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ORIGINAL RESEARCH

Problematic Technology Use and Well-Being in Adolescence: The Personal and Relational Effects of Technology

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Main Points

- Self-control negatively predicts game and smartphone addictions.
- Game and smartphone addictions negatively predict family harmony and self-esteem.
- Self-esteem and family harmony play mediating role in the relationship between problematic technology use and well-being.
- Males have higher game addiction levels than females and females have higher smartphone addiction levels than males.
- Academic achievement decreases, as game and smartphone addictions increase.

Abstract

The purpose of this study is to examine the relationships among self-control, problematic technology use, family harmony, self-esteem, and well-being. The sample is composed of high school students from several schools in Istanbul. The Turkish versions of the Brief Self-Control Scale, Digital Game Addiction Scale (DGAS-7), Smartphone Application-Based Addiction Scale (SABAS), Family Harmony Scale, Lifespan Self-Esteem Scale, and EPOCH Measure of Adolescent Well-Being have been used for collecting the data. IBM Statistical Package for the Social Sciences and Statistical Packages for the Analysis of Moment Structures have been used for the data analyses. Structural equation models have been created for both digital game addiction and smartphone addiction. According to the findings, self-control significantly predicts problematic technology use, and problematic technology use significantly predicts well-being through the mediation of family harmony and self-esteem. As the level of self-control increases, smartphone and digital game addictions decrease. However, as digital game and smartphone addictions increase, family harmony, self-esteem, and well-being decrease. The negative relationship between problematic technology use and well-being may be related to disruptions in family harmony and decreased self-esteem. The relationships among problematic technology use, gender, and academic achievement have also been examined. The research findings are discussed through the literature. Future recommendations based on the results have been presented for researchers and practitioners.

Keywords: Digital game addiction, smartphone addiction, self-control, self-esteem, family relationship, well-being, gender, academic achievement

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Introduction

People of all ages have undeniably been increasingly involved in the digital world in recent years. According to the data for 2019, 57% of the world's 7.676 billion population use the Internet and 42% use social media actively. In one month, 92% of the total population has watched videos on the Internet and 30% have played games (We Are Social, 2019). With the increasing use of technology, technology addiction has also become widespread. Examining the situations that cause problematic technology use and the results of problematic technology use is one of

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the focal points of cyber psychology research. The information gained on this subject can help in planning preventive and remedial works. This study investigates the individual and relational results of smartphone addiction and digital game addiction, which are among the sub-areas of problematic technology use.

Griffiths (1996) defined technology addiction as a behavioral addiction involving interactions between man and machine (for example, watching television, playing computer games) and generally shows compulsive and triggering features. Internet addiction, which is a specific form of technology addiction, has been defined as excessive and compulsive Internet use, the uncomfortable feeling when deprived of the Internet, decreased relations with people because of Internet use, and avoiding problems and unhappy feelings (Young, 2004). The addictions that adolescents develop through the Internet, such as game addiction, smart phone addiction, and social media addiction can be evaluated as technological addictions (Savcı & Aysan, 2017; Valderrama, 2014). Adolescents can meet their needs to get along well, be accepted, and be appreciated by people through technology and the Internet. In adolescence, the need to form an identity (Erikson, 1968), be social, and communicate with friends (Cüceloğlu, 1994) stands out. As getting along with people, being accepted, and being appreciated are the needs of adolescents, they mostly reach for technology and Internet to meet these needs (Griffiths, 2001; Ögel, 2012). Adolescents may be more prone to Internet addiction due to their developmental needs (Lin & Tsai, 2002; Öztürk, Odabaşıoğlu, Eraslan, Genç, & Kalyoncu, 2007). Emotional and behavioral problems have been associated with variables such as problematic Internet use (Caplan, 2002, 2007) and Internet addiction behaviors (Tsitsika et al., 2014). Digital game play (Lemmens, Valkenburg, & Peter, 2009; Lenhart et al., 2008) and heavy smartphone use (Dave & Davey, 2014; Kuyucu, 2017) seem to cause adolescents to develop technology addiction (Valkenburg & Peter, 2011). This study investigates the effect of adolescents' self-control on problematic technology use and the mediating role of the variables of family harmony and self-esteem on the effect of problematic technology use on well-being using different structural equation models.

Digital Game Addiction

The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) defines game addiction under the heading of Internet Gaming Disorder as the behavior of playing games on the Internet in a recurring and repetitive manner. Nine criteria are listed under this disorder. Observing five or more symptoms among these criteria indicates that the individual has an Internet gaming disorder. These criteria include the mind being constantly busy with Internet games; being irritated when deprived of a game, and feeling stressed and sad; the urge to increase the time spent in playing games; wanting to control game play on the Internet but not being able to achieve this; decreasing interest in other areas and entertainments aside from game play; playing Internet games excessively despite experiencing psychosocial problems; deceiving the family, the therapist or others with regard to playing time; playing games to avoid negative emotional states (i.e., helplessness, guilt, and anxiety); and sacrificing meaningful relationships and professional, educational, and career opportunities because of playing games (American Psychiatric Association (APA), 2013).

Young people are especially known to play digital games heavily (Gentile, 2009; Griffiths, Davies, & Chappell, 2004). In addition, the level of game addiction and problematic game play in adolescent boys has been found to be higher than that in girls (Griffiths, 2004; Király et al., 2014; Lee & Kim, 2016; Lemmens, Valkenburg & Peter, 2011; Rehbein & Baier, 2013). The use of digital games has been observed to positively affect adolescents' life satisfaction and friendly relationships (Kowert, Vogelgesang, Festl, & Quandt, 2015). However, digital game addiction has also been found to cause aggression in adolescents (Kim, Namkoong, Ku, & Kim, 2008: Wallenius, Punamäki, & Rimpelä, 2007); to have a negative relationship with academic success (Haghbin, Shaterian, Hosseinzadeh, & Griffiths, 2013; Tangney, Baumeister, & Boone, 2004), self-control, social relationships (Kim et al., 2008), and parental bonds (Schneider, King, & Delfabbro, 2017); and to cause psychological disorders such as depression and anxiety (Männikkö, Billieux, & Kääriäinen, 2015).

Smartphone Addiction

Smartphone addiction can be described as the excessive use of smartphone, not taking breaks from the phone, feeling empty without a smartphone, and having problems concentrating on one's daily work because of smartphone use (Kwon et al., 2013a; Lin et al., 2014). Bianchi and Phillips (2005), who did the first study on problematic use of mobile phones, found extraversion and low self-esteem to be associated with problematic use of mobile phones, and young people to be more prone to excessive and problematic use of phones. According to a study conducted in Turkey, youths with high smartphone dependency are found to use smartphones for playing games and connecting to the Internet and social networking sites, in that order (Demirci, Orhan, Demirdas, Akpinar, & Sert, 2014). In addition, the factors that cause young people to heavily use smartphones are known to be social networking sites (Kwon, Kim, Cho, & Yang, 2013; Salehan & Negahban, 2013). In a study conducted with university students, young people were observed to maintain strong relationships with others because of smartphones; thus, their loneliness and depression levels decreased, and self-confidence increased (Park & Lee, 2012). However, smartphone addiction in adolescents has been found to be related to exposure to domestic violence (Kim et al., 2018), poor communication with parents, low self-esteem (Lee et al., 2018), and low academic success (Humanitarian Relief Foundation (IHH), 2015; Samaha & Hawi, 2016). Studies that show low self-control to cause smartphone addiction in young people also exist (Cho, Kim, & Park, 2017; Jeong et al., 2016; Kim et al., 2018; Servidio, 2019). In terms of gender, girls in adolescence are found to have higher levels of smartphone use and addiction than boys (Heo & Lee, 2018; Yang, Lin, Huang, & Chang, 2018). Furthermore, some studies found that smartphone addiction does not differ by gender (Cha & Seo, 2018; Kwon, Kim, Cho, & Yang, 2013b).

Self-Control and Problematic Technology Use

Self-control is one's ability to regulate emotional and physical responses, delay instant gratification, and not act impulsively (Rosenbaum, 1980). As self-control increases, one's academic performance, self-esteem, and positive interpersonal relationships (especially with family) increase, and the level of impulsivity decreases (Tangney et al., 2004). Internet addiction has also been observed to increase in adolescents with low self-control who feel negative restraint and pressure from their parents (Li, Dang, Zhang, Zhang, & Guo, 2014). Young people's impulsive and re-

peated use of the Internet has been found to possibly be due to a lack of self-regulation (LaRose, Lin, & Eastin, 2003). When looking at the research on gaming addiction, studies that revealed a negative relationship between game addiction and self-control were found (Chen & Leung, 2016; Kim et al., 2008). Individuals with problematic use of Internet, who show digital game addiction symptoms, were found to have low self-control and high impulsivity (Blinka et al., 2015; Yau, Potenza, & White, 2012).

Low self-control, as in other types of addiction, has been shown to cause smartphone addiction (Jeong, Kim, Yum, & Hwang, 2016; Kim et al., 2016; Kim Min, Min, Lee, & Yoo, 2018). Young adults who use their smartphones to enter social networking sites have been found to have the desire to be in contact with other people by sharing their instant feelings and thoughts, and that their high impulsiveness causes dependence on social networking sites (Wu, Cheung, Ku, & Hung, 2013).

Considering these findings, investigating the relationship between adolescents' problematic technology use and self-control levels becomes important.

Well-Being and Problematic Technology Use

Well-being is defined as the satisfaction, positive mood, and state of happiness one gets from life (Diener, 2000). Ryyf (1989) identifies well-being with positive psychological functionality and defined it as self-acceptance, establishing positive relationships with others, being autonomous, being able to organize one's environment, having meaning and purpose in life, and discovering personal growth and potential. Similarly, Seligman (2011), one of the pioneers of positive psychology and the developer of the authentic happiness theory, revealed happiness to be something defined by life satisfaction, and well-being consists of components such as positive emotion, engagement, meaning, accomplishment, and relationships. By creating acronyms from the initials of these components, he named his model PERMA. Positive emotion has been associated with enjoying life and happiness. Engagement means concentrating on the activity in which one is engaged and being in flow. Relationships include establishing intimate and close relationships with others and not breaking from one's social life. Meaning refers to connecting and serving something larger than oneself. Accomplishment is defined as something to pursue, even if it does not bring positive emotion and meaning. (Seligman, 2011).

After the PERMA model developed by Seligman (2011) was adapted to adolescents (Kern et al., 2015), the EPOCH Scale was developed within the scope of well-being theory for adolescents (Kern, Benson, Steinberg, & Steinberg, 2016). Well-being for adolescents includes 5 positive psychological traits: engagement, perseverance, optimism, connectedness, and happiness. Engagement is similar to Seligman's (2011) definition. Perseverance refers to the effort made to complete the targeted job despite the difficulties. Optimism is defined as being hopeful and secure about the future and looking at things positively. Connectedness is defined as being in a positive relationship with others and feeling loved, valued, and respected in relationships. Happiness involves being in a positive mood and being satisfied with life, not temporarily but permanently (Kern et al., 2016). The theory was formed into an acronym with the first letters of these traits in English and named EPOCH (Demirci & Ekşi, 2015; Kern et al., 2016).

An overall negative relationship has been found among problematic Internet usage (Caplan, 2002; Caplan, Williams, & Yee, 2009; Derin & Bilge, 2016), digital game addiction (Lemmens, Valkenburg, & Peter, 2011), smartphone use (Rotondi, Stanca, & Tomasuolo, 2017), and well-being. A longitudinal study in which low self-esteem, loneliness, and social competence were considered as the psychosocial characteristics found the reason for adolescents' game addiction to be due to low psychosocial well-being. However, loneliness, which can be associated with the connectedness sub-dimension of well-being, was shown to be both the cause and the result of game addiction (Lemmens et al., 2011). Adolescents' having satisfactory relationships with their family and environment is known to be an important factor in preventing game addiction (Lee & Kim, 2016). Beside this, young people with high levels of game addiction are found to have poor interpersonal communication and high social anxiety (Lo, Wang, & Fang, 2005). Based on these findings, this study will investigate whether game addiction has an impact on factors such as family harmony and self-esteem. In addition to the negative relationship between smartphone addiction and well-being (Kumcagiz & Gündüz, 2016), the use of smartphones indirectly affects well-being because it negatively affects the quality of face-to-face communication with people (Rotondi et al., 2017).

In studies that have investigated the relationship between problematic technology use and well-being, the concept of well-being is generally approached psychosocially. In a study conducted in Turkey, the relationship between Internet addiction and well-being was observed and an increase in positive feelings such as being in a relationship with others and happiness was found to reduce the risk of Internet addiction in adolescents (Derin & Bilge, 2016). This study examines the relationship between gaming and smartphone addictions based on the concept of 5-dimensional well-being (Kern, Waters, Adler, & White, 2015; Seligman, 2011). In this respect, the research can contribute to the literature because it approaches the relationship that technology addiction has with engagement, perseverance, optimism, connectedness, and happiness.

Mediating Variables: Family Harmony and Self-Esteem

Family harmony has been a value that expresses the closeness, cooperation, and relationships among family members and contributes to the well-being of both the individual and society (Ip, 2014). A strong relationship has been found between low family harmony and life stress in individuals with symptoms of depression (Kavikondala et al., 2015). Adolescents have also been found to model the family in developing addiction and negative behaviors; not receiving warm or close support from the family negatively affects their behaviors (Johnson & Pandina, 1991). Positive friends and family relations are also found among the factors preventing smartphone addiction (Kim et al., 2018). Lack of discipline in the family, poor parental supervision, and adolescents with conflicting familial communications are the factors that cause Internet addiction (Yen, Yen, Chen, Chen, & Ko, 2007). In addition, open and mutual communication with the family is known to positively contribute to the well-being of adolescents (Joronen & Kurki, 2005; Rask, Kurki, Paavilainen, & Laippala, 2003). Therefore, family harmony is worth investigating in terms of its mediating role in the relationship between problematic technology use and well-being of adolescents.

Self-esteem can be explained as one feeling self-accepted, sufficient, and worthy (Coopersmith, 1967, as cited in Higbee & Dwinell, 1996). Considering that self-esteem levels decrease during adolescence, self-esteem is an important factor during this period (Robins, Trzesniewski, Tracy, Gosling, & Potter, 2002). At the same time, self-esteem is closely related to subjective well-being. Increased self-esteem shows an individual's satisfaction with life and increases well-being (Huebner, 1991; Rosenberg, Schooler, Schoenbach, & Rosenberg, 1995). In a study in which self-esteem is considered as self-love and self-efficacy, self-esteem was seen to positively and significantly predict well-being (Doğan & Eryilmaz, 2013). A negative relationship is known to exist between problematic Internet use and self-esteem (Caplan, 2002). In a study with adolescents, the self-esteem of the adolescents who had received positive feedback from social networking sites increased, and those who had received negative feedback were indicated to have low self-esteem levels (Valkenburg, Peter, & Schouten, 2006). These studies show self-esteem to be an important variable in the effect of problematic technology use on well-being.

In addition to students' academic development, their social, emotional, and character developments are also important for ensuring their active participation in the society and being open to learning throughout their lives (Cohen, 2006). In addition, the positive psychology approach in education, which is aimed at the students' well-being, positively affects both the learning activities and social development of the children (Seligman, 2009; Waters, 2011). Therefore, well-being is anticipated to be important for adolescents, and researching the use of technology for their positive development will help them use it consciously. For this reason, investigating digital game and smartphone addiction is important through the variable of well-being in adolescents who are continuing to develop. With respect to the theoretical framework expressed in this research, although impulsivity poses as a risk for technology addiction, impulse control plays a role in preventing it. As for the use of technology, it has both personal and relational consequences that are negative. Family harmony and self-esteem are very crucial for developing well-being. Based on this theoretical framework, the models will be tested in which impulse control predicts game addiction and smartphone addiction, and in which game addiction and smartphone addiction predict the well-being through self-esteem and family harmony. In addition, solutions to the following research questions will be sought: (a) Does game addiction differ by gender? (b) What is the relationship between game addiction and academic success? (c) Does smartphone addiction differ by gender? (d) What kind of relationship exists between smartphone addiction and academic achievement?

Examining the role of self-control on problematic technology use, looking at the role of the mediating variables of family harmony and self-esteem on the relationship between problematic technology use and well-being, and examining the relationships among the variables of gender, academic success, and problematic technology use can provide findings that will contribute to the literature. This research can provide information for school counselors and researchers working in this field.

Methods

Participants

The study group in which the relationship between digital game addiction and well-being has been examined consisted of 135 male and 71 female students from various high schools in Istanbul. A total of 206 students who were in 9th, 10th, and 11th grades were reached using convenience sampling. Although the data were collected from 350 participants, 144 participants who did not specify their time spent on digital game playing were not included in the study model. The participants' ages ranged from 14 to 18 with a mean age of 15.58±0.88 years. Of the total, 87 were 9th graders, 68 were 10th graders, and 49 were 11th grade students. Two students did not specify their class levels. As time spent on the game ranged from 1 to 360 minutes, the mean daily time spent on digital game play is 67.80±63.12 minutes. The academic averages of 170 participants ranged from 47 to 99 points with a mean age of 81.92±11.14 years.

The study group in which the relationship between smartphone addiction and well-being was examined consisted of 172 male and 165 female students from various high schools in İstanbul. A total of 337 students who were in 9th, 10th, and 11th grades were reached using convenience sampling. Although the data were collected from 350 participants, 13 participants who did not specify their time spent on smartphones were not included in the study model. The participants' ages ranged from 14 to 19 years, with a mean age of 15.76±0.90 years. Of the total, 117 were 9th graders, 107 were 10th graders, and 111 were 11th grade students. Two students did not specify their class levels. Because the time spent on smartphone ranged from 1 to 900 minutes, the mean daily time spent on digital game play is 167.04±113.74 minutes. The academic averages of 280 participants ranged from 36 to 99.20 points with a mean age of 82.19±11.43 years. Participants descriptive statistics are given in Table 1.

Data Collection Instruments

Demographic Information Form: In this form, information about students' gender, age, socioeconomic status, class level, academic average, daily time spent using smartphone, and digital game play was collected.

EPOCH Measure of Adolescent Well-being: EPOCH measure is a scale for adolescents and an adaptation form of Seligman's (2011) well-being model in which he identifies five domains for well-being. The scale was developed by Kern et al. (2016) and adaptated into Turkish by Demirci and Ekşi (2015). The validity and reliability of the Turkish version were tested. Each item that has a 5-point Likert scale is scored between 1 (never) and 5 (always). The measure consisting of 20 items has five domains, namely, engagement, perseverance, optimism, connectedness, and happiness. Each domain includes 4 items. Scores ranging from 1 to 5 are obtained by calculating the average of each domain. The internal consistency of the measure for the total score is 0.95. The internal consistency values of the domains (connectedness, engagement, happiness, optimism, and perseverance) are 0.88, 0.84, 0.88, 0.84, and 0.72, respectively. When examining the construct validity of EPOCH, the five domains indicated an acceptable fit. For the criterion validity, the 20-item measures are positively correlated to the Oxford Happiness-Short Scale (0.61). The correlation coefficients between the five factors of the measures and Oxford Happiness-Short Scale range from 0.35 to 0.60. The measure does not include reverse items.

Digital Game Addiction Scale (DOBÖ-7): The scale that has been developed by Lemmens et al. (2009) and adaptated into Turkish by Yalçın-Irmak and Erdogan (2015) includes 7 items

and has one-dimentional structure. The scale is scored using a 5-point Likert scale between 1 (never) and 5 (always). Exploratory and confirmatory factor analysis indicated that the scale has one-dimensional structure. For criterion validity of the scale, the relationship among Pediatric Symptom Checklist - 17 (Erdogan & Ozturk, 2011), digital game play duration, and Online Cognition Scale (Davis, Flett, & Besser, 2002) were examined; it was found that there were statistically significant relationships among them. The Cronbach alpha coefficient value was 0.72, test-retest correlation was .80, and item total point correlations were found to be significant between 0.52 and 0.76. Higher scores obtained from the scale means that the digital game addiction level is higher.

The Smartphone Application-Based Addiction Scale (SABAS): The one-dimensional scale, which constitutes six items, was developed by Csibi, Griffiths, Cook, Demetrovics, and Szabo (2018) and adaptated into Turkish by Demirci (2019). It is rated between 1 (strongly disagree) and 6 (strongly agree). Exploratory and confirmatory factor analysis indicated that this measurement tool has one factor. The scale is positively correlated with the smartphone addiction scale. The Cronbach alpha internal consistency coefficient was found to be .83. Higher scores obtained from the scale indicated high level of smartphone addiction.

Family Harmony Scale: This scale was developed by Kavikondala et al. (2016) and was adaptated into Turkish by Duman-Kula, Ekşi, and Demirci (2018). It includes 5 items. The scale is rated on a 5-point Likert scale (strongly agree to strongly disagree). The results of confirmatory factor analysis indicated good fit. The factor loads of the items are differentiated between .70 and .89. The Cronbach alpha internal consistency was found to be .91. Higher scores obtained from the scale indicate higher levels of family harmony.

The Lifespan Self-Esteem Scale: This scale, which was developed by Harris, Donnellan, and Trzesniewski (2018) and adaptated into Turkish by Demirci (2019), has four items and is made up of one factor. It is rated on a 5-point scale between "very sad" and "very happy." Exploratory and confirmatory factor analysis indicated that the scale has one-dimensional structure. It is positively correlated to the Rosenberg Self-esteem Scale ($r=0.66$, $p<0.01$). The Cronbach alpha internal consistency coefficient was found to be 0.83, and the test-retest reliability coefficient was found to be 0.68.

Brief Self Control Scale: The scale, which was developed by Tangney et al. (2004) and was adaptated into Turkish by Nebioğlu, Konuk, Akbaba, and Eroglu (2012), has nine items. It consists of two subdomains (impulsivity and self-discipline). It is scored using a 5-point scale (1: completely contrary, 2: rather contrary, 3: neutral, 4: rather favorable, and 5: completely favorable). The confirmatory factor analysis indicated that the scale is at an acceptable fit. The Cronbach alpha internal consistency for the total scale was found to be 0.83. The Cronbach alpha internal consistency coefficients of the self-esteem and impulsivity subscales were found to be 0.81 and 0.87, respectively. Although there are 13 items in the original form, the Turkish version of the scale includes 9 items. In this study, self-discipline was not used because its Cronbach alpha internal consistency coefficient was found to be quite low (0.31). In the original form, impulse control was used instead of impulsivity. Therefore, as in the original form, the items were scored in a reverse scale, and self-control has been used as a concept in this study.

Procedure and Data Analysis

The data collection process for this study took place throughout April and May of 2019. The battery, which includes the instruments, was filled by the students in appropriate class hours, in approximately 15 minutes. Because the senior students were in the period of exam preparation, they were not involved. Therefore, only 9th, 10th, and 11th grade students were included in the study. Convenience sampling strategy was used for the sampling to reach a sufficient sample size (Büyüköztürk, Çakmak, Akgün, Karadeniz, & Demirel, 2015).

In this study, structural equation modeling (SEM) was used to investigate the relations among the variables. The significance of the indirect effects of the variables on the model was examined by means of Bootstrap Analysis performed by 5.000 resampling. AMOS 24 program was used to test the mediating role of family harmony and self-esteem for problematic technology use (digital game and smartphone addiction) and well-being. First, the mean, standard deviation, and skewness-kurtosis values of the data were computed. Subsequently, the correlation analysis was done to reveal the relationships among the variables. The measurement model was tested to assess whether the data indicated good fit with the measurement model or not. After that, each of the two structual equation models were examined seperately.

Results

Correlation Analysis and Descriptive Statistics for Game Addiction, Self-Control, Family Harmony, Self-Esteem, and Well-Being

The relationship between the variables has been examined using the Pearson Correlation Analysis. The results obtained as a result of the analysis are presented in Table 2. The structural equation model for game addiction was designed by examining the relationships among the variables.

Table 1.
Descriptive Statistics

		Game Addiction (N=206)		Smartphone Addiction (N=337)	
Variables		**N**	**%**	**N**	**%**
Gender	Female	71	34.5	165	49.0
	Male	135	65.5	172	51.0
Grade	9th	87	42.2	117	34.7
	10th	68	33.0	107	31.8
	11th	49	23.8	111	32.9

Self-Control and Game Addiction

When correlation analysis was examined, self-control was not included in the mediation model because it did not indicate a significant correlation with family harmony (r=0.097, p>0.05) and connectedness (r=0.062, p>0.05). The model for self-control predicting game addiction showed acceptable fit: $\chi^2_{(53,\ N=206)}$ =87.143; χ^2 / df=1.644 p<0.01; CFI=0.96; TLI=0.95; SRMR=0.056; RMSEA=0.056 CI (0.034-0.077). According to the results of SEM, self-control predicts game addiction negatively (β=-0.34, p<0.001). The structural equation model and the path coefficients between the variables are shown in Figure 1.

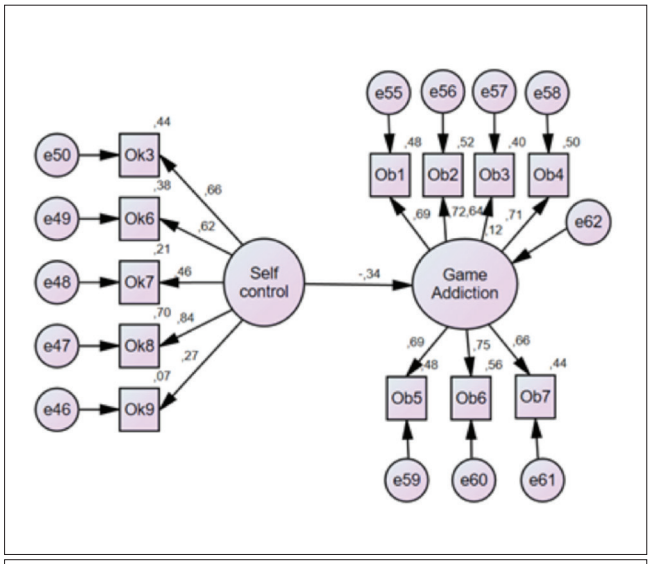

Figure 1. Structural equation model for self-control and game addiction.

Game Addiction and Well-being: The Mediating Role of Family Harmony and Self-Esteem

Measurement Model: After the correlation analysis, the measurement model that includes the variables of digital game addiction, family harmony, self-esteem, and well-being was tested. The engagement and happiness dimensions, which are among the sub-dimensions of the well-being variable, were not included in the model because they did not show significant correlation with game addiction. The tested model showed acceptable fit: $\chi^2_{(146,\ N=206)}$=209.111, χ^2 / df=1.432, p<0.001; CFI=0.97; TLI=0.96; SRMR=0.055; RMSEA=0.046 CI (0.031 – 0.059).

Structural Model: The model, which examines the mediating role of family harmony and self-esteem between game addiction and

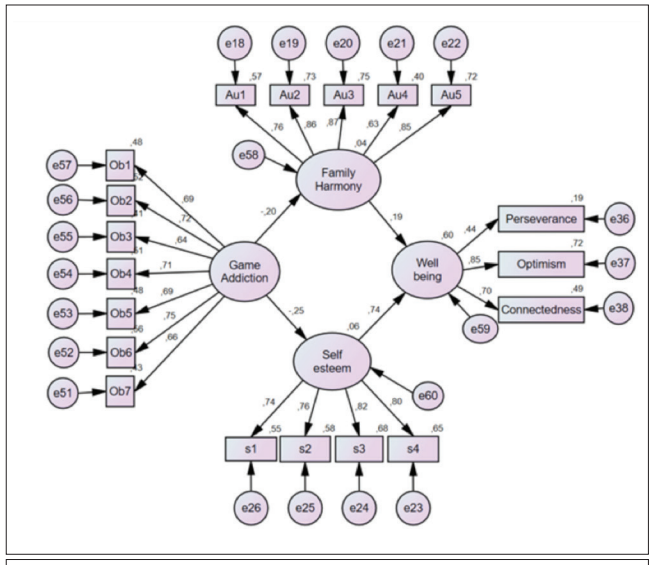

Figure 2. Structural equation model for the mediating model.

Table 2.
Correlation Analysis of Variables

Scales	1	2	3	4	5	6	7	8	9	10
1. Game addiction	1									
2. Family harmony	−0.169*	1								
3. Self-esteem	−0.204**	0.258**	1							
4. Self-control	−0.249**	0.097	0.187**	1						
5. Engagement	0.103	0.146*	0.345**	−0.065	1					
6. Perseverance	−0.151*	0.151*	0.333**	0.418**	0.328**	1				
7. Optimism	−0.204**	0.272**	0.618**	0.195**	0.452**	0.397**	1			
8. Connectedness	−0.165*	0.326**	0.509**	0.062	0.326**	0.264**	0.612**	1		
9. Happiness	−0.105	0.327**	0.603**	0.079	0.515**	0.329**	0.676**	0.468**	1	
10. Well-being	−0.141*	0 .332**	0.656**	0.178*	0.705**	0.603**	0.856**	0.713**	0.826**	1
M	17.21	21.45	14.75	24.63	14.22	13.33	12.10	13.61	16.38	14.15
SD	7.19	3.31	3.42	3.31	4.08	3.29	3.03	3.64	3.14	3.86
Skewness	0.55	−0.98	−0.85	−.59	0.20	−0.04	0.04	−0.48	−0.90	−0.47
Kurtosis	−0.31	1.03	1.19	0.63	−0.56	−0.22	−0.42	−0.09	0.41	−0.50
Cronbach α	0.87	0.89	0.86	0.71	0.72	0.66	0.73	0.76	0.84	0.89

**p<0.01. *p<0.05.
M: mean; SD: standard deviation.

well-being, showed acceptable fit: $\chi^2_{(148, N=206)}$=219.969; χ^2 / df=1.486, p<0.001; CFI=0.96; TLI=0.95; SRMR=0.078; RMSEA=0.049 CI (0.035 – 0.062). To ensure the significance of the indirect effects of the mediating variables in the model, the Bootstrap Analysis was performed by 5.000 resampling. The structural equation model and the path coefficients between the variables are shown in Figure 2.

According to the SEM result, game addiction predict family harmony (β =-0.20, p<0.05, 95% CI=[-0.36]-[-0.03]) and self-esteem (β=-0.25, p<0.01, 95% CI=[-0.42]-[-0.07]) negatively; and self-esteem (β=0.74, p<0.001, 95% CI =0.62 – 0.86) and family harmony (β=0.19, p<0.01, 95% CI=0.05 – 0.35) predict well-being positively. When the indirect effects of the variables are examined, game addiction was found to indirectly predict well-being (β=-0.22, p<0.01, 95% CI=[-0.37]-[-0.07]) through self-esteem/family harmony. The results regarding the standardized path coefficients for the model are given in Table 3.

Game Addiction and Gender

According to the t-test results, a significant difference was found between game addiction levels of the male and female students (t =-2.601, p<0.05). It can be concluded that male students have higher game addiction levels than the female students. The t-test results are given in Table 4.

Game Addiction and Academic Achievement

The students' academic average levels are grouped as "low" for those students whose academic averages are between 47-70, which is below 1 standard deviation, and "high" for students whose academic averages are between 93-99, which is above 1 standard deviation. According to the t-test results, a significant difference was found between game addiction levels of the students whose academic average was between 47-70 and 93-99 (t=2.944, p<0.05). The game addiction levels of lower academic average group were found to be higher than those of the group with a high academic average. The t-test results are given in Table 5.

Correlation Analysis and Descriptive Statistics for Smartphone Addiction, Self-Control, Family Adaptation, Self-Esteem, and Well-Being

The relationship between the variables has been examined using the Pearson Correlation Analysis. The results obtained as a result of the analysis are presented in Table 6. The structural equation model for smartphone addiction was designed by examining the relationships between the variables.

Self-Control, Smartphone Addiction, and Well-being: The Mediating Role of Family Harmony and Self-Esteem

Measurement Model: After the correlation analysis, the measurement model that includes the variables of smartphone addiction, family harmony, self-esteem, and well-being was tested. The engagement and connectedness dimensions, which are among the sub-dimensions of the well-being variable, were not included in the model because they did not show significant correlation with game addiction and self-control. The tested model showed acceptable fit: $\chi^2_{(220, N=337)}$=422.158, χ^2 / df=1.919, p<0.001; CFI=0.94; TLI=0.93; SRMR=0.061; RMSEA=0.052 CI (0.045-0.060).

Structural Model: After the measurement model showed acceptable fit, the structural model that self-control predicted smartphone addiction, and smartphone addiction predicted well-being through family cohesion and self-esteem, were tested. The tested model showed acceptable fit: $\chi^2_{(225, N=337)}$=460.892, χ^2 / df=2.05, p<0.001; CFI=0.93; TLI=0.95; SRMR=0.091; RMSEA=0.056 CI

Table 3.
Standardized estimated parameters and 95% CIs for Structural Model Pathways

				%95 CI	
Direct Link			**B**	**Lower**	**Upper**
Game addiction	→	Self-esteem	−0.247	−0.422	−0.065
Game addiction	→	Family harmony	−0.198	−0.359	−0.032
Self-esteem	→	Well-being	0.744	0.618	0.858
Family harmony	→	Well-being	0.191	0.054	0.348
Indirect Link					
Game addiction	→	Family harmony / Self-esteem → Well-being	−0.221	−0.368	−0.072

CI: confidence interval.

Table 4.
Results of the t-Test for Gender Differences about Game Addiction

Scale	**Female (N=71)**	**Male (N=135)**	***t***	***Cohen's d***
Game addiction	15.44±7.62	18.14±6.80	−2.601*	−0.37

*p<0.05.

Table 5.
Results of the t-Test for Academic Average about Game Addiction

Scale	**47-70 (N=32)**	**93-99 (N=34)**	***t***	***Cohen's d***
Game addiction	19.00±6.78	14.18±6.51	2.944*	0.74

*p<0.05.

Table 6.
Correlation Analysis of Variables

Scales	1	2	3	4	5	6	7	8	9	10
1. Game addiction	1									
2. Family harmony	−0.163**	1								
3. Self-esteem	−0.220**	0.332**	1							
4. Self-control	−0.462**	0.165**	0.226**	1						
5. Engagement	0.024	0.184**	0.354**	−0.008	1					
6. Perseverance	−0.253**	0.211**	0.355**	0.396**	0.411**	1				
7. Optimism	−0.194**	0.311**	0.598**	0.205**	0.490**	0.463**	1			
8. Connectedness	−0.024	0.338**	0.478**	0.106	0.404**	0.338**	0.610**	1		
9. Happiness	−0.118*	0.386**	0.623**	0.109*	0.580**	0.409**	0.696**	0.536**	1	
10. Well-being	−0.146**	0.374**	0.631**	0.204**	0.745**	0.662**	0.854**	0.745**	0.849**	1
M	20.14	21.03	14.52	14.35	13.31	12.33	13.49	16.28	13.95	69.36
SD	6.81	3.67	3.57	4.01	3.43	3.19	3.82	3.33	3.93	13.75
Skewness	0.07	−1.16	−0.89	0.32	−0.07	0.06	−0.44	−0.89	−0.41	−0.45
Kurtosis	−0.58	1.97	0.99	−0.28	−0.37	−0.42	−0.38	0.16	−0.54	0.07
Cronbach α	0.82	0.90	0.88	0.68	0.76	0.68	0.76	0.79	0.86	0.90

**p<0.01, *p<0.05.
M: mean; SD: standard deviation.

Table 7.
Standardized estimated parameters and 95% CIs for Structural Model Pathways

				95% CI		
Direct Link				**B**	**Lower**	**Upper**
Self-control	→	Smartphone Addiction		−0.575	−0.699	−0.439
Smartphone Addiction	→	Self-esteem		−0.269	−0.397	−0.134
Smartphone Addiction	→	Family harmony		−0.211	−0.337	−0.085
Self-esteem	→	Well-being		0.726	0.616	0.821
Family harmony	→	Well-being		0.192	0.092	0.303
Indirect Link						
Self-control	→	Smartphone Addiction →	Self-esteem	0.155	0.073	0.253
Self-control	→	Smartphone Addiction →	Family harmony	0.121	0.048	0.215
Self-control	→	Smartphone Addiction/Family harmony/ Self-esteem →	Well-being	0.136	0.066	0.226
Smartphone Addiction	→	Family harmony / Self-esteem →	Well-being	−0.236	−0.349	−0.124

(0.049 – 0.063). To ensure the significance of the indirect effects of the mediating variables in the model, the Bootstrap Analysis was performed by 5.000 resampling. The structural equation model and the path coefficients between the variables are shown in Figure 3.

According to the SEM result, self-control predicts smartphone addiction negatively (β=−0.58, p<0.001, 95% CI=[−0.70] – [−0.44]); smartphone addiction predicts family harmony (β=−0.21, p<0.01, 95% CI=[−0.38] – [−0.09]) and self-esteem (β=−0.27, p<0.001, 95% CI=[−0.13] – [0.40]) negatively; and self-esteem (β=0.73, p<0.001, 95% CI=0.62 – 0.82) and family harmony (β=0.19, p<0.01, 95% CI=0.09 – 0.30) predict well-being positively.

When the indirect effects of the variables were examined, self-control was found to indirectly predict family harmony (β=0.16, p<0.001, 95% CI=0.07 – 0.25) and self-esteem (β=0.12, p<0.01, 95% CI=0.05 – 0.22) through smartphone addiction; self-control was found to indirectly predict well-being (β=0.14, p<0.001, 95% CI=0.07 – 0.23) through smartphone addiction/self-esteem/family harmony. The results regarding standardized path coefficients for the model are given in Table 7.

Smartphone Addiction and Gender

According to the t-test results, a significant difference was found between the smartphone addiction levels of the male and female students (t=3.509, p<0.01). It can be concluded that female students have higher smartphone addiction levels than male students. The t-test results are given in Table 8.

Smartphone Addiction and Academic Achievement

The students' academic average levels are grouped as low for the students whose academic averages are between 36 and 70, which is be-

Table 8.
Results of the t-Test for Gender Differences about Smartphone Addiction

Scale	Female (N=165)	Male (N=172)	*t*	*Cohen's d*
Smartphone Addiction	21.44±6.36	18.88±7.01	3.509***	0.38

***p<0.001.

Table 9.
Results of the t-Test for Grade Average about Smartphone Addiction

Scale	36-70 (N=48)	93.70-99.20 (N=40)	*t*	*Cohen's d*
Smartphone Addiction	21.18±7.13	18.10±7.18	2.011*	0.44

*p<0.05.

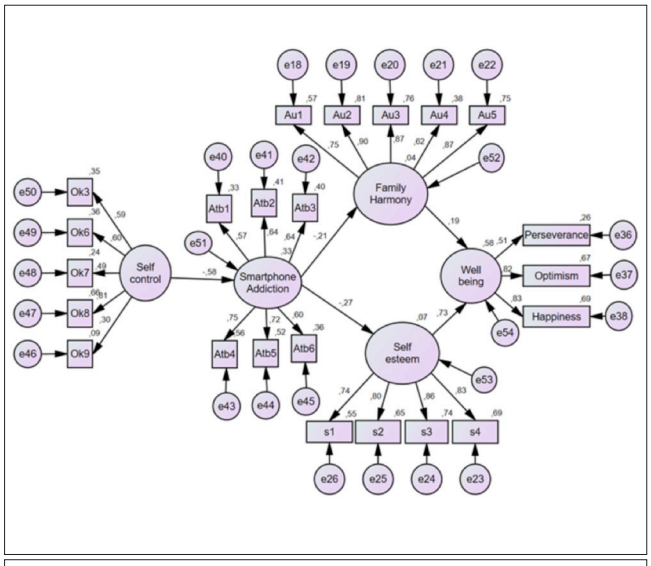

Figure 3. Structural equation model for the mediating model.

low 1 standard deviation, and high for the students whose academic averages are between 93.70 and 99.20, which is above 1 standard deviation. According to the t-test results, a significant difference was found between the smartphone addiction levels of the students whose academic average was between 36 and 70, and 93.70 and 99.20 (t=2.011, p<0.05). The smartphone addiction levels of the lower academic average group were found to be higher those that of the group with a high academic average. The t-test results are given in Table 9.

Discussion

This study has investigated the effects of self-control in the adolescents on their game addiction and smartphone addiction, and the effect of their game addiction and smartphone addiction on their well-being through the variables of family harmony and self-esteem. When observing the direct effects of the variables in the research, self-control has been found to negatively predict game and smartphone addictions, game and smartphone addictions to negatively predict family harmony and self-esteem, and self-esteem and family harmony to positively and significantly predict well-being. When examining the indirect effects of the variables in the research, problematic technology use has been found to negatively affect well-being through self-esteem and family harmony. In the group in which smartphone addiction was examined, self-control was found to negatively affect the variables of family harmony and self-esteem through smartphone addiction. In addition, self-control has been concluded to indirectly affect the well-being through smartphone addiction, self-esteem, and family harmony.

Self-Control and Problematic Technology Use

Self-control significantly, directly, and negatively predicts game addiction and smartphone addiction. Problematic technology use has been found to decrease as self-control increases. The high levels of game addiction in individuals with low self-control support the findings in the literature (Blinka et al., 2015; Chen & Leung, 2016; Kim et al., 2008; Yau, Potenza, & White, 2012). The study by Kim et al. (2008) in which self-control was considered as delayed gratification found the levels of game addiction in individuals with low self-control to be high. Becuase of self-control, keeping one's digital game play at a certain level is able to prevent game addiction (Chen & Leung, 2016). In this study, the variable of self-control, which has been associated with game addiction, relates to having self-confidence, planning skills, anger management, self-discipline, and academic success, as well as in establishing positive communications with people (Tangney et al., 2004). Therefore, this research has shown game addiction to be possibly related to the above-mentioned factors.

The increase in smart phone addiction as self-control decreases supports the results from studies in the literature (Cho, Kim, & Park, 2017; Jeong et al., 2016; Jiang & Zhao, 2016). A study in which self-control was shown to have a mediating role between stress and smartphone addiction found increases in one's stress level to cause lower self-control. Therefore, low self-control also causes smartphone addiction (Cho et al., 2017). The fear of missing out on what is going on and self-control have been found to be important factors in university students' problematic smart phone use. Individuals with low self-control have been found to have an increased fear of missing out on what is happening, and as a result, there is an increase in their interactions with smartphone applications (Servidio, 2016). The tendency of the individuals with low self-control to participate in recreational and instant gratification activities should be noted as factors affecting their smartphone addiction (Jiang & Zhao, 2016; Servidio, 2016).

Self-control was not included in the mediation model because it showed no significant relationship with family harmony in the sample in which game addiction was investigated. However, in the sample in which smartphone addiction was investigated, self-control was found to indirectly predict family harmony and self-esteem through the mediating role of smartphone addiction. According to one study, high self-control is known to be a factor

that increases family unity and reduces family conflict (Tangney et al., 2004). Positive relations with friends and family are also known to play an important role in preventing the smartphone addiction (Kim et al., 2018). A study conducted with the Turkish youth has found self-control to play a mediating role between loneliness and Internet addiction, loneliness to affect self-control adversely, and low self-control to have a strong relationship with Internet addiction (Özdemir, Kuzucu, & Ak, 2014). A study conducted in Asian countries found Internet addiction to play a mediating role in the effect of depression and social anxiety on the well-being of adolescents. Their research was based on the assumption that Internet addiction can occur in individuals with depression and social anxiety disorder to escape from negative moods (Lai et al., 2015).

The Relationship Between Problematic Technology Use, Self-esteem, and Family Harmony

Game addiction and smartphone addiction have been found to negatively and significantly predict self-esteem and family harmony. These findings are consistent with previous studies. In a study in which low self-esteem, decreased social competence, and loneliness were considered as psychosocial well-being, these variables were found to be the factors leading to problematic digital game play (Lemmens et al., 2011). These findings also support research in the literature where game addiction negatively predicts family harmony. A negative relationship has been found to exist between adolescents' social activities with their parents and game addiction (Jeong & Kim, 2011). Children who are satisfied with their family environment have been found to show less symptoms of game addiction (Liau et al., 2015). In a longitudinal study lasting three years, it was found that adolescents who play pathological digital games tend to negatively interpret their family environment and their communication with the family (Da Charlie, HyeKyung, & Khoo, 2011).

Smartphone addiction has been found to negatively affect self-esteem. A longitudinal study on adolescents has found compulsive Internet use to have a negative relationship with self-esteem, and compulsive Internet use to cause a decrease in the levels of self-esteem over time (Donald, Ciarrochi, Parker, & Sahdra, 2018). Considering that one of the purposes of smartphone use is connecting to the Internet, this finding is also remarkable. However, contrary to the findings of this research, smartphone use in young people has been found to increase self-esteem and well-being, especially when used to improve their relationships with others (Park & Lee, 2012). Although no study explaining the negative effects of smartphone addiction on family harmony is found in the literature, positive relationships with the family are also known to be a protective factor against adolescents' smartphone addiction (Kim et al., 2018).

The Relationship of Family Harmony and Self-Esteem with Well-Being

The variables of family harmony and self-esteem positively predict well-being for both the groups in which game addiction and smartphone addiction have been investigated. Studies have been found that show family harmony to be positively associated with well-being (Duman-Kula et al., 2018; Kavikondala et al., 2016). A study with adolescents has found open communication within the family, adolescents' lack of difficulty in expressing themselves, flexible family rules, and adolescents' having the right to make decisions to have positive relationships with subjective well-being (Eryilmaz, 2010). Another research on adolescents (Joronen & Kurki, 2005; Rask et al., 2003) has found open communication within the family, adolescents' and other family members' feeling love toward each other, family members being mutually aware of their emotional needs, and adolescents' feeling supported in the family to contribute to their subjective well-being, which supports the finding from this research where family harmony positively affects well-being.

The positive relationship between adolescents' self-esteem, another mediating variable, and well-being supports the findings in the literature (Dogan & Eryilmaz, 2013; Dogan, Totan, & Sapmaz, 2013; Eryilmaz & Atak, 2011). As for this study, self-esteem is a strong predictor of well-being in the samples of game addiction and smartphone addiction. One study with adolescents has found self-esteem to have a positively significant relationship with well-being and optimism, which is a sub-dimension of well-being in this study (Eryılmaz & Atak, 2011). In the literature, self-esteem has also been found to have a positive relationship with happiness, which is another sub-dimension of well-being in this study (Dogan et al., 2013).

When we look at the indirect effects of the variables according to the results of the research, self-control positively and significantly affects family harmony and self-esteem through smartphone addiction. Game addiction and smartphone addiction have been found to negatively predict well-being through family harmony and self-esteem. Self-control has also been found to positively predict well-being through the variables of smartphone addiction, self-esteem, and family harmony. These findings are discussed below in the light of the literature.

The Mediating Role of Self-Esteem and Family Harmony

Game addiction indirectly predicts well-being through self-esteem and family harmony. A longitudinal study lasting two years has found children and adolescents' engagement with their parents and feelings of a warm family environment to be protective factors against pathological game addiction (Liau et al., 2015). In a study investigating game addiction among adolescents, the adolescents with game addiction were found to have high negative self-esteem scores, but no significant relationship was found between the addiction level and self-esteem (van Rooij, Schoenmakers, Vermulst, van den Eijnden, & van de Mheen, 2011).

The negative relationship between game addiction and well-being is in line with the findings from studies in the literature (Molinos, 2016). The negative relationship between game addiction and sub-dimension of connectedness supports the research in the literature (Kim et al., 2008; Schneider et al., 2017). However, studies are also found that show well-being and social relationships to be positive for those playing multiplayer online games (Cole & Griffiths, 2007; Topsumer & Sağlam, 2019). Nevertheless, the use of digital games has not been addressed in these studies at the level of addiction, and only the sub-dimension of connectedness has been the focus. In addition, this research has revealed game addiction to have a negatively significant relationship with the dimensions of perseverance and optimism. In a study with the adults, individuals with high levels of perseverance were found to have lower game addiction levels (Borzikowsky & Bernhardt, 2018). A negative relationship was found between game addic-

tion and optimism. Although not related to game addiction in the literature, optimism has been revealed to be an important factor in preventing addiction in adolescents (Carvajal, Clair, Nash, & Evans, 1998). Because no significant relationship among game addiction, happiness, and the sub-dimensions of well-being has been found, it was not included in the model. However, the relationship between game addiction and happiness is known to be negative, and individuals with low happiness levels are known to be prone to game addiction (Hull, Williams, & Griffiths, 2013).

Smartphone addiction has also been found to indirectly predict well-being through the mediating role of self-esteem and family harmony. The predicted negative relationship between the smartphone addiction and well-being supports the research in the literature (Kumcagiz & Gündüz, 2016; Rotondi et al., 2017). In a study with university students (Tangmunkongvorakul et al., 2019), a negative relationship was found between smartphone overuse and well-being. In addition, when smartphone use is intended for connecting with the family and environment and for being in close contact with them, one's levels of loneliness and depression decrease, self-esteem increases, and thus, psychological well-being also increases (Park & Lee, 2012). This finding shows that when smartphone use is not at the level of addiction, it may have psychosocial benefits. This study has revealed smartphone addiction to be negatively and significantly related to well-being's subscales of perseverance, optimism, and happiness. In a study on the relationship between smart phone addiction and perseverance, a negative relationship was found between smartphone addiction and perseverance in traumatized individuals (Contractor, Weiss, Tull, & Elhai, 2017). A negative relationship has been found between smartphone addiction and optimism, and Internet addiction has been found to negatively affect optimism (Donald et al., 2018); however, this is not related to smartphone use in the literature.

In this study, self-control indirectly predicts well-being through smartphone addiction, self-esteem, and family harmony. In a large-scale study investigating smartphone addiction in adolescents, high self-control and having positive relationships with friends were found to be protective factors against smartphone addiction in adolescents with a negative family environment (domestic violence and parental substance/gambling addiction Kim et al., 2018). In a study conducted by Kim et al. (2008) on 1,471 individuals playing online games, a relationship was found among weak interpersonal relationships, negative communication with friends and family, and game addiction. At the same time, low self-control levels indicated high game addiction. However, the research did not reveal weak self-control and interpersonal relationships to cause addiction or vice versa. In this study, the direct effects have been found for self-control on game addiction and for game addiction on family harmony.

In both samples, self-control has been found to have a positively significant relationship with well-being's sub-dimensions of perseverance and optimism. In the literature, adolescents' self-control has also been found to be positively associated with grit/perseverance (Li et al., 2016; Oriol, Miranda, Oyanedel, & Torres, 2017) and optimism (Carver, 2014). In a study with adults in the process of overcoming drug addiction and undergoing treatment, a positive and strong relationship has been found between self-control and hope, which is known to be associated with optimism (Ferrari, Stevens, Legler, & Jason, 2012). In this research, self-control has been found to have a positive relationship with the variable of happiness in the group in which smartphone addiction was studied. In a study using the Brief Self-Control Scale, which is found in this study and was created by Tangney et al. (2004), self-control has been found to have a positive relationship with happiness and life satisfaction (Hofmann, Luhmann, Fisher, Vohs, & Baumeister, 2014).

Problematic Technology Use and Gender

A significant difference has been found between the male and female students as a result of the t test performed to see if game addiction differs by gender. The fact that male students have higher game addiction levels than female students supports the studies that have revealed problematic digital game play and digital game addiction levels to be higher in boys (Griffiths, 2004; Király et al., 2014; Lee & Kim, 2017; Lemmens et al., 2011; Rehbein & Baier, 2013). The high amount of games with action and violence (Dill et al., 2005) and men's greater interest in such games (Quaiser-Pohl, Geiser, &Lehmann, 2006; Taylan, Kara, & Durgin, 2017) can cause addiction.

A significant difference has been found between the male and female students as a result of the t test performed to see if smartphone addiction differs by gender. The higher levels of smartphone addiction in the female students compared with those in male students supports the findings in the literature (Heo & Lee, 2018; Yang et al., 2018). A study with university students has found using smart phones for socializing to have a significant relationship with problematic smart phone use. Because women's purpose for using smartphones is generally to socialize and communicate, their addiction levels are found to be higher (Servidio, 2019). In addition, a study with 671 adolescents in Turkey has found smartphone addiction levels to not differ according to gender (Yıldırım, 2018).

Problematic Technology Use and Academic Achievement

When examining the game addiction levels of students whose academic averages are between 47 and 70 or 92 and 97, the game addiction levels of the group with lower academic averages are found to be higher than that of the group with high academic averages. This finding supports research that shows a negative relationship to exist between game addiction and academic achievement (Haghbin et al., 2013; Tangney et al., 2004).

Smartphone addiction levels have been compared for the students whose academic averages are between 36 and 70 to those who have averages between 93.7 and 99.2. The low academic average group was found to have more smartphone addictions than the group with higher academic averages. This finding supports studies in the literature that show smartphone addiction to increase as academic achievement decreases (Hamutoğlu, Gezgin, Samur, & Yıldırım, 2018; IHH, 2015; Samaha & Hawi, 2016).

Low academic achievement for the participants with high game and smartphone addictions may also be caused by poor study time or poor study planning. In a study with adolescents, youths who use the social networking site Facebook were found to have lower academic success and less weekly time spent studying. Although these adolescents spend similar amounts of time on the Internet as the youths who do not use Facebook, they have been

revealed to have academic procrastination behaviors and poor time management. When considering the qualitative data of that research, they suggested that they actually use social networking sites for learning and academic purposes (Kirschner & Karpinski, 2010).

Limitations and Recommendations

Because cross-sectional data have been used in the research, conducting longitudinal and experimental studies would be useful for analyzing causal results. In the study, data have been collected only from the measurement tools based on self reports. Studies conducted over different data sources will contribute toward achieving objective results. The research is anticipated to be able to contribute to the literature in terms of these findings. This research has considered game addiction and smartphone addiction as separate variables. However, game addiction has been found in the literature to cause intense smartphone use, and, accordingly, to have a role in decreasing academic success (Bülbül & Tunç, 2018). Mobile game addiction also has psychologically significant and negative effects on young individuals (Chen & Leung, 2016). In addition to the habit of playing games, users who use smartphones for social networking sites and entertainment purposes have been found to have higher smartphone addiction than those who use smartphones for research or study purposes (Jeong et al., 2016). These studies show the importance of determining the purpose for which young people use smartphones and for examining smartphone addiction and game addiction in an interrelated manner. Considering this, future research will provide more detailed information on problematic technology use. Based on the results of this research, considering the variables of self-esteem, family harmony, and impulse control will be useful in applications that focus on reducing problematic technology use.

Ethics Committee Approval: Authors declared that the research was conducted according to the principles of the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects", (amended in October 2013).

Informed Consent: Written informed consent was obtained from volunteer students who participated in this study.

Peer-review: Externally peer-reviewed.

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