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Relationship between digital game addiction with body mass index, academic achievement, player types, gaming time: A cross-sectional study

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Highlights

- Digital game addiction was significantly predicted by gender, academic achievement score
- Digital game addiction was significantly predicted by computer and smartphone gameplay per-week
- Digital game addiction was not significantly predicted by the body mass index and player types.

Article Info: Research Article

Keywords: *Digital game addiction, player types, body mass index, gaming time, academic achievement*

Abstract

Digital game addiction was classified as a disease by the World Health Organization. It is characterized by impaired control over gaming and increasing priority given to gaming over other activities. Especially for school-age children, there are concerns about the effects of gaming addiction on health problems that are difficult to treat later and on their future careers. This study was conducted to analyze the relationship between academic achievement, body mass index and player types and computer game addiction of secondary school students. Study participants included 289 students attending fifth and sixth grades in a public school in Sivas province during the 2018-2019 academic year in Turkey. The data were analyzed with hierarchical regression analysis. The study findings revealed that digital game addiction was significantly predicted by gender, academic achievement score, computer and smartphone gameplay per-week, but not significantly predicted by the body mass index and player type variables. These findings suggest that male students with high weekly gameplay on computers and smartphones were exposed to a high risk of digital game addiction, and digital game addiction negatively affects academic achievements of the students. Future studies could be carried on focusing on the games and the types of games played by the students with similar variables.

1. Introduction

Gameplay significantly contributes to the cognitive, physical, emotional, and social development of children (Hurwitz, 2002). The advances in information and internet technologies have profoundly affected gaming habits as well as all other aspects of human life. Widespread use of technological tools and the internet replaced traditional games with digital games. According to the "Survey on Information and Communication Technology Usage by Children", the proportion of children aged 11-15 who stated that they used mobile phone/smartphone was 75% and while Internet usage was 50.8% in 2013 for children aged 6-15, it became 82.7% in 2021 and 66.1% of the children's purpose of Internet usage was playing or downloading games (TURKSTAT, 2021). The gaming behavior of the children in digital environments led

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to various problems and introduced the phenomenon of digital game addiction. Therefore, digital game addiction was classified as a disease by the World Health Organization (WHO) (WHO, 2018a). WHO described gaming disorder as a gameplay (digital gameplay or video gameplay) behavior where playing digital games become a priority over other hobbies and daily activities due to the lack of control over gameplay, and sustenance and exacerbation of this trend despite negative consequences in the 11th revision of the International Classification of Diseases (WHO, 2018b).

There are many studies examining the digital game addiction of children in the literature. In studies conducted on digital game addiction, it was reported that game addiction affected the current lifestyles of children and young adults, their academic achievements, communication with parents, relationships with peers; in short, all aspects of their lives. Most of the initial studies investigated digital game addiction based on demographic variables such as gender, class level, computer ownership, duration of gameplay, socio-economic level, and education level of the parents (Aydoğdu, 2018; Bilge,2012; Erboy,2010; Gökçearslan ve Durakoğlu 2014; Göldağ, 2018; Güllü, Arslan, Dündar ve Murathan 2012; Horzum,2011; Köseliören 2017; Şahin ve Tuğrul 2012; Taş, Eker ve Anlı 2014;Ulum 2016). Later studies investigated digital game addiction based on more specific variables such as communication skills (Bilgin; 2015), social anxiety levels (Karaca et al; 2016), physical activity levels (Hazar, Demir, Namlı & Türkeli, 2017), loneliness (Öncel & Tekin, 2015), psychological requirements (Dursun, Eraslan-Çapan; 2018), aggression levels (Güvendi, Demir & Keskin, 2019), aggressive behaviour (Balıkçı, 2018), academic achievements and the initial age phone use (Bülbül & Tunç, 2018), self-control and social trends (Aksel, 2018), the effects on psychological and physical health (Mustafaoğlu & Yasacı; 2018), the methods of expressing anger (Çakıcı, 2018), aggression levels (Hazar et al., 2017), parental relations (Karacaoğlu, 2019), digital game types (Aydoğdu, 2018), peer bullying (Gökbulut, 2020), game habits and preferences (Korkmaz & Korkmaz, 2019) of the students. Furthermore, internet and game addiction and perceived social support levels (Yavuz, 2018) in gifted students and computer game addiction in children with and without attention deficit and hyperactivity disorder (Bekar, 2018) were also investigated.

1.1 Relationship Between Body Mass Index, Game Addiction and Academic Achievement

Overweight and obesity are described as abnormal or excessive fat deposits that could impair well-being (WHO, 2022). According to the WHO, the rate of overweight and obesity among children and adolescents aged 5-19 years has increased from only 4% in 1975 to over 18% in 2016, totaling more than 340 million (WHO, 2022). Overweight is a risk factor in childhood that could lead to adult diseases and is associated with childhood health disorders, including increased risks of long-term untreatable hypertension, insulin resistance, fatty liver disease, orthopedic disorders, and psychosocial problems (De Onis & Lobstein, 2010). Furthermore, there are significant relationship between childhood obesity and cardiovascular diseases, Type 2 diabetes, movement problems, psychological problems, failure in school and lack of self-confidence (WHO, 2013). It was reported that at least 2.8 million people die each year of overweight or obesity worldwide (WHO, 2020a). Usually, height-weight indices are used in clinical evaluation of obesity in children and adolescents. (Hammer, 1991). Body mass index (BMI), which is a measure of body mass based on height, became the most practical, universally applicable and inexpensive body measurement for classifying overweight and obesity (De Onis & Lobstein, 2010). BMI, formerly called the Quetelet index, is calculated by dividing an individual's weight in kilograms by the square of the height in meters (kg/m2). For example, an adult weighing 70 kg and with a height of 1.75 m would have a BMI of 22.9 (WHO, 2020b). For adults, the range that reflects obesity and being overweight are not associated with age and do not differ between genders, while it varies based on age and gender in children and adolescents. Thus, to calculate the BMI for children, it should be compared with a standard reference that includes the factors of age and gender (Must & Anderson, 2006).

Obesity is a chronic disease characterized by various genetic and environmental factors (Gedik, 2003). However, the significant increase in obesity during the last 3 decades (Han, Lawlor & Kimm, 2010) suggested that mostly environmental factors, not genetic factors, played a key role in this development

(Tremblay & Willms, 2003). Several studies have been conducted on environmental factors. A study by Tremblay and Willms (2003) on Canadian children reported that physical activity protects individuals from being overweight or obese, and watching TV and playing video games were the risk factors. It was also observed that the high computer gameplay levels boosted the weight of Canadian children, since there was an inverse relationship between playing video games and daily physical activity. Stettler, Signer, and Suter (2004) determined that the electronic gameplay was significantly associated with obesity calculated with body mass index in a study conducted with Swiss children.

Another variable associated with digital game addiction is the time individuals devote to playing digital games on computers, smartphones, or other devices. In a study conducted by Chan and Rabinowitz (2006), the relationship between the social and academic functions and the daily time spent by 9th and 10th grade students on internet, TV, console, and internet games was investigated. Significant relationship were determined between spending more than one hour daily on games and Conners Parent Rating Scale internet addiction ($p < 0.001$), general academic achievement score ($p \leq 0.019$), and attention deficit and hyperactivity disorder ($p \leq 0.020$) and inattention (p 0.001) components. There was no significant relationship between video gaming and BMI and exercise, the number of disciplinary retributions, and Conners Parent Rating Scale hyperactivity and reciprocity components. In the study conducted by Truel, Romashkin and Morrison (2016), the effects of the use of information systems on the health of young adults were investigated. Based on the hypothesis that obesity, which is currently common among young individuals and considered as a risk factor for serious chronic diseases in future years and the relationship is partly mediated by a decrease in sleep time, the relationship between these variables and cardio-metabolic problems was investigated. In the study, it was reported that there was a negative relationship between game addiction and sleep duration. It was also demonstrated that restricted sleep was a mediator of the relationship between game addiction and obesity and was associated with cardio-metabolic disorders. However, no direct relationship was found between game addiction and obesity in the study. In a study conducted by Wack and Tantleff-Dunn (2009), the relationships between the frequency of electronic gameplay among male college students and obesity, the social and emotional context of electronic game play, and academic performance were investigated. The study revealed no significant relationship between the frequency of gameplay and BMI and academic achievement. However, there was a positive significant relationship between the frequency of gameplay and the frequency of gameplay when the students were bored, lonely or stressed.

1.2 Relationship Between Player Types and Game Addiction

In addition to being associated with several variables, game addiction is among the variables that have the potential to affect game addiction such as player motivation and player types (Király et al., 2015). One of the most important components that lead to gameplay is the motivation of the individual to play games (Ghuman & Griffiths, 2012). Bartle (1996) reported that there are four basic player and motivation types: focused on discovery, focused on success, focused on socialization, and focused on competition. Lazzaro (2004), on the other hand, argued that motivations such as hard competition-based entertainment, easy gameplay and system discovery-based entertainment, the entertainment that positively changes player emotions, and social entertainment that allows interaction with other players affected the players. According to Yee (2006), there are three types of player motivation especially in online games: social motivation, achievement motivation, and immersion. Kim and Ross (2006) reported that sportive games included player fantasy, competition, entertainment, social interaction, and diversion of player motivations. Ryan, Ribgy and Przybylski (2006), on the other hand, categorized players based on the type of engagement with games as intrinsic or extrinsic, not based on player motivation. Demetrovics et al. (2011) claimed that online games provided social, escape, competition, coping, skill development, fantasy, and recreation player motivations. Thus, player types and player motivations vary based on the type of the game.

In the literature, certain studies investigated the relationships between player types, play time, player motivation and game addiction. It was determined that social interaction and socialization opportunities

force the players to stay in the game and play the games for a long time, especially the online games (Ng and Wiemer-Hastings, 2005; Ducheneaut et al., 2006). Furthermore, the motivation to discover new things (Hsu, Wen & Wu, 2009; Billieux et al., 2013), motivation to advance (Hsu, Wen & Wu, 2009; Hussain, Williams and Griffiths, 2015; Dindar & Akbulut, 2014), cyber social relationships (Hsu, Wen & Wu, 2009; Dindar & Akbulut, 2014), competition and achievement (Lehenbauer-Baum et al., 2015; Hussain, Williams and Griffiths, 2015) and cooperative achievements and play (Billieux et al., 2013) are among the variables that could affect game addiction. Kuss, Louws and Wiers (2012) reported that the motivation to escape from real life problems and the interest in analyzing the rules and the system to optimize the character performance in video games increase the excessive game play and time spent in gameplay. Thus, player type and player motivation have various effects on digital game addiction.

1.3 Current Study

According to the TURKSTAT (2021) report, the use of smartphones and the internet in secondary school children has increased significantly in the past decade, and their use of the internet for mostly playing and downloading games has caused parents and educators to worry. It is important to reveal the relationship between childhood obesity, game addiction and academic achievement together in order to develop evidence-based measures and practices to protect children from digital game addiction and ensure that they become healthy and successful adults in the future. It is thought that the results and recommendations of the research will guide parents and educators to take effective measures so that children have conscious play behaviors. Literature review revealed that the studies on the relationship between player motivation and digital game addiction were conducted on groups who played certain games (mostly MMORPGs), and compared player motivation, in-game and game-related player behaviors. The present study aimed to determine whether player and motivation types were significant predictors of game addiction with GUTS which determines player types. Thus, the hypothesis that there is a relationship between computer game addiction and gamification user types was tested. So that, in the study, the impact of variables such as gender, weekly computer and smartphone play time, BMI and academic achievement, which were reported to affect computer game addiction in the literature, was investigated and the same variables were tested as control variables in the analysis of the relationships between addiction and player types. Specifically, the study sought to answer the following research question “Are the digital game addiction scores of participants can be predicted by gender, academic achievement, weekly computer and smartphone play time, player types, body-mass index (BMI)?”

2. Method

2.1 Research Model

The research was designed in a cross-sectional survey model. In studies conducted with the cross-sectional survey model, variables are measured at once for description (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz & Demirel, 2012).

2.2 Participants

The study participants included 289 students attending fifth and sixth grades in a randomly selected public school in Sivas province during the 2018-2019 academic year. 129 students (44.6%) were female and 160 (55.4%) were male. 109 (37.7%) were 5th grade, 180 (62.3%) were 6th grade students.

2.3 Data Collection Tools

2.3.1 Digital Game Addiction Scale

Digital Game Addiction Scale (DGAS) was developed by Lemmens et al. (2009) and adapted to the Turkish language by Irmak and Erdoğan (2015). It is a five-point Likert-type scale with 7 items and a single dimension. The Scope Validity Index of the scale was r = 0.92, Cronbach's alpha coefficient was 0.72, and item total score correlations were between 0.52 and 0.76. In the exploratory factor analysis, the scale that

included a single dimension explained 56.96% of the total variance and the factor loads varied between 0.52 and 0.77. The confirmatory factor analysis results were as follows: $\chi 2$ = 14:22, p = 0.37, df = 14, RMSEA = 0.012, AGFI = 0.92, CFI = 0.99, GFI = 0.96 and SRM = 0.06, and determined that the model had best goodness of fit and the scale could be used as a valid and reliable tool in determination of or early diagnosis of problematic digital gaming behavior in adolescents in Turkey.

2.3.2 Gamification User Types Scale (GUTS)

The gamification user types scale was developed based on a framework proposed by Marczewski (2015), and the validity and reliability of the scale was determined by Tondello et al. (2016). The scale was adapted to Turkish language by Akgün and Topal (2018) with translation, linguistic equivalence, validity and reliability studies. The scale includes 22 items and six sub-dimensions. Each scale sub-dimension represents a user type. These sub dimensions include the free spirit, the socializer, the achiever, the philanthropist, the player, and the disruptor. It is a 7-point Likert type scale. High and low scores indicate the dominance of a player profile in an individual. The Cronbach alpha internal consistency coefficient calculated is .89 for the whole scale (Akgün & Topal, 2018). The Cronbach's alpha internal consistency coefficients for the sub-factors are as follows: the philanthropist: .76, socializer: .79, the free-spirit: .72, the achiever: .80, the disruptor: .71, and the player type: .78 (Akgün & Topal, 2018).

The player type scale developed by Tondello et al. (2016) is focused on gamification. The scale validity was determined with a scale validated by individual game dynamic and mechanism preferences and the Big-5 personality inventory. The difference between this and other scales proposed in the literature is the fact that this scale was not developed for a specific game type, but based on gamification assumptions. The gamification user types scale (GUTS) developed by Tondello et al. (2016) could determine player profiles without the need for individuals to play a certain game. Thus, this scale was preferred to measure the player types and motivations.

2.3.3 Participant Information Form

A participant information form was developed by the authors to collect participant demographics such as gender, weekly time devoted to play digital games by hour on computer (CGT) and smartphone (SGT), height, and weight. To calculate the BMI value with the height and weight data collected with the form, the BMI classification published by the World Health Organization for 5-19 years old children was employed (Who, 2020c). Also, general grade point average (GPA) was asked to participants via this form.

2.4 Data Collection and Analysis

The required permission for research was obtained from the school administration. Data collection instruments were converted into online forms. The data of the volunteer students, whose parents were informed about the study and their verbal consent was obtained, were collected in the Information Technologies Laboratories of the school. Hierarchical linear regression analysis was conducted to determine the correlation between the player types and addiction based on gender and age. Gender variable was coded as a dummy variable where "0" represented females and "1" represented males. The analyses were conducted with the SPSS 21 software.

3. Findings

It was determined that student academic achievement scores varied between 44.12 and 98.84 (sd: 78.06 ± 11.44), BMI varied between 13.78 and 24.45 (sd: 18.19 ± 2.57), play time on computer (hours per week) varied between 0 and 56 (sd: 3.69 ± 6.23), and play time on smartphone (hours per week) varied between 0 and 34 (sd: 2.88 ± 5.15). The scores obtained from the digital game addiction scale ranged between 8.24 and 28.83 (± sd; 13.83 ± 3.26). The GUTS scores were as follows: The socializer type scores varied between 4 and 28 points (± sd; 22.86 ± 6.49), the philanthropist type scores varied between 4 and 28 points (± sd; 20.77 ± 5.80), the achiever type scores varied between 4 and 28 points (± sd; 22.56 ± 6.69), the free-spirited

type scores varied between 4 and 28 points (± sd; 20.61 ± 6.35), the disruptor type scores varied between 3 and 21 points (± ss; 12.22 ± 3.87), and the player type scores varied between 3 and 21 points (± sd; 15.34 ± 5.00). Among the participants, the highest mean score was achieved by the socializer type, while the lowest mean score was achieved by the disruptor type. Initially, to analyze the correlations between the variables, Pearson moment correlation coefficient was calculated and the results are presented in Table 1.

Table 1.

The Pearson Correlation Coefficients for the Correlations Between Digital Game Addiction and Predictor Variables

	GPA	**BMI**	**CGT**	**SGT**	**Philanthropist**	**Free Spirit**	**Socializer**	**Achiever**	**Player**	**Disruptor**
DGAS	-.259**	.009	.356**	.298**	-.146*	-.125*	-.175*	-.189**	-.019	.053

The analysis results demonstrated that there were no statistically significant correlations between DGAS scores of the participants and BMI (r = .009, p <.05), player type (r = -.019, p <.05) and disruptor type (r = .053, p <.05) variables. However, there was a significant relationship between DGAS and certain GUTS sub-dimension scores and academic achievement. The Pearson moment correlation coefficients presented in Table 1 demonstrated that there were negative significant correlations between DGAS scores and academic achievement score (r = -. 259, p <.01), philanthropist type (r = -. 146, p <.05), free-spirited type (r =. -.125, p <.05), socializer type (r = -. 175, p <.05), and achiever type (r = -. 189, p <.01) scores. Thus, digital game addiction decreased as the academic achievement score increased and the dominance of the philanthropist type who seeks meaning in work and loves to help others, free-spirited, socializer and achiever types increased in the individual. Furthermore, the play time on the computer and DGAS (r = .356, p <.01) and the play time on the smartphone and DGAS (r = .298, p <.01). The correlation analysis revealed that DGAS and GUTS were correlated and the hierarchical regression analysis was conducted to determine which variables were correlated.

Table 2.

Findings of the Hierarchical Regression Analysis on Digital Game Addiction Scale

Predictor	B	S.E.	Beta	T	Significance
Block 1 (R^2 = 0.143; ΔR^2 = 0.137; F(2,286) = 23.798; p. < 0.001)					
Gender	*3.528*	*.703*	*.282*	*5.019*	*.000*
GPA	*-.107*	*.031*	*-.196*	*-3.499*	*<.001*
Block 2 (R^2 = 0.235 ΔR^2 = 0.224; F(2,284) = 17.064; p. < 0.001)					
Gender	*2.516*	*.690*	*.201*	*3.664*	*.000*
GPA	*-.106*	*.029*	*-.195*	*-3.662*	*<.001*
CGT	*.210*	*.062*	*.210*	*3.359*	*.001*
SGT	*.163*	*.068*	*.148*	*2.418*	*.016*
Block 3 (R^2 = 0.275 ΔR^2 = 0.246; F(7,277) = 2.202; p. < 0.005)					
Gender	*2.406*	*.694*	*.192*	*3.465*	*.001*
GPA	*-.067*	*.031*	*-.122*	*-2.178*	*.030*
CGT	*.211*	*.062*	*.211*	*3.389*	*.001*
SGT	*.175*	*.069*	*.158*	*2.542*	*.012*
BMI	.077	.126	.032	.610	.542
Philanthropist	-.001	.092	-.001	-.015	.988
Socializer	-.123	.110	-.128	-1.111	.268
Free Spirit	.022	.095	.022	.232	.817
Achiever	-.172	.097	-.184	-1.763	.079
Player	.118	.091	.094	1.290	.198
Disruptor	.169	.096	.105	1.755	.080

Durbin-Watson* = 1.787, Tolerance values** range from .240 to .951 and VIF values** range from 1.034 to 4.171.
* Durbin-Watson value was near 2, and it is indicated non-autocorrelation between variables.

** All tolerance values greater than .20 and VIF values smaller than 5, it is indicated no multicollinearity problem.
Significant values marked as italic.

In the first block, the impact of gender and academic achievement score on DGAS score was analyzed in the hierarchical regression model, and it was determined that both variables were the predictors of DGAS score (Table 2). The change in F value was significant in the first block: F change F (2,286) = 23.798; p <.05, R2 change = 0.137 (Table 2). The gameplay time on the computer and on the phone were included in the second block of the hierarchical regression model, and it was observed that these variables were also the predictors of DGAS score (Table 2). In the second block, the change in F value was also significant: F(2.284) = 17.064, p <.05, R2 = 0.224. In the third block, six sub-factors that represented player types in GUTS were included. However, it was observed that these variables were not predictors of the DGAS score. In the third block, the change in F was again significant: F(7.277) = 2.202, p <.05, R2 = 0.246. It was observed that the R2 change increased in the second and third blocks when compared to the first block (Table 2). Analysis results demonstrated that males tended to be addicted to games more than females. It was observed that there was an inverse relationship between digital game addiction and academic achievement score, and as digital game addiction increased, academic achievement score decreased. Furthermore, analysis results suggested that weekly computer and phone play times increased digital game addiction individually. On the other hand, it was observed that there was no significant relationship between the BMI values of the students based on their player profiles.

4. Conclusion and Suggestions

The study findings revealed that gender, academic achievement, and weekly computer and phone play time significantly predicted digital game addiction. Among these factors, male gender, increase in weekly play time on the computer and phone led to an increase in digital game addiction, and an increase in academic success led to a decrease. Furthermore, it was observed that BMI and player type were not significant predictors of digital game addiction.

The study findings revealed that the gender variable predicted digital game addiction and male students tended to be game addicts more than female students. These findings were consistent with the results of similar studies in the literature (Bilgin, 2015; Çakıcı, 2018; Dursun, Eraslan-Çapan, 2018; Erboy, 2010; Gökbulut, 2020; Gökçearslan & Durakoğlu, 2014; Göldağ, 2018; Güllü, Arslan, Dündar & Murathan, 2012; Güvendi, Demir, Hazar, Demir, Namlı & Türkeli, 2017; Hazar et al, 2017; Horzum, 2011; Karacaoğlu , 2019; Keskin, 2019; Köseliören, 2017; Mustafaoğlu & Yasacı, 2018; Şahin & Tuğrul, 2012; Yavuz, 2018). This could be due to the higher motivation levels of the male students to play computer games when compared to females (Chou & Tsai, 2007). Furthermore, certain studies in the literature reported that females could be more addicted to digital games when compared to males (Ulum, 2016) and there was no relationship in digital game addiction based on gender (Taş, Eker & Anlı, 2014; Öncel & Tekin, 2015; Aydoğdu, 2018). These findings also show that new research is needed to better understand the causes of male students' digital game addiction. In addition, it may be useful to direct male students to do more physical activity and to inform the parents about negative consequences of digital game addiction.

The study findings on academic achievement revealed that digital game addiction negatively affected academic achievement. Several studies in the literature indicated that digital game addiction negatively affected academic achievement (Brunborg et al., 2014; Bülbül & Tunç, 2018; Bülbül, Tunç & Aydil, 2018; Gentile et al., 2011; Karacaoğlu, 2019; Rehbein, Psych, Kleimann, Mediasci & Mößle, 2010). These findings suggested that students could not focus on their lessons or study adequately since they constantly think about playing games. It was also observed that the more students played digital games on computers and smartphones every week, their chance of addiction to digital games increased. Several studies reported similar findings (Aksel, 2018; Güvendi, Demir, Keskin, 2019; Gökçearslan & Durakoğlu, 2014; Hazar, Demir, Namlı & Türkeli, 2017; Mustafaoğlu & Yasacı, 2018; Korkmaz & Korkmaz, 2019). Gaming

behaviors can be controlled by informing the parents about digital game addiction and by emphasizing the importance of controlling their children's playing time.

Based on the study findings, a significant relationship was not determined between the BMI and digital game addiction. This finding was similar to the findings reported by Chan and Rabinowitz (2006), Saquib et al. (2017), Truel, Romashkin and Morrison (2016), and Wack and Tantleff-Dunn (2009). On the other hand, it is known that problematic digital gaming habits and digital game addiction affect BMI of the individuals either directly or indirectly (Canan et al., 2014; Stettler, Signer & Suter, 2004; Tremblay & Willms, 2003;). This could be due to the fact that participating students' eating habits. Furthermore, it was observed that there were no significant relationships between digital game addiction levels based on player type or player motivation. Previous studies reported that narcissistic personality disorder (Kim, Namkoong, Ku & Kim, 2008), a player profile motivated by external rewards and expecting a reward for actions (Hsu et al., 2009; King et al., 2010), in-game socialization (Dindar & Akbulut, 2014; Ducheneaut et al., 2006; Hussain, Williams & Griffiths, 2015; Ng & Wiemer-Hastings, 2005), novel in-game discoveries (Hsu, Wen & Wu, 2009) and motivation for achievement in the game (Lehenbauer-Baum et al., 2015) increased game addiction. However, the present study findings did not confirm this effect, which could be due to the young age of the students who participated in the present study and cultural differences.

4.1 Suggestions for Future Research

The present study aimed to analyze the digital game addiction based on gender, digital play time (weekly) on computers and smartphones, academic achievement, BMI and player type variables. The study findings demonstrated that male participants had a higher risk for digital game addiction. It was also determined that the time spent on a computer and smartphone to play games increased digital game addiction, while digital game addiction decreased academic achievement. No significant relationship was determined based on BMI and player motivations. In future studies, the relationship between the games and types of games played by the students based on gender, academic achievement, play time and digital game addiction could be investigated. Furthermore, in future studies, especially considering the gradually decreasing socialization, the psychological consequences of digital gameplay on individuals could be researched based on various variables to introduce suggestions for correct digital gameplay.

With the COVID-19 pandemic that emerged after the research was carried out, the interruption of face-to-face education and the transition of schools to online education caused an increase in the time spent by children and adolescents in digital environments and their interest in digital games. The NPD Group, which analyzes the consumer and market, stated that in March 2020, video game sales in North America increased by 34% compared to March 2019, sales of video game hardware increased by 63%, and sales of the Nintendo Switch console doubled (NPD, 2020) . According to the information on the GaminInTurkey site, it has been stated that there are changes in the game playing habits of the users during the COVID-19 process in a similar way in Turkey. According to the information, there is an increase of 40-50% in the number of daily active players in Turkey, an increase of up to 40% in the time devoted to video games, a 52% increase in digital games, while the sales of game consoles increased by 155%, in total game sales. On the other hand, a percentage of 63% is reported (GaminInTurkey, 2020). According to the April 2020 data of sahibinden.com, the e-commerce site serving in Turkey, the Computer category received 135% more attention compared to the same period of the previous year, and users posted 286 percent to Game Console advertisements in April compared to the same period of the previous year, and Online Games' a, on the other hand, showed 177% more interest (Digital Age, 2020). In the light of this information, in future studies, the psychological consequences of digital games on individuals can be examined in terms of various variables, especially during the pandemic period where physical socialization is gradually decreasing and the use of digital media is increasing.

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