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RESEARCH ARTICLE

How Much Digital Gaming Addiction Affects Mathematics Achievement?

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Abstract

The purpose of this research is to determine the effect of digital game addictions of fourth-grade students on their mathematics achievement. The sample of this research, which was carried out in correlational survey model, consists of 389 fourth-grade students studying in public schools in Kayseri. Digital Game Addiction Scale and Mathematics Achievement Test were used as data collection tools. The results of this study indicated that the digital game addiction of the participants was at a low level. While it was determined that male students' digital game addictions were significantly higher than females, it was seen that gender was not a factor on mathematics achievement. It has been concluded that the digital game addictions affect the students' mathematics achievement negatively.

Keywords: Digital game addiction, mathematics achievement, mathematics, primary school.

Introduction

The society should give importance to education in order to be able to live independently, to develop itself, to keep up with the times, and to shape the developing technology (Toy, 2019). In this sense, mathematics, which has a great contribution to the mental development of individuals, has a great importance for the development of society (Borlat, 2018). Mathematics is described as a field of science that brings concepts out of abstract context and into reality with symbols and some specific rules (Courant et al., 1996). Mathematics has continued to develop continuously in the historical process with the help of the structures created in the mind of the individuals (Baykul, 2014; Hersh, 1997; Umay, 1996). Contemporary communities have been interested in mathematics in every period of history in order to stand out in the world of science and to adapt to the constantly developing technology. For this reason, the science of mathematics has started to gain importance in terms of providing solutions to the problems faced by the individual in daily life (Bell, 2017; Karah, 2022).

The fact that mathematics has an important role in education is due to the fact that it is an active science in all areas of life and contributes to social development (Baltayeva, 2021). Therefore, it has become a necessity to teach mathematics, which is of great importance in almost every aspect of daily life (Biber, 2019). For a society that can adapt to innovations in the field of technology, one of the main goals of today's teachers is to raise students with high mathematical literacy, who develop problem-solving skills, and who can act with reasoning (Akgül, 2008; Akkurt, 2021).

What is described as technology is that scientific knowledge provides solutions that make daily life easier and more practical (Kalelioğlu, 2015). Today, the use of technology is constantly increasing and changing (Bekir, 2018; Gedik et al., 2019). With the developing Internet technology, many different tools have entered our lives. Thanks to the

applications developed in the digital environment, smartphones, laptops, and tablets that are easy to carry have started to take an important place in daily life (Babacan & Şaşmaz Ören, 2017; Delican, 2021). The effects of these technological tools differ according to the fields they are used in and range from the social life of the individual to the academic success (Meltem, 2021). The change in technology day by day and the rapid development of the Internet have begun to change the living habits of individuals (Gedik, 2021; Tsai et al., 2020).

Regardless of age, game is an important part of personality development that will affect the whole life from childhood (Yayman, 2019). While the use of the Internet makes our lives easier in many areas, it has also started to be widely used as a game and entertainment tool. Digital games have started to take the place of traditional games due to reasons such as developing technology, urbanization, and insufficient playgrounds. Games that were played with friends on the streets and in parks in the past are now played with virtual friends in virtual environments via Internet, with the development of technology that has become a part of our lives (Dilci, 2015)

Although digital games are software that children, young people, and even adults use mostly for entertainment purposes (Günbaşı & Öztürk, 2022), they are types of games that are programmed with different technologies and then enable their users to log in with a visual environment (Çetin, 2013). Such games, which are prepared with different programs and use various technologies, are also divided into groups as digital console games, computer games, and online games according to the program and technology they are prepared (Dilci, 2015). The classification of digital games can also differ according to the content of the games, the way they are played, and the themes of the games. Due to the fact that some digital games contain more than one theme, different definitions and classifications (adventure, strategy, action, role-playing, simulation, sports, and combat) have emerged about digital games (Eni, 2017).

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Digital games have different effects on children and adults playing the game. Digital games have become one of the indispensable activities especially for children and have begun to completely change their understanding of play (Gülbetekin et al., 2021). Children are constantly trying to spend their free time playing digital games and keep digital games above all activities (Hazar et al., 2017a).

In the twenty-first century, which is called as the digital age, the concept of digital addiction has emerged as a result of the rapid development of technology and the increase in Internet use (Cam & Nur, 2015). Factors including different basic mental needs such as socialization, self-confidence, and sense of competence are important for children to spend time with digital games (Ferguson & Olson, 2013; Westwood & Griffiths, 2010). As a result of trying to achieve these needs in the virtual environment and this action turning into playing digital games in an uncontrolled way, digital game addiction emerges (Ayas et al., 2017). The digital game drags the individual into an unreal world and causes them to be unable to control their perception of time (Vefa, 2021). The presence of factors such as violence and conflict that these games deal with causes people to experience some mental and social problems over time. One of the most important of these problems is digital game addiction (Dilci, 2015).

Digital game addiction, like other types of addiction, causes many negative consequences in the life of the family and the individual (Dilci, 2015). This addiction can be defined as the individuals' uncontrolled spending of time with games played on Internet with tools such as computers, tablets, or smartphones (Eni, 2017).

Students with digital game addiction prefer to spend most of their free time playing games instead of studying and fulfilling their responsibilities (Abdullah, 2021). Therefore, they spend most of their time without moving, which results in a decrease in the level of physical activity of individuals. The decrease in the level of physical movement of individuals and the increase in digital game addictions also cause negative consequences on their attention levels (Dilci, 2015). Children who are addicted to digital games have difficulty in fulfilling their responsibilities and gradually become individuals far from socialization (Akyurt, 2019; Aydemir, 2020; Young, 2009). The order in the game, which is based on constantly losing and winning, increases the individual's desire to play again after the game is over and makes the child impatient to play. It seems to be a very difficult situation for the individual who has become addicted to the game to take a break from the game and get away from it. Many families and teachers also complain about this situation, stating that children spend a lot of time with digital games and that this situation reduces children's interest in lessons (Horzum, 2011).

Nowadays, depending on the developing technology and the prevalence of Internet, the game-playing habits of the students have also changed and digital games have become preferred. Therefore, this situation has revealed a new type of addiction, digital game addiction. In the literature, the relationships between digital game addiction and some physical attributes such as health, obesity, and systems of the body were investigated in some studies (e.g. Aziz et al., 2021; Başdaş & Özbey, 2020; Cankurtaran et al., 2022). Moreover, there are some studies focusing on psychological attributes such as aggression, loneliness, depression, and emotional intelligence (Caner & Evgin, 2021; Jeong et al., 2016; Tetik & Aktan, 2021). However, a limited number of studies have explored cognitive attributes (e.g., Yavuz et al., 2019). Almost all of the studies in the literature are about medical sciences. Therefore, since this study deals with the relationship between game addiction and achievement, this can be expressed as the strength of the study. From this point of view, it is thought to be important to examine the possible relationships between digital game addiction and mathematics achievement of students, especially at primary school level. This situation forms the basic motivation of the study.

In this study, the effect of digital game addictions of primary school fourth-grade students on their mathematics achievement was examined. In addition, we tried to reveal the differentiation status of students' digital game addictions and mathematics achievements according to some demographic characteristics. The following research questions were formed within the scope of the research:

- What is the level of digital game addiction and mathematics achievement of fourth-grade students?
- Do digital game addictions and mathematics achievements of fourth-grade students differ according to gender?
- What is the relationship between digital game addiction and mathematics achievement of fourth-grade students?
- What is the predictive level of digital game addictions of fourth-grade students on their mathematics achievement?

Method

Research Design

This research is a quantitative study designed to examine the effect of digital game addictions on mathematics achievement of fourth-grade students. A correlational survey model was used in the research to reveal the possible relationships between students' digital game addictions and mathematics achievements.

While examining the relationships between variables in education-related research, a correlational research should be conducted (Creswell, 2017). It is possible to define correlational studies as a type of comparison that examines whether there is a difference between groups in terms of dependent variables (Karasar, 2005).

Participants

In the academic year 2021–2022, 389 fourth-grade students studying in four different public schools in Kayseri province participated in this study. Within the scope of the study, the effect of digital game addiction of primary school students on mathematics achievement was investigated. Fourth-grade students were preferred because both students' mathematics achievement should be measurable and students should have an awareness about digital game addiction. Among the participants, 47.3% of them were female ($N=184$) and 52.7% were male ($N=205$). Moreover, 72.0% of the participants took pre-school education ($N=280$) and 28.0% did not receive pre-school education ($N=109$).

Data Collection Tools

“Digital Game Addiction Scale for Children” and “Mathematics Achievement Test” were used in this study.

Digital Game Addiction Scale for Children: This scale was developed by Hazar et al. (2017b) to determine the digital game addiction levels of children aged 10–14. The scale was in 5-point Likert type and consists of a total of 24 items. In this study, for internal consistency Cronbach's alpha reliability coefficient was calculated as .94. This result shows that the data obtained from the digital game addiction scale for children are reliable.

Mathematics Achievement Test: The mathematics achievement test, which was developed by researchers, consists of 25 multiple-choice items. In test development, the primary school mathematics curriculum was examined and fourth-grade learning outcomes were listed. Accordingly, the learning outcomes of natural numbers, addition, subtraction, multiplication, and division of natural numbers, and operations in fractions constitute the content domain of the mathematics achievement test. Based on the determined outcomes, pilot test items were created. The pilot test items were given to the experts for arrangements, and a 30-item test was prepared for pilot application. Then, pilot application was carried out with 100 fourth-grade students studying in

a different primary school. After pilot application, item analyses were made, item difficulty (p_j) and item discrimination (r_{jx}) values that did not meet the sufficient conditions for five items [(3rd item ($r_{jx}=0.06$), 11th item ($r_{jx}=-0.02$), 20th item ($r_{jx}=0.24$), 27th item ($r_{jx}=0.25$), and 30th item ($r_{jx}=0.21$)] were removed from the test, and the test was given its final form. Accordingly, the arithmetic mean value calculated for the 25-item mathematics achievement test was 16.14, the standard deviation value was 7.11, the mean item difficulty value was 0.65, and the mean item discrimination value was 0.68. As a result of the reliability analysis for the mathematics achievement test, the KR-20 reliability coefficient was calculated as .93. It can be said that the mathematics achievement test, which is prepared based on these values, is a valid and reliable measurement tool.

Statistical Analysis

Statistical Package for Social Sciences version 21.0 (IBM SPSS Corp., Armonk, NY, USA) statistics program was used in the analysis of the data obtained in the research. In this direction, descriptive analyses were used to reveal students’ digital game addictions and mathematics achievement levels. Normality assumption was tested in order to determine whether parametric or nonparametric tests would be used to compare students’ digital game addictions and mathematics achievements by gender, and depending on the results obtained, parametric tests were used in comparisons. For this reason, an independent sample t -test was used. Pearson’s product–moment correlation coefficient was used to determine the possible relationships between students’ digital game addiction levels and mathematics achievement. Lastly, a simple linear regression analysis method was used to determine the predictive level of students’ digital game addictions on their mathematics achievement.

Research Ethics

In this study, data were collected with the permission of Niğde Ömer Halisdemir University Ethics Committee (Date: December 7, 2020, approval number: 2020/11-17). In the first part of the personal information form, the participant consent form is also included. Therefore, the participants were included in the study, taking into account their voluntariness.

Results

The results obtained from the study were discussed separately within the framework of the research questions. Accordingly, first of all, the digital game addictions and mathematics achievement levels of the participants were revealed. The obtained results are given in Table 1.

Table 1 shows descriptive statistic results for mathematics achievement test and digital game addiction scale. While the mean score of the mathematics achievement test was 16.14 and the standard deviation was 7.12, the mean score of the digital game addiction was 1.44 and the standard deviation was 0.44. Based on this finding, it can be said that mathematics achievement levels are above average and their digital game addictions are at low level.

Table 2 indicates the t -test results to determine whether mathematics achievement test scores and digital game addiction scale scores differ according to gender. Accordingly, while there was no significant difference in students’ mathematics achievement test scores according

Table 1. Descriptive Statistics of Digital Game Addiction Scale and Mathematics Achievement Test

Instrument	Mean	Standard Deviation	Min–Maximum Values
Mathematics Achievement Test	16.14	7.12	0–25
Digital Game Addiction Scale	1.44	0.44	1–5

Table 2. t -Test Results for Gender Comparison of Mathematics Achievement Test and Digital Game Addiction Scale

Instrument	Gender	N	Mean	SD	t	p
Mathematics Achievement Test	Female	184	16.65	7.23	1.32	.18
	Male	205	15.69	7.01		
Digital Game Addiction Scale	Female	184	1.33	0.43	-4.74	.00
	Male	205	1.54	0.44		

$p < .05$.

to gender ($p > .05$), a significant difference was found in favor of male students in digital game addictions ($p < .05$). This finding shows that male students’ digital game addiction level is higher than that of female students.

Within the scope of the study, Pearson’s product–moment correlation analysis was conducted to determine the relationship between mathematics achievements and digital game addictions. The results are shared in Table 3.

Table 3. Pearson’s Product–Moment Correlation Coefficient Between Mathematics Achievement and Digital Game Addictions

Instrument	MATS	DGAS
Mathematics Achievement Test (MATS)	1	-.22**
Digital Game Addiction Scale (DGAS)	-.22**	1

** $p < .01$.

Table 3 shows the results of Pearson’s product–moment correlation analysis to determine the relationship between mathematics achievement and digital game addictions. Accordingly, a negative and low-level significant relationship was found between primary school fourth-grade students’ mathematics achievement and digital game addiction ($r = -.22, p < .01$). Based on this finding, it can be said that as students’ addiction to digital games increases, their mathematics achievement decreases.

Finally, simple linear regression analyses were held to predict mathematics achievement from digital game addiction. The results are given in Table 4.

Table 4. Simple Linear Regression Analysis Results Predicting Mathematics Achievement

Variables	Coefficient	SE	Beta	t	p
Constant	21.288	1.197		17.78	<.001
Digital game addiction	-3.572	0.795	-0.223	-4.49	<.001

$N = 389; R^2 = .053 (F = 20.188, p < .001);$ Durbin Watson= 1.431.

The model obtained from the simple linear regression analysis performed to determine the predictive level of digital game addictions of fourth-grade students on their mathematics achievement, given in Table 4, is significant ($p < .001$). The created regression model was found as: “Mathematics achievement = 21.288 – 3.572 × digital game addiction.” Accordingly, when the values of other independent variables are considered as constant, mathematics achievement scores decrease by 3.572 points while digital game addiction scores increase by 1 unit. When the model explanatory coefficient is examined, it is seen that 5% of the variance in mathematics achievement score is explained by digital game addiction. In addition, the calculated Durbin–Watson value of 1.431 indicates that there is no autocorrelation problem in the model.

Discussion, Conclusion, and Recommendation

The purpose of this research is to determine the effect of digital game addictions of fourth-grade students on their mathematics achievement. According to the results, it was found that the mathematics achievement levels of the fourth-grade students in primary school were above average. When the literature is examined, there are results that support this finding (Aktan, 2012; Yılmaz, 2021), but it is also possible to reach the results of the research in which the mathematics achievement of the fourth-grade students in primary school was found to be high (Toy, 2019). In addition, it is seen that this result is consistent with the upper-intermediate level of mathematics performance of Turkish students in international large-scale exams such as Trends in International Mathematics and Science Study (MEB, 2020).

According to another result of the research, it was found that the digital game addiction of fourth-grade students in primary school was low. Many studies have also been found to support this finding (Aktaş & Bostancı, 2021; Güvendi et al., 2019; Koç, 2020; Li et al., 2016; Rehbein et al., 2010). It can be said that primary school students spend less time with digital games compared to students in higher grades and that their age is relatively low, which ensures that students' digital game addiction is low.

While there was no significant difference in the mathematics achievement of primary school fourth-grade students according to gender, it was found that the digital game addiction of male students was significantly higher than that of female students. Based on teachers' opinions, Dursun and Dede (2004) concluded that gender is the least important factor in students' mathematics achievement. Herbert and Stipek (2005) also stated in their longitudinal study that gender is not a factor in students' mathematics achievement. Many studies (Akhan & Bindak, 2017; Hyde, Fennema & Lamon, 1990; Leahey & Guo, 2001; McGraw et al., 2006; Sarı & Ekici, 2018; Tanrıverdi, 2021; Yılmaz, 2021) emphasize that gender does not have any effect on mathematics achievement. Although this finding largely overlaps with the literature, it is possible to come across research results in which it was found that mathematics achievement differs according to gender (Kara & Özkaya, 2022).

In the study, it was also found that digital game addiction of male students studying in the fourth grade of primary school is higher than female students. When the literature is reviewed, many studies (Bülbül et al., 2018; Çavuş et al., 2016; Güvendi et al., 2019; Fam, 2018; Ko et al., 2005; Lopez-Fernandez et al., 2014; Li et al., 2016; Mentzoni et al., 2011; Miezah et al., 2020; Rehbein, Kleimann & Mossle, 2010; Rehbein et al., 2015; Toker & Baturay, 2016; Şimşek & Karakuş Yılmaz, 2020; Wang et al., 2014) seem to support this finding. In addition, Koç (2020) concluded that male students are about three times riskier than female students in terms of digital game addiction. It can be said that the most important reason for this situation is that male students spend more time with digital games than female students (Aktaş & Bostancı, 2021) and, accordingly, the increase in addiction as the duration of playing games increases (Şimşek & Karakuş Yılmaz, 2020).

Another finding of the study is related with the correlation between mathematics achievement and digital game addiction. A negative and low-level significant relationship between fourth-grade students' mathematics achievement and digital game addiction was found. Based on this finding, it can be said that as students' addiction to digital games increases, their mathematics achievement decreases. In addition, it was found that digital game addiction of fourth-grade students was a significant predictor of mathematics achievement and 5% of the variance was explained by digital game addiction, and the regression model obtained in this direction was significant. These results are

largely consistent with the studies in the literature (Anderson & Dill, 2000; Bülbül et al., 2018; Fam, 2018; Rehbein, et al., 2010; Toker & Baturay, 2016; Wang et al., 2014; Wright, 2011). Based on this finding, it can be said that the reasons such as the decrease in the study time of the students due to the increase in addiction and the difficulty in concentrating on the lesson may have led to the decrease in mathematics achievement.

In the light of the findings and results obtained in this study, the following recommendations could be made:

1. Due to the high digital game addiction of male students, the time that male students spend with digital games should be limited, and activities that will direct their attention to different points at school and at home could be planned.
2. Since digital game addiction negatively affects mathematics achievement, students' use of digital resources should be kept under control and especially families should be made aware of it so that they do not lose their control.
3. Researchers could conduct studies that reveal the effects of digital game addiction on other lessons.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of Niğde Ömer Halisdemir University (date: December 7, 2020, approval number: 2020/11-17).

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

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References

- Abdullah, Ç. (2021). *İnternet Oyun Bağımlılığının Bağlanma Stilleri, Metakognisyonlar ve Çocukluk Çağı Olumsuz Yaşantıları İle İlişkisinin İncelenmesi*. İstanbul Kent Üniversitesi Eğitim Bilimleri Enstitüsü.
- Akgül, S. (2008). *İlköğretim İkinci Kademe 7. ve 8. Sınıf Öğrencilerinin Matematik Kaygıları ile Algıladıkları Öğretmen Sosyal Desteğinin Cinsiyete Göre Matematik Başarılarını Yordama Gücü* [Yayımlanmamış Yüksek Lisans Tezi]. Yıldız Teknik Üniversitesi.
- Akhan, Ş., & Bindak, R. (2017). Bazı Kişisel Değişkenlerin Ortaokul Öğrencilerinin Matematik Başarıları Üzerindeki Etkisi: Bir Regresyon Modeli. *IHEAD*. 2(2), 5–17. e-ISSN 2528-9632.
- Akkurt, Z. (2021). *Sınıf Öğretmenlerinin Matematik Öğretimine Yönelik Görüşleri ile Öğrencilerin Matematik Kaygısının İncelenmesi* [Yayımlanmamış Yüksek Lisans Tezi]. Kahramanmaraş Sütçü İmam Üniversitesi.
- Aktan, S. (2012). *Öğrencilerin Akademik Başarısı, Öz Düzenleme Becerisi, Motivasyonu ve Öğretmenlerinin Öğretim Stilleri Arasındaki İlişki* [Yayımlanmamış Doktora Tezi]. Balıkesir Üniversitesi.
- Aktaş, B., & Bostancı, N. (2021). Covid-19 Pandemisinde Üniversite Öğrencilerindeki Oyun Bağımlılığı Düzeyleri ve Pandeminin Dijital Oyun Oynama Durumlarına Etkisi. *Bağımlılık Dergisi*, 22(2), 129–138. [CrossRef]
- Akyurt, G. K. (2019). *İlkokul 4. Sınıf Öğrencilerinin Matematik Motivasyonu, Kaygısı ve Başarısı Arasındaki İlişkinin İncelenmesi* [Yayımlanmamış Yüksek Lisans Tezi]. Ordu Üniversitesi.

- Anderson, C. A., & Dill, K. E. (2000). Video games and aggressive thoughts, feelings, and behavior in the laboratory and in life. *Journal of Personality and Social Psychology*, 78(4), 772–790. [CrossRef]
- Ayas, T., Horzum, M. B., Güngören, Ö. C., Taş, İ., Kaymak, Z. D., & Hamutoğlu, N. B. (2017). *Teknolojinin Olumsuz Etkileri*. Vize Yayıncılık.
- Aydemir, N. (2020). *Dijital Oyun Bağımlılığı ile Saldırganlık Eğilimi ve Sosyalleşme Arasındaki İlişkinin İncelenmesi* [Yayınlanmamış Yüksek Lisans Tezi]. Haliç Üniversitesi.
- Aziz, N., Nordin, M. J., Abdulkadir, S. J., & Salih, M. M. M. (2021). Digital addiction: Systematic review of computer game addiction impact on adolescent physical health. *Electronics*, 10(9), 996. [CrossRef]
- Babacan, T., & Şaşmaz Ören, F. (2017). Teknoloji Destekli Mikro Öğretim Uygulamalarının Fen Bilimleri Öğretmen Adaylarının Teknoloji Kullanım Algıları Üzerine Etkisi. *Kuram ve Uygulama*, 7(2), 193–214.
- Baltayeva, L. (2021). *Sınıf Öğretmenlerinin Oyunla Matematik Öğretimine İlişkin Görüşleri* [Yayınlanmamış Yüksek Lisans Tezi]. Anadolu Üniversitesi.
- Başdaş, Ö., & Özbey, H. (2020). Digital game addiction, obesity, and social anxiety among adolescents. *Archives of Psychiatric Nursing*, 34(2), 17–20. [CrossRef]
- Baykul, Y. (2014). *İlkokulda Matematik Öğretimi*. Pegem Akademi.
- Bekir, S. (2018). *Üniversite Öğrencilerinde Çevrimiçi Bağımlılık Düzeyinin Duygusal Şemalar, Eylemler ve Bazı Değişkenler Açısından İncelenmesi* [Yayınlanmamış Yüksek Lisans Tezi]. Sakarya Üniversitesi Eğitim Bilimleri Enstitüsü.
- Bell, E. T. (2017). *The development of mathematics*. Dover Publication, Inc.
- Biber, A. Ç. (2019). Matematik ve öğretimi. İçinde A. Kaçar (Ed.), *İlkokulda matematik öğretimi* (s. 2-11). Pegem Akademi.
- Borlat, G. (2018). *Yaratıcı Drama Yönteminin Matematik Kaygısı ve Motivasyonuna Etkisi* [Yayınlanmamış Yüksek Lisans Tezi]. Çanakkale Onsekiz Mart Üniversitesi.
- Bülbül, H., Tunç, T., & Aydıllı, F. (2018). Üniversite öğrencilerinde oyun bağımlılığı: Kişisel Özellikler ve Başarı İle İlişkisi. *Ömer Halisdemir Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 11(3), 97–111. [CrossRef]
- Cam, H. H., & Nur, N. (2015). A study on the prevalence of Internet addiction and its association with psychopathological symptoms and obesity in adolescents. *TAF Preventive Medicine Bulletin*, 14(3), 181–188. [CrossRef]
- Caner, N., & Evgin, D. (2021). Digital risks and adolescents: The relationships between digital game addiction, emotional eating, and aggression. *International Journal of Mental Health Nursing*, 30(6), 1599–1609. [CrossRef]
- Cankurtaran, F., Menevşe, O., Namlı, A., Kızıltoprak, H. Ş., Altay, S., Duran, M., Demir, E. B., Şahan, A. A., & Ekşi, C., Şahan, A. A., & Ekşi, C. (2022). The impact of digital game addiction on musculoskeletal system of secondary school children. *Nigerian Journal of Clinical Practice*, 25(2), 153–159. [CrossRef]
- Çavuş, S., Ayhan, B., & Tuncer, M. (2016). Bilgisayar Oyunları ve Bağımlılık: Üniversite Öğrencileri Üzerine bir Alan Araştırması. *İletişim Kuram ve Araştırma Dergisi*, 43, 265–289.
- Çetin, İ. G. (2020). *Ortaöğretim Öğrencilerinin Matematik Umutsuzluğunu Yordayan Değişkenler: Matematik Kaygısı, Matematiğe yönelik Motivasyonel İnançlar, Matematik Başarısı* [Yayınlanmamış Yüksek Lisans Tezi]. Adnan Menderes Üniversitesi Sosyal Bilimler Enstitüsü.
- Courant, R., Robbins, H., & Stewart, I. (1996). *What is mathematics?* Oxford University Press.
- Creswell, J. W. (2017). *Eğitim Araştırmaları: Nicel ve Nitel Araştırmanın Planlanması*. Yürütülmesi ve Değerlendirilmesi.
- Delican, B. (2021). Okuma Yazma Öğretimine Yönelik Geliştirilmiş Mobil Uygulamalar; Olanaklar ve Sınırlılıklar. *Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi*, 21(2), 682–703. [CrossRef]
- Dilci, T. (2015). *Dijital Diyet Zamani*. Geçit Yayıncılık.
- Dursun, Ş., & Dede, Y. (2004). Öğrencilerin Matematikte Başarısını Etkileyen Faktörler: Matematik Öğretmenlerinin Görüşleri Bakımından. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, 24(2), 217–230.
- Eni, B. (2017). *Lise Öğrencilerinin Dijital Oyun Bağımlılığı ve Algıladıkları Ebeveyn Tutumlarının Değerlendirilmesi* [Yayınlanmamış Yüksek Lisans Tezi]. Haliç Üniversitesi Sosyal Bilimler Enstitüsü.
- Erkılıç, E. (2021). *Ortaokul Öğrencilerinin Dijital Oyun Bağımlılığının Yalnızlık ve Benlik Saygısı Arasındaki İlişkisi ve Çeşitli Demografikler Açısından İncelenmesi* [Yayınlanmamış Yüksek Lisans Tezi]. Bahçeşehir Üniversitesi Eğitim Bilimleri Enstitüsü.
- Fam, J. Y. (2018). Prevalence of internet gaming disorder in adolescents: A meta-analysis across three decades. *Scandinavian Journal of Psychology*, 59(5), 524–531. [CrossRef]
- Ferguson, C. J., & Olson, C. K. (2013). Friends, fun, frustration and fantasy: Child motivations for video game play. *Motivation and Emotion*, 37(1), 154–164. [CrossRef]
- Gedik, O. (2021). Teknoloji Işığında Okuryazarlıklar ve sosyal bilgiler Eğitimi. İçinden E. Yeşiltaş (Ed.). *Teknolojik Pedagojik Eğitim ve Sosyal Bilgiler Eğitimi* (ss. 20-51). Pegem Akademi.
- Gedik, O., Sönmez, Ö. F., & Yeşiltaş, E. (2019). Sınıf Eğitimi öğretmen Adaylarının teknolojik Pedagojik İçerik bilgi Yeterliliklerinin İncelenmesi. *Eğitim Kuram ve Uygulama Araştırmaları Dergisi*, 5(2), 187–198.
- Gülbetkin, E., Güven, E., & Tuncel, O. (2021). Adolesanların Dijital Oyun Bağımlılığı ile Fiziksel Aktivite Tutum ve Davranışlarını Etkileyen Faktörler. *Bağımlılık Dergisi*, 22(2), 148–160. [CrossRef]
- Günbaş, N., Öztürk, A., & N. (2022). Eğitim Bilişim Ağı (EBA) içeriklerinde yer Alan Dijital Matematik Oyunlarının Bloom Taksonomisine Göre İncelenmesi. *e-Kafkas Eğitim Araştırmaları Dergisi*, 9, 253–278. [CrossRef]
- Güvendi, B., Tekkurşun Demir, G., & Keskin, B. (2019). Ortaokul Öğrencilerinde Dijital Oyun Bağımlılığı ve Saldırganlık. *OPUS Uluslararası Toplum Araştırmaları Dergisi*, 11(18), 1194–1217. [CrossRef]
- Hazar, Z., Demir, G. T., Namlı, S., & Türkeli, A. (2017a). Ortaokul Öğrencilerinin Dijital Oyun Bağımlılığı ve Fiziksel Aktivite Düzeyleri Arasındaki İlişkinin İncelenmesi. *Beden Eğitimi ve Spor Bilimleri Dergisi*, 11(3), 320–332.
- Hazar, Z., Hazar, M., Hazar, M., & Hazar, M. (2017b). Çocuklar İçin dijital oyun bağımlılığı Ölçeği. *Journal of Human Sciences*, 14(1), 203–216. [CrossRef]
- Herbert, J., & Stipek, D. (2005). The emergence of gender differences in children's perceptions of their academic competence. *Journal of Applied Developmental Psychology*, 26(3), 276–295. [CrossRef]
- Hersh, R. (1997). *What is mathematics, really?* Oxford University Press.
- Horzum, M. B. (2011). İlköğretim Öğrencilerinin Bilgisayar Oyunu Bağımlılık Düzeylerinin Çeşitli Değişkenlere Göre İncelenmesi. *Eğitim ve Bilim*, 36(159), 56–68.
- Hyde, J. S., Fennema, E., & Lamon, S. J. (1990). Gender differences in mathematics performance: A meta-analysis. *Psychological Bulletin*, 107(2), 139–155. [CrossRef]
- Jeong, E. J., Kim, D. J., Lee, D. M., & Lee, H. R. (2016). A study of digital game addiction from aggression, loneliness and depression perspectives. In 49th Hawaii International Conference On System Sciences (HICSS), 2016 (pp. 3769–3780). IEEE Publications Hawaii, USA.
- Kalelioğlu, F. (2015). *Öğretim Teknolojileri ve materyal Tasarımı "Temel Kavramlar"*. İçinden E. Cabi (Ed.) (2. Baskı). Pegem A Akademi.
- Kara, Y., & Özkaya, A. (2022). Ortaokul Öğrencilerinin Matematik Motivasyonları, Tutumları ve Başarıları Arasındaki İlişkinin İncelenmesi. *International Journal of Educational Studies in Mathematics*, 9(1), 33–48. [CrossRef]
- Karalı, Y. (2022). Sınıf Öğretmeni Adaylarının Matematik Okuryazarlığı ve Matematik Öğretimine Yönelik Öz-Yeterlik İnançlarının İncelenmesi. *Kahramanmaraş Sütçü İmam Üniversitesi Sosyal Bilimler Dergisi*, 19(1), 89–101.
- Karasar, N. (2005). Bilimsel araştırma yöntemi (17. Baskı). Ankara: Nobel yayın dağıtım, 81, 83.
- Ko, C. H., Yen, J. Y., Chen, C. C., Chen, S. H., & Yen, C. F. (2005). Gender differences and related factors affecting online gaming addiction among Taiwanese adolescents. *Journal of Nervous and Mental Disease*, 193(4), 273–277. [CrossRef]
- Koç, A. (2020). *Lise ve Üniversite Öğrencilerinde İnternet Oyun Bağımlılığı Sıklığı ve Etkili Faktörler* [Uzmanlık Tezi]. Gazi Üniversitesi Tıp Fakültesi, Halk Sağlığı Anabilim Dalı.
- Leahy, E., & Guo, G. (2001). Gender Differences in mathematical trajectories. *Social Forces*, 80(2), 713–732. [CrossRef]
- Li, H., Zou, Y., Wang, J., & Yang, X. (2016). Role of stressful life events, avoidant coping styles, and neuroticism in online game addiction among college students: A moderated mediation model. *Frontiers in Psychology*, 7, 1794. [CrossRef]
- Lopez-Fernandez, O., Honrubia-Serrano, M. L., Baguley, T., & Griffiths, M. D. (2014). Pathological video game playing in Spanish and British adolescents: Towards the exploration of Internet Gaming Disorder symptomatology. *Computers in Human Behavior*, 41, 304–312. [CrossRef]
- McGraw, R., Lubienski, S., & Strutchens, M. (2006). A closer look at gender in NAEP mathematics achievement and affect data: Intersections with

- achievement, race/ethnicity, and socioeconomic status. *Journal for Research in Mathematics Education*, 37(2). [CrossRef]
- Meltem, Ö. (2021). *Ortaokul Öğrencilerinin Dijital Oyun Bağımlılığı ve Sosyal Eğilimleri* [Yayımlanmamış Yüksek Lisans Tezi]. Mersin Üniversitesi Eğitim Bilimleri Enstitüsü.
- Mentzoni, R. A., Brunborg, G. S., Molde, H., Myrseth, H., Skouvrøe, K. J. M., Hetland, J., & Pallesen, S. (2011). Problematic video game use: Estimated prevalence and associations with mental and physical health. *Cyberpsychology, Behavior and Social Networking*, 14(10), 591–596. [CrossRef]
- Miezah, D., Batchelor, J., Megreya, A. M., Richard, Y., & Moustafa, A. A. (2020). Video/computer game addiction among university students in Ghana: Prevalence, correlates and effects of some demographic factors. *Psychiatry and Clinical Psychopharmacology*, 30(1), 17–23. [CrossRef]
- Millî Eğitim Bakanlığı (2020). *TIMSS 2019 Türkiye ön Raporu*. Eğitim Analiz ve Değerlendirme Raporları Serisi No: 15. MEB.
- Rehbein, F., Kleimann, M., & Mössle, T. (2010). Prevalence and risk factors of video game dependency in adolescence: Results of a German nationwide survey. *Cyberpsychology, Behavior and Social Networking*, 13(3), 269–277. [CrossRef]
- Rehbein, F., Kliem, S., Baier, D., Mößle, T., & Petry, N. M. (2015). Prevalence of Internet gaming disorder in German adolescents: Diagnostic contribution of the nine DSM-5 criteria in a state-wide representative sample. *Addiction*, 110(5), 842–851. [CrossRef]
- Sarı, M. H., & Ekici, G. (2018). İlkokul 4. Sınıf Öğrencilerinin Matematik Başarıları ile Aritmetik Performanslarının Etkileyen Duyuşsal Değişkenlerin Belirlenmesi. *OPUS Uluslararası Toplum Araştırmaları Dergisi*, 8(15), 1562–1594. [CrossRef]
- Şimşek, E., & Karakuş Yılmaz, T. (2020). Türkiye'de Yürütülen Dijital Oyun Bağımlılığı Çalışmalarındaki Yöntem ve Sonuçların Sistematik İncelemesi. *Kastamonu Education Journal*, 28(4), 1851–1866. [CrossRef]
- Tanrıverdi, B. (2022). *İlkokul 3. Sınıf Öğrencilerinin Matematik Başarılarının Bazı Değişkenler Açısından İncelenmesi* [Yayımlanmamış Teziz Yüksek Lisans Projesi]. Pamukkale Üniversitesi.
- Tetik, G., & Aktan, Z. D. (2021). The mediator effect of digital game addiction on the relationship between perceived parental attitudes and emotional intelligence among adolescents (tur). *Journal of Clinical Psychiatry*, 24(2), 181–190. [CrossRef]
- Toker, S., & Baturay, M. H. (2016). Antecedents and consequences of game addiction. *Computers in Human Behavior*, 55, 668–679. [CrossRef]
- Toy, H. (2019). *İlkokul Öğretmenlerinin Matematik Öğretim Kayguları ile Öğrencilerinin Matematik Başarı ve Tutumları Arasındaki İlişki* [Yayımlanmamış Yüksek Lisans Tezi]. Niğde Ömer Halis Demir Üniversitesi.
- Tsai, S. M., Wang, Y. Y., & Weng, C. M. (2020). A study on digital games Internet addiction, peer relationships and learning attitude of senior grade of children in elementary school of Chiayi County. *Journal of Education and Learning*, 9(3), 13–26. [CrossRef]
- Umay, A. (1996). Matematik Eğitimi ve Ölçülmesi. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 12, 145–149.
- Vefa, T. Ö. (2021). *Çevrimiçi Oyun Bağımlılığı ile Saldırganlık ve Yalnızlık Arasındaki İlişkinin İncelenmesi* [Yayımlanmamış Yüksek Lisans Tezi]. Üsküdar Üniversitesi Sosyal Bilimler Enstitüsü.
- Wang, C. W., Chan, C. L., Mak, K. K., Ho, S. Y., Wong, P. W., & Ho, R. T. (2014). Prevalence and correlates of video and internet gaming addiction among Hong Kong adolescents: A pilot study. *TheScientificWorldJournal*, 2014, 874648. [CrossRef]
- Westwood, D., & Griffiths, M. D. (2010). The role of structural characteristics in video-game play motivation: A Q-methodology study. *Cyberpsychology, Behavior and Social Networking*, 13(5), 581–585. [CrossRef]
- Wright, J. (2011). The effects of video game play on academic performance. *Modern Psychological Studies*, 17(1), 37–44.
- Yavuz, M., Nurullayeva, N., Arslanogdu, S., Cimendag, A., Gunduz, M., & Yavuz, B. (2019). The relationships between the digital game addiction, alexithymia and metacognitive problems in adolescents. *Journal of Clinical Psychiatry*, 22(3), 254–259. [CrossRef]
- Yayman, E. (2019). *Ergenlerde Sosyal Medya Bağımlılığı Oyun Bağımlılığı ve Aile İşlevleri Arasındaki İlişkinin İncelenmesi* [Yayımlanmamış Yüksek Lisans Tezi]. İstanbul Sabahattin Zaim Üniversitesi, Sosyal Bilimleri Enstitüsü.
- Yılmaz, H. (2021). Öğrencilerin Öğretim Sürecine Yönelik Algıları ile Matematiksel Motivasyon ve Akademik Başarı İlişkisi [Yayımlanmamış Yüksek Lisans Tezi]. Balıkesir Üniversitesi.
- Young, K. (2009). Understanding online gaming addiction and treatment issues for adolescents. *American Journal of Family Therapy*, 37(5), 355–372. [CrossRef]