased the play of video games (Kim, 2022). The difference between these two studies is about who decides. If students are forced to play video games less, they are unwilling to comply with the idea. However, when they decide alone, desirable outcomes emerge. In a study carried out in Japan to determine the effect of video games found that long time spent on video games risks for obesity in students (Morita et al., 2016). This finding can be significant for school outcomes because physical fitness is correlated with academic achievement (García-Hermoso & Marina, 2017; Marques et al., 2014).

Video games sometimes seem like a mirage. If people are mistakenly becoming Don Quixote by assuming video games as a mirage, an oasis will be lost in the education desert. Thus, this review study is crucial to explore how video games affect academic achievement.

There have been many studies investigating academic achievement. However, literature on video games has recently thrived because serious concerns have been raised. For example, a study conducted in 33 countries demonstrated the prevalence of internet gaming disorder for adolescents and young adults, respectively 8.8% and 10.4% (Gao, Wang & Dong, 2022). Similarly, according to American College Health Association, 10 % of undergraduate students in the USA experience problematic internet use/computer gaming (Stevens et al., 2020). In the existing literature, sleep quality, eating habits, and active lifestyle are some of the factors related to video games and academic achievement. Nevertheless, how video games influence academic achievement is debatable. The types of video games differ, and therefore, their relationship with academic achievement also changes. Current literature has revealed many different findings regarding this issue, and it would be helpful to evaluate and discuss these findings by making comparisons. Thus, a comprehensive review study is essential to understand existing studies' characteristics and how video games impact academic achievement.

METHOD

This review study aims to investigate how video games affect academic achievement by considering existing current literature. The objectives of this study are to (1) identify all studies which include the relationship between video games and academic achievement, and (2) evaluate how video games influence the academic achievement of students. Following terms were used for the search strategy: 1) video games, 2) computer games, 3) academic achievement, 4) academic performance. These search terms were combined as follows: ("video games" OR "computer games") AND ("academic achievement" OR "academic performance"). PubMed/MEDLINE, ScienceDirect, and Scopus were used to search for relevant studies addressing the relationship between video games and academic achievement. The search was conducted in January 2023. The date of publication was not restricted for searching on the databases. Similar review studies applied a date restriction by claiming that research on video games has thrived after the 2010s (Martinez, Gimenes & Lambert, 2022; Pallavicini, Pepe & Mantovani, 2021). Some review studies did not apply a date restriction (Bonnechère et al., 2016; LeBlanc et al., 2013). Therefore, this review study did not include a date restriction, considering that the research on the relationship between video games and academic achievement does not go back a very long time ago today.

A literature search was conducted to identify eligible studies investigating the relationship between video games and academic achievement. Studies identified after a literature review were used to get a general understanding of how video games may affect academic achievement. This study aimed to get a narrative and

reasons behind the outcomes to understand the complex nature of video game research related to academic achievement. Studies observing school-aged children's use of at least one video game were included. The following information was focused on the included studies: the country where the study was conducted, the study design, school grade levels of participants, video game type, and primary outcomes. When this literature review study gives the general view of current literature by making an in-depth discussion, a summary of findings is presented in a table. The variety of educational policies enacted by countries, a substantial number of concerns of parents and educators, numerous factors researchers tried to explain the relationship between video games and academic achievement necessitate a thorough discussion on this subject to get a general framework. Thus, this study aimed to conduct a comprehensive literature review.

FINDINGS

Evaluating all relevant studies in the literature together is critical in terms of allowing the interpretation of different dynamics in the relationship between video games and academic achievement, which is a controversial issue. A summary of the findings can be seen in Table 1.

Table 1

Summary of the Study Characteristics of the Papers

Study	Country	Study design	School grade levels	Game	Main findings
Adžić et al. (2021)	Saudi Arabia	Cross sectional	Undergraduate students (n = 17)	Video game	The differences in GPA between the students who were gamers and those who were not was not significant.
Anand (2007)	United States	Cross sectional	Undergraduate students (n = 245)	Video game	Video games have a high possibility of negatively influencing students' GPA and SAT scores.
Borgonovi (2016)	26 countries who sat the PISA 2012 assessments	Cross sectional	High school students (n = 145,953)	Video game	Excessive gaming may hinder academic achievement, but moderate gaming can promote positive student outcomes.
Brunborg, Mentzoni & Frøyland (2014)	Norway	Longitudinal	High school students (n = 8,356)	Video game	Video game addiction was associated with lower academic achievement, depression, and conduct problems. However, there was no relationship between time spent on video games and these outcomes.
Bustamante-Barreto, Corredor & Hernandez-Posada(2022)	Colombia	Cross sectional	High school students (n = 1,149,964)	Video game	Having a video game console helps to improve academic results of all students.
Cardoso-Leite et al. (2021)	Switzerland	Cross sectional	Elementary school students (n = 118)	Video game	Spending time with video games was associated with high response speed without any change in cognitive performance.
Chen, Wilhelm & Joeckel (2020)	Singapore	Cross sectional	Middle school students (n= 507)	Video game	Time spent on video games was negatively associated with active gamers' school performances.

Table 1 (continued)

Drummond and Sauer (2014)	22 OECD countries involved in the 2009 PISA	Cross sectional	High school students (n = 192,000)	Video game	There was no significant relationship between videogame use and academic performance.
Drummond and Sauer (2020)	35 OECD countries	Cross sectional	High school students (n = 219,113)	Video game	A systematic relationship was not found between video gameplay and academic performance.
Eow and Baki (2009)	Malaysia	Cross sectional	Middle school students (n = 236)	Video game	Computer games have negative and weak associations with students' academic achievement.
Gao et al. (2013)	United States	Cross sectional	Elementary school students (n = 268)	Exergame	The DDR-based exercise intervention improved children's cardiorespiratory endurance and math scores over time.
Gnambs et al.(2020)	Germany	Longitudinal	High school students (n = 3,554)	Video game	Longer gaming times predicted worse grades 2 years later.
Gómez-Gonzalvo, Devís-Devís & Molina-Alventosa (2020)	Spain	Cross sectional	High school students (n = 1,502)	Video game	Frequent, moderate and many of the occasional players obtain good academic results, while the opposite happens to the intensive players.
Haghbin et al. (2013)	Iran	Cross sectional	High school students (n = 339)	Video game	A causal association was not found between video game addiction, video game use and academic achievement.
Hastings et al. (2009)	United States	Cross sectional	Elementary school students (n = 70)	Video game	Excess game play and violent games lead to adverse academic and behavioral outcomes, while educational games are associated with more positive results.
Hawi, Samaha & Griffiths (2018)	Lebanon	Cross sectional	High school students (n = 2,096)	Video game	Students with internet gaming disorder had the lowest grades compared to other groups.
Islam, Biswas & Khanam (2020)	Australia	Cross sectional	High school students (n = 1,704)	Video game	Addiction tendency to internet and electronic-gaming is found to be adversely associated with academic achievement.
Jackson et al. (2011a)	United States	Longitudinal	Middle school students (n = 482)	Video game	Playing video games was linked to lower grades but also with better visual-spatial skill.
Kanthan and Senger (2011)	United States	Cross sectional	Undergraduate students (n = 114)	Educational video game	Specially constructed digital games-based learning in undergraduate pathology courses showed improved academic performance with increased student satisfaction and engagement.

Table 1 (continued)

Kebritchi, Hirumi & Bai (2010)	United States	Randomized controlled trial	High school students (n = 193)	Video game	Students playing in their school labs and classrooms showed higher motivation and academic achievement compared to the ones who played the games only in the school labs.
Kert et al. (2017)	Turkey	Cross sectional	Elementary school students (n = 105)	Video game	It was found that participants' mathematical or physical science skills were positively correlated with game success.
Lin, Wei & Hung (2012)	Taiwan	Randomized controlled trial	Middle school students (n = 30)	Educational video game	The research presents positive impact of Digital Game Based Learning on enhancing students' learning motivation and academic performance.
Merino-Campos, del-Castillo & Medina-Merodio (2022)	Spain	Randomized controlled trial	High school students (n = 166)	Educational video game	Educational video games led to enhanced academic performance in physical education.
Ramírez et al. (2021)	Chile	Cross sectional	Middle school students (n = 2,440)	Video game	The time spent playing video games was related to lower self-reported academic performance.
Sahin, Gumus & Dincel (2016)	Turkey	Cross sectional	High school students (n = 370)	Video game	Although game addiction is negatively associated with academic achievement, this relationship is not significant.
Savić et al. (2022)	Serbia	Cross sectional	Undergraduate students (n = 233)	Video game	Students who play more games may have slightly lower grades than students who do not play games. The best students spend the least time playing video games and the most time studying compared to other students.
Skoric, Teo & Neo (2009)	Singapore	Cross sectional	Elementary school students (n = 333)	Video game	Although video engagement and time spent on video games are not associated with scholastic performance, addiction tendencies are negatively linked to scholastic performance.
Stevens et al. (2020)	United States	Cross sectional	Undergraduate students (n = 43,003)	Video game	Problematic internet use/computer gaming negatively impacted academic performance.
Tobias, Rudy & Ispa (2011)	United States	Cross sectional	Middle school students (n = 88)	Video game	Findings demonstrate that spatial content, time spent on playing and complexity of games are not related to math performance.

Table 1 (continued)

Ventura, Shute & Kim (2012)	United States	Cross sectional	Undergraduate students (n = 319)	Video game	Students who were medium in selective player style (spent 11–50 h) had significantly higher GPAs than students low on selective player style (spent 0–10 h).
Weis and Cerankosky (2022)	United States	Randomized controlled trial	Elementary school students (n = 64)	Video game	Boys who received the video game system started to spend more time on video games while they chose to participate in less after-school academic activities. Also, their writing and reading scores decreased.
Yang and Chang (2013)	Taiwan	Randomized controlled trial	Middle school students (n = 67)	Educational video game	Digital game-based learning demonstrated significant improvements in critical thinking skills, and academic achievement.
Yeh and Cheng (2016)	Taiwan	Cross sectional	Middle school students (n = 355)	Video game	Greater participation in computer games correlated significantly with lower academic achievement.
Yeşilbağ, Korkmaz & Çakir (2020)	Turkey	Quasi experimental	High school students (n = 60)	Educational video game	Educational video games increased tenth-grade students' academic achievement.

When Table 1 is examined, it is understood that most studies related to relationship between video games and academic achievement were conducted in the United States, with 10 studies followed by Spain (4) and Taiwan (3). The most investigated school grade level was high school, with 14 studies, followed by middle school (8), university (6), and elementary school (6). Included studies in which students experience different video game types examined academic achievement. Several studies investigated educational video games (Kanthan & Senger, 2011; Lin et al., 2012; Merino-Campos et al., 2022; Yang & Chang, 2013; Yeşilbağ et al., 2020), while only one study related to exergame was found (Gao et al., 2013). The remaining 28 studies examined the relationship between general video games and academic achievement. Included studies employed different study designs; cross-sectional, longitudinal, randomized controlled trial, and quasi-experimental. The main findings obtained from these studies give an understanding of the current literature on the relationship between video games and academic achievement and should be comprehensively discussed.

DISCUSSION, CONCLUSION AND SUGGESTIONS

This study, which does not focus on statistical data of current research, has some limitations. Terms applied for search could be more extensive in order to get richer and more extensive arguments to include in discussion and reach more focused recommendations. Future studies may use more terms in the literature review because this study is limited to video game research only including video game and computer game terms. Also, studies other than those in English could be included in future review studies. Future studies should specifically focus on educational policies implemented by countries because the unstoppable rise of video game usage is increasingly getting more attention from policymakers to improve school outcomes. Every country has a Ministry responsible for educational policies. Different educational policies should be handled and compared to reach better educational policies. Educational policies do not have to focus on directly usage of tools which enable students to play video games. When activities are boosted, replacement of video game playing can be achieved. Also, school start time may have an effect on video game playing. Families and educators should be trained about how to approach students playing a certain amount of video games regardless of screen time because guidance is always critical when supporting students.

The findings show that the literature on video games is quite extensive. In alignment with the studies showing the growing video game market for all age groups (Khorsandi & Li, 2022), this study suggests that

research on video games includes various age groups. The increasing and expanding video game market requires the study of different age groups. Since academic achievement is an expected goal in a long process that continues from the beginning to the end of educational life, there are studies related to video games from elementary school to university level. Nevertheless, most studies on this topic have focused on high school students. The fact that these students are in a challenging and turbulent period during adolescence may have caused research to be concentrated on this age group. It may be difficult to strike a balance in the usage of video games for high school students, who, unlike primary and secondary school students, spend more time with their friends during the period of identity formation and in search of independence. Video games require balanced playing as they are an attractive tool for students to play more (Corder et al., 2015; Rahmawati et al., 2022). Studies conducted with high school students focused on the effect of excessive gaming on academic achievement. In this regard, video game addiction (Brunborg et al., 2014; Hawi et al., 2018; Islam et al., 2022) and excessive gaming (Borgonovi, 2016; Gnambs et al., 2020) were found to be risk factors for low academic achievement among high school students, while moderate playing was harmless. Even, studies suggested that it may foster academic achievement (Borgonovi, 2016; Gómez-Gonzalvo et al., 2020). This can be attributed to the fact that video games reduce cognitive load (Hwang et al., 2021), increase executive functions (Benzing & Schmidt, 2017), and improve visual-spatial skills (Jackson et al., 2011b; Kühn et al., 2022; Schmidt & Vandewater, 2008), as long as video game playing is not excessive. When high school students play video games excessively, reduced sleep (Husarova et al., 2018; Pandya & Lodha, 2021) and undesirable psychological states (Adelantado-Renau et al., 2019; Yland et al., 2015) may occur, thus the positive outcomes provided by moderate playing disappear.

Unlike high school students, there are far fewer empirical studies with elementary school students. However, similarly, excessive gaming (Hastings et al.,2009; Weis & Cerankosky, 2022) and addiction tendencies (Skoric et al., 2009) were also associated with low academic achievement for these students. Research does not focus much on elementary school students, who are more under the control of their parents compared to high school students. It may be beneficial for elementary school students, who become increasingly independent in the following school levels, to ensure their autonomy and support them with guidance instead of their parents directly intervening and hindering them. In today's conditions where helicopter parenting has become widespread, drawing sharp boundaries for elementary school students may cause them to have difficulties in showing willpower and making decisions in the challenging experiences they encounter later. Excessive video game playing stands out as a habit and worsens other outcomes of the individual by affecting daily habits. In this regard, an excessive increase in video game playing causes healthy habits to disappear (Pandya & Lodha, 2021). More importantly, unhealthy habits gradually become established (Adelantado-Renau et al., 2019; Yland et al., 2015). Video game playing affects academic achievement in every aspect by changing students' daily functionality and priorities. The fact that there are not as many negative findings for moderate playing as for excessive video game playing shows that there is no harm in having video game playing as a part of student's lives, but they need to be supported in determining their priorities by weighing the impact of video game playing on them.

Similar to other school levels, excessive video game playing and addiction for middle school students and undergraduate students were related to low academic achievement (Anand, 2007; Chen et al., 2020; Fow & Baki, 2009; Jackson et al., 2011a; Ramirez et al., 2021; Savić et al., 2022; Stevents et al.,2020; Yeh & Cheng, 2016). On the other hand, exergame and educational video games were found to be promising for academic achievement (Gao et al., 2013; Kanthan & Senger, 2011; Lin et al., 2012; Yang & Chang, 2013; Yeşilbağ et al., 2020). The increase in video game playing today reveals the need for educational environments to adapt to today's conditions. Including activities that motivate students, such as educational video games and exergames, in the school environment may be beneficial in terms of improving academic outcomes. Purifying school environments from video game playing will not be enough to keep students' home and outdoor lives under control. For example, the South Korean government implemented an online game shutdown policy at certain times of the day, but it was still not successful (Choi et al., 2018). Students need to learn correct usage instead of prohibitions. Video game playing can be used as a motivating factor in ensuring academic achievement, but students should prioritize healthy habits over video game playing. In order to provide an oasis where students can breathe against school stress and homework intensity, video game playing should not exceed a moderate level. On the other hand, students who excessively focus on video game playing move away from their healthy habits and experience reduced sleep, improper eating, and undesirable psychological status. When video game playing becomes excessive and addictive, it is an obstacle to academic achievement. Therefore, as long as it is balanced, it can have positive effects on students' academic outcomes.

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