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The *International Journal of Mental Health Nursing* is the official journal of the Australian College of Mental Health Nurses Inc. It is a fully refereed journal that examines current trends and developments in mental health practice and research.

The *International Journal of Mental Health Nursing* provides a forum for the exchange of ideas on all issues of relevance to mental health nursing. The Journal informs you of developments in mental health nursing practice and research, directions in education and training, professional issues, management approaches, policy development, ethical questions, theoretical inquiry, and clinical issues.

The Journal publishes feature articles, review articles, clinical notes, research notes and book reviews. Contributions on any aspect of mental health nursing are welcomed.

Statements and opinions expressed in the journal reflect the views of the authors and are not necessarily endorsed by the Australian College of Mental Health Nurses Inc.

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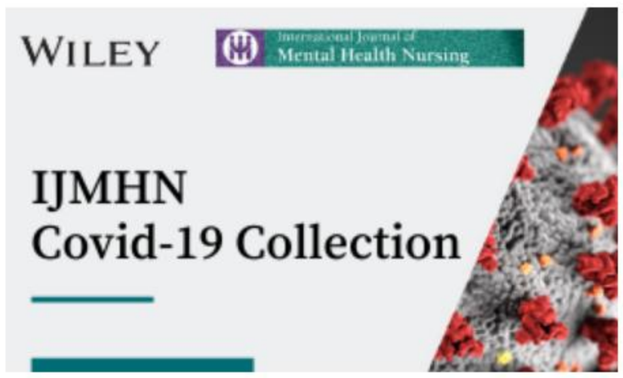

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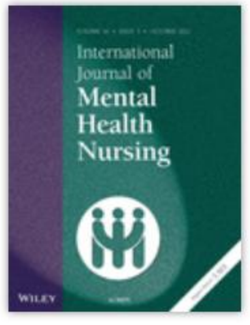

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ORIGINAL ARTICLE

Digital risks and adolescents: The relationships between digital game addiction, emotional eating, and aggression

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ABSTRACT: *Nowadays, weight gain and obesity are major health-threatening issues for children. Emotional eating, a negative health condition that can lead to obesity in children, is a defence mechanism for coping with negative emotions. This cross-sectional study aimed to evaluate the relationships between emotional eating behaviour and digital game addiction, which can cause stress and aggression in adolescents. This study was conducted with 856 adolescents from the Mediterranean region of Turkey. The data were collected using a personal information form, the Buss-Perry Aggression Questionnaire (BPAQ), the Digital Game Addiction Scale (DGAS-7), and the Emotional Eating Scale (EES). In this study, 32.4% of the adolescents were addicted to digital games. The male adolescents had higher BPAQ, DGAS, and EES mean scores. There was also a relationship between digital game addiction, aggressive behaviour, and emotional eating. This is a significant study because it shows that digital game addiction and aggressive behaviour are important determinants of emotional eating. The results of this study indicate that emotional eating is a component of digital game addiction that increases the risk of adolescent obesity.*

KEY WORDS: *adolescent health, aggression, digital game, eating behaviour, nursing.*

INTRODUCTION

Nowadays, children grow up using both traditional and modern technology (Mustafaoğlu ety al. 2018; Sivalingam & Subbaiyan 2018). Computers have quickly gained significance in their world. The use of modern technological devices such as computers, tablets and smartphones has become very common in recent years. These devices make life easier, but they also cause some problems due to careless use (Mridha 2019; Mustafaoğlu *et al*. 2018). Computers are used for communication and education, but they are also considered an important means of entertainment (Joshi & Rose 2018). Adolescents use social media to communicate with peers (Anderson & Jiang 2018) and play digital game for entertainment and leisure (Tone *et al*. 2014).

The use of digital games among children is increasing every day (Yalçın Irmak & Erdogan 2016). The Turkish Digital Games Federation (2012) has reported that more than one billion people around the world play digital games and the age of players has fallen to 4–5 years (Türkiye Büyük Millet Meclisi 2015). In Turkey, only 36.9% of children use family or child protection packages on the internet. The rest of them, particularly children with limited internet skills, are exposed to a variety of risks (Karakuş *et al*. 2014). One study has found that the prevalence of game addiction among adolescents is 28.8% in Turkey (Yalçın Irmak & Erdogan 2019).

The positive and negative effects of the widespread use of computer games on children have been studied

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(Oswald *et al*. 2020; Stiglic & Viner 2019). It is normal to play digital games without overuse as a part of a healthy lifestyle, and they even have positive effects such as emotional release and relaxation (Prot *et al*. 2014; Yalçın Irmak & Erdoğan 2016). Children who have safe and protected internet access can use computer games to comprehend many of the concepts they learn in daily life and during their education (Alexiou & Schippers 2018; Schaffer & Fang 2019). Adolescents do not use the internet for productivity, but rather for social media, games, and similar leisure activities (Anderson & Jiang 2018). Excessive and uncontrolled internet use in adolescence can negatively affect physical, psychological, and social and cognitive development (Anderso *et al*. 2017; Evgin *et al*. 2019). In adolescents with this habit, synaptic pruning (functional decline) occurs in the prefrontal cortex of their brains during puberty, decreasing their motivation to control and plan movements and impairing their planning abilities. It also causes adolescents to take more risks, to engage in dangerous behaviours, to adopt harmful internet habits, and to acquire psychosocial problems such as internet addiction (Kawabe *et al*. 2016; Mridha 2019). Long-term computer use can lead to emotional eating and obesity due to inactivity, physiological issues with visual and musculoskeletal systems, and social development problems (Mustafaoğlu *et al*. 2018). Overeating as a psychological response to negative emotions is defined as emotional eating, and excessive food consumption causes obesity (Serin & Şanlıer 2018). Obese children consume excessive food for negative emotional reasons (Sánchez *et al*. 2016). Children and adolescents who play violent computer games are more likely to engage in aggressive behaviours (Copenhaver & Ferguson 2018). Studies report that playing video games causes psychosocial problems, including loneliness (Şahin *et al*. 2019), dissatisfaction with life (Bargeron & Hormes 2017) depression (Andreassen *et al*. 2016), emotional eating (Kafali *et al*. 2020), aggression (Demirtaş Madran & Ferligül Çakılcı 2014), violent tendencies (Göldag 2020; Sari & Camadan 2016), reduced positive social behaviours (Greitemeyer & Mügge 2014), increased hostile feelings (Brockmyer 2014; Miles-Novelo & Anderson 2020), and desensitization to violence (Brockmyer 2014).

Instead of prohibiting children from using computers in order to protect them from the negative effects of computer games, it is important for families and school staff to be in close contact with them and interact with them constructively so that they can use computer for beneficial purposes (Evgin, *et al*. 2019; Mridha 2019). Although schools are the easiest place to reach children, school health nurses are responsible for helping children to acquire preventive health practices and healthy lifestyles (Sisson *et al*. 2017). Child health nursing should promote children's physical, intellectual, emotional and social development. Nurses should be aware of the effects of computers and the internet on child development and counsel families in order to reduce their harm because nurses interact with parents and educators in different roles and environments (Byrne *et al*. 2018). This study was conducted to determine the relationship between risky internet use, playing computer games, digital addiction, emotional eating, and aggressive behaviours in adolescents.

Research Questions

What is the level of the adolescents' digital game addiction?
What is the level of the adolescents' aggression?
What is the level of the adolescents' emotional eating behaviour?
Is there a relationship between digital game addiction and aggression of the adolescents'?
Is there a relationship between digital game addiction, aggression, and emotional eating behaviour of the adolescents'?

METHODS

Design

This descriptive and correlational study used the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist.

Sample

The study population consisted of secondary schools students in a city in Turkey's Mediterranean region (N = 4602). No sample selection was made in the study and the study was conducted with 856 students who agreed to participate in the study. Based on the sample size (n = 856), its power was as 99% at a 0.5 effect size and 0.95 confidence level.

Inclusion criteria

Students in the 9-12th grades who agreed to participate and received permission from their families were included in the study.

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Participants

In Turkey, compulsory education is administered for 12 years by the Ministry of National Education. This responsibility is carried out by national education directorates affiliated with the Ministry of National Education. Turkey's 12-year compulsory education has three levels in a 4 + 4 + 4 education system: (a) primary school (1st, 2nd, 3rd, and 4th grades), (b) middle school (5th, 6th, 7th, and 8th grades), and (c) secondary school (9th, 10th, 11th, and 12th grades) (Ministry of National Education 2012).

This study was conducted from October 24, 2020 to November 31, 2020 in secondary schools affiliated with the provincial directorate of education in a city in Turkey's Mediterranean region. The researchers obtained approval for the study from the ethics committee and the Ministry of National Education. They visited the school administrators to explain the purpose of the study and ask for their help. All of them agreed to cooperate and gave their approval for online data collection. A written informed consent form, which was prepared in accordance with the Helsinki Declaration, was sent to the students and their parents in opaque envelopes. This form explained the purpose and gave an overview of the study. The consent form also included phone numbers so that the parents and children could easily ask questions about the study. All the students who agreed to participate voluntarily and whose parents gave their verbal and written consent were included in the study. Children who did not have any physical, cognitive, or psychological disabilities, who gave their consent to participate in the study, and who had similar sociodemographic characteristics were included in the study.

Ethical Considerations

Prior to the study, ethical committee approval and written permission were obtained from the ethics committee (number KAEK-172, dated February 19, 2020) and the Provincial Directorate of National Education (number 50913635-605.01-E.97613). Informed consent was obtained from the children and their parents using an online form.

Data collection

Before the links for the forms were sent out to the adolescents, data collection forms were administered to 10 adolescents who were not included in the sample group; five of them were administered the written forms and five were administered via an online interface so that a preliminary application was completed, and the forms were finalized. The data collection forms were administered using Google forms. Due to coronavirus pandemic measures, the forms were collected online using WhatsApp. The students were informed that participation was voluntary, and that they were free to participate or not. The students who agreed to participate answered the questions in ~15–20 min. The data were collected over approximately two weeks. This ensured that the participants were not influenced by anyone, gave more thoughtful answers because they could choose the best time to answer the questions, and provided more truthful answers because their identities were not exposed. After the data collection forms were shared with the adolescents, 879 data were obtained. When data set was analysed, 23 duplications were detected and these duplications were excluded from the data set.

Data collection tools

The data were collected using a personal information form prepared by the researchers, the Buss-Perry Aggression Questionnaire (BPAQ), the Digital Game Addiction Scale (DGAS), and the Emotional Eating Scale (EES).

The Personal Information Form

This form was developed after a review of the literature. It includes items about the children's age, gender, height, weight, daily time online, and internet use (Bektaş *et al*. 2016; Evgin *et al*. 2019; Kafali *et al*. 2020).

The Buss-Perry Aggression Questionnaire (BPAQ)

This questionnaire was developed by Buss and Perry (1992) to measure aggression. It is a 5-point Likert-type scale based on self-assessment with 29 items in five subscales: physical aggression, verbal aggression, anger, hostility, and indirect aggression (Demirtaş Madran 2013). Its Turkish adaptation, validity, and reliability studies were conducted by Demirtaş Madran (2013). The Cronbach's alpha value of the scale was 0.915 (Demirtaş Madran 2013). In this study, the Cronbach alpha coefficient for the scale was found to be 0.90.

The Digital Game Addiction Scale (DGAS-7)

This scale was developed by Lemmens *et al*. (2009) to determine the problematic digital game playing behaviours of 12- to 18-year-olds. Its Turkish validity and

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reliability were conducted by the researcher using a separate sample for her thesis. This study used the short form of the scale with 21 items in 7 subscales. The validity and reliability values of the original DGAS-7 were as follows: Cronbach's alpha = 0.92, CFI = .904, and RMSEA = 0.053 (90% CI = 0.049 and 0.056). These values indicate that it can be used with adolescents. It is a 5-point Likert-type scale with a single factor and is scored from 1 to 5 (1 = never, 5 = always). Scale scores range from 7 to 35. Monothetic and polythetic diagnoses are used to determine whether adolescents are addicted to digital games. The monothetic diagnosis indicates addiction for scores of three (3 = sometimes) or more on three of the seven items, and the polythetic diagnosis indicates addiction for scores of three (3 = sometimes) or more on at least four of the seven items. Stronger digital game addiction is indicated by higher scale scores (Yalçın Irmak & Erdogan 2015). In this study, the Cronbach alpha coefficient for the scale was found to be 0.81.

The Emotional Eating Scale for Children and Adolescents (EES-C)

This scale was developed to evaluate the emotional eating of 10- to 18-year-olds. It was developed by Tanofsky-Kraff *et al*. (2007) by adapting the adult version of the emotional eating scale for children and adolescents. Its Turkish validity and reliability study were conducted by Bektaş *et al*. (2016). It has 25 items in three subscales: eating in response to anxiety, anger and frustration (EES-C-AAF); depressive symptoms (EES-C-DEP), and feeling unsettled (EES-C-UNS). The Cronbach's alpha values of these three subscales were 0.95, 0.92, and 0.83 for the original scale, and 0.86, 0.76, and 0.72 for the Turkish version. It is a five-point Likert-type scale scored from 1 = I never want to eat to 5 = I want to eat a lot. The scale has 26 items, but its item about being happy is not included in its scoring. Scale score ranges from 25 to 125. Higher scores indicate more eating as a response to negative emotional states. The EES-C is a valid and reliable tool for measuring the emotional eating of children and adolescents (Bektaş *et al*. 2016). In this study, the Cronbach alpha coefficient for the subscales was found to be 0.91, 0.80, and 0.83, respectively.

Statistical analysis

The data were analysed using SPSS 25 (IBM Corp., Armonk, New York, USA). The data are shown as percentages, means, and standard deviations ($\underline{x} \pm sd$). The Shapiro–Wilk test, histograms, and Q-Q plots were used to assess the normality of the numeric variables. Descriptive statistics (numbers, percentages, means, and standard deviations), the Mann–Whitney U-test, the Kruskal–Wallis H-test, and Spearman's correlation were used to evaluate the data. The independent variables of age, gender, daily time online, and internet use were thought to affect the children's aggression, emotional eating, and digital game addiction scale scores. Linear regression was used to determine the effect of digital game addiction on aggressive behaviour. Hierarchical regression was used to specify the determinants of emotional eating behaviour. The results were evaluated at a confidence interval of 95% and with a threshold for significance of $P < 0.05$.

RESULTS

The descriptive characteristics of the adolescents

This study included 856 adolescents. Their mean age was 15.4 ± 1.32 years, and 66.0% of them were female. The adolescents reported that they use the internet mostly for homework and social media (34.0%, 33.6%, respectively). Also they use internet for chatting, playing video games, and watching TV series/movies (10.4%, 11.4%, and 10.9%, respectively) (Fig. 1). Their mean daily time online was 5.55 ± 3.28 hours. Their mean DGAS-7 score was 11.54 ± 4.79. The polythetic assessment indicated that 32.4% of them were addicted to digital games. The adolescents' mean aggression score was 67.01 ± 18.87. Their mean scores on BPAQ subscales were 17.67 ± 6.49 for physical aggression, 11.66 ± 3.74 for verbal aggression, 15.52 ± 5.50 for anger, and 19.14 ± 6.61 for hostility. The adolescents' mean EES-C score was 52.41 ± 17.76, where their mean scores its subscales were 12.77 ± 4.88 for the EES-C-UNS, 13.89 ± 5.01 for the EES-C-DEP, and 25.74 ± 9.88 for the EES-C-AAF (Table 1).

The aggression, emotional eating, and digital game addiction characteristics of the adolescents

The male adolescents obtained higher aggression, emotional eating, and digital game addiction mean scores than the females ($P < 0.05$). The adolescents who use the internet mostly for homework had lower mean aggression, emotional eating, and digital game addiction scores ($P < 0.001$). The adolescents who use the internet mostly for playing games and social media had

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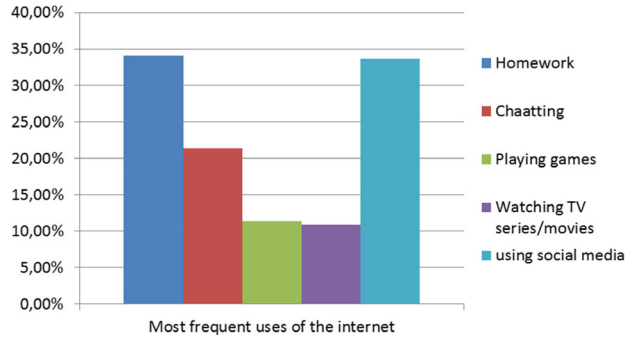

FIG. 1 Most frequent uses of the internet by Adolescents'.

TABLE 1 *The Distribution of DGAS-7, BPAQ, EES-C Total Score and BPAQ, EES-C Subscale Scores of the Adolescents (N = 856)*

Scales	Mean ± SD	Median (Min–Max)
DGAS-7 Total Score	11.54 ± 4.79	10.0 (7.0–35.0)
BPAQ Total Score	64.01 ± 18.87	60.0 (34.0–131.0)
Physical Aggression	17.67 ± 6.49	16.0 (11.0–42.0)
Verbal Aggression	11.66 ± (3.74)	11.0 (5.0–25.0)
Anger	15.52 ± (5.50)	15.0 (7.0–35.0)
Hostility	19.14 ± (6.61)	18.0 (8.0–40.0)
EES-C Total Score	52.41 ± (17.76)	51.0 (25.0–125.0)
EES-C-UNS	12.77 ± (4.88)	12.0(6.0–30.0)
EES-C-DEP	13.89 ± (5.01)	14. (6.0–30.0)
EES-C-AAF	25.74 ± (9.88)	24.5 (13.0–65.0)

a higher mean aggression score, and those who use the internet mostly for playing games had a higher mean digital game addiction score ($P < 0.001$) (Table 2).

The relationships between adolescents' aggression, emotional eating, and digital game addiction scores

Correlation analysis found a weak, positive correlation between time online, and mean aggression and digital game addiction scores ($r = 0.228$, $P < 0.001$; $r = 0.285$, $P < 0.001$, respectively). There was a moderate, positive correlation between the adolescents' digital game addiction, and mean aggression and emotional eating scores (r: 0.436, $P < 0.001$; $r = 0.427$, $P < 0.001$, respectively). There was also a weak, positive correlation between the adolescents' mean aggression and emotional eating scores ($r = 0.277$, $P < 0.001$) (Table 3).

Linear regression determined that digital game addiction accounted for 21% of the variance in the adolescents' aggressive behaviours ($P < 0.001$) (Table 4).

Hierarchical regression found that the determinants of the adolescents' emotional eating were best accounted for by the third model in which gender, aggressive behaviours, and digital game addiction were the statistically significant determinants of emotional eating ($R^2 = 0.18$; $P < 0.001$). Digital game addiction was the strongest determinant of emotional eating ($\beta = 0.334$, $P < 0.001$) (Table 5).

DISCUSSION

Problematic internet use or internet addiction is defined as having problems in social, academic, or business life due to excessive internet use (Fernandes *et al*. 2019). It can occur at almost any age, but it is a major risk for 12- to 18-year-olds (Ektiricioğlu *et al*. 2020). Excessive use of the internet and computers negatively affects both the academic and personal development of adolescents, and can cause addiction (Balhara, Mahapatra *et al*. 2018; Singh & Barmola 2015). The use of digital technology has been associated with lack of attention, aggressive behaviours, physical inactivity, obesity, and sleep problems in school age children (Mustafaoğlu *et al*. 2018). There are important relationships between internet use, body image, and eating issues (Kafali *et al*. 2020; Rodgers & Melioli 2016).

Disinhibited eating is a sub-element of eating behaviours and consists of several eating disorders, including unrestrained food intake, loss of control over eating, emotional eating, eating overly delicious foods, and eating without hunger (Byrne & Tanofsky-Kraff 2018). Disinhibited eating is common in adolescents (Neyland *et al*. 2021). Aggressive behaviours are also common in adolescents who are unable to express and regulate their emotions due to digital game addiction (Ektiricioğlu *et al*. 2020). This study aimed to determine the relationships between digital game addiction, aggression, and emotional eating in adolescents.

Emotional eating refers to eating in response to negative emotions such as depression, fear, anxiety, or stress. It is a coping mechanism in which food is used as an emotional defence against stressful situations. Emotional eating is a risk factor for weight gain and obesity (Young & Limbers 2017). Studies have reported that situations that cause anxiety and depressive symptoms trigger emotional eating in adolescents (Rodgers & Melioli 2016; Sloan *et al*. 2017). In this study, digital game addiction and aggressive behaviours

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TABLE 2 *The distribution of the adolescents' emotional eating, aggression and digital game addiction scores, and their descriptive characteristics*

	BPAQ	Test/*P*	EES-C	Test/*P*	DGAS-7	Test/*P*
	Mean ± SD		Mean ± SD		Mean ± SD	
Gender						
Female	62.7 ± 17.7	Z:-2.300	50.9 ± 17.6	Z:-3.885	10.4 ± 4.0	Z:-9.547
Male	66.5 ± 20.7	*P*:0.021	55.3 ± 17.6	$P < 0.001$	13.6 ± 5.4	$P < 0.001$
Most frequent uses of the internet						
Homework	58.7 ± 15.6[a]	KW:38.701	47.3 ± 15.4[a]	KW:51.259	9.9 ± 3.7[a]	KW:112.815
Chatting	63.7 ± 20.1[ab]	$P < 0.001$	54.4 ± 20.2[b]	$P < 0.001$	11.5 ± 4.5[b]	$P < 0.001$
Playing games	68.4 ± 20.6[b]		58.8 ± 18.7[b]		16.3 ± 6.2[c]	
Watching TV series/movies	64.2 ± 17.8[ab]		54.4 ± 18.3[b]		11.5 ± 4.07[b]	
Using social media	67.8 ± 19.9[b]		54.2 ± 18.3[b]		11.6 ± 4.3[b]	

Note: KW, Kruskal–Wallis H Test; Z, Mann–Whitney U Test value.

TABLE 3 *The correlations between the adolescents' mean scale and subscale scores*

	1	2	3	4	5	6	7	8	9	10
1. Daily time online										
2. Physical Aggression	0.232**									
3. Verbal Aggression	0.172**	0.565**								
4. Anger	0.189**	0.608**	0.568**							
5. Hostility	0.190**	0.542**	0.583**	0.580**						
6. Aggression	0.228**	0.808**	0.782**	0.827**	0.846**					
7. EES-C-UNS	0.149**	0.234**	0.194**	0.124**	0.172**	0.207**				
8. EES-C-DEP	0.113**	0.287**	0.267**	0.212**	0.220**	0.282**	0.444**			
9. EES- C-AAF	0.149**	0.282**	0.207**	0.156**	0.186**	0.238**	0.761**	0.619**		
10. EES-C	0.158**	0.312**	0.253**	0.182**	0.220**	0.277**	0.833**	0.763**	0.951**	
11. DGAS-7	0.285**	0.432**	0.311**	0.322**	0.395**	0.436**	0.368**	0.348**	0.399**	0.427**

**$P < 0.001$; Spearman Correlation Analysis.

TABLE 4 *The relationship between the adolescents' aggression and digital game addiction scores*

	Aggression					
Determinant	β	SE	*P*	95% CI	R^2	Model *P*
DGAS-7	1.828	0.119	0.001	1.59–2.06	0.21	0.001

were found to be important determinants of the adolescents' emotional eating.

Anger and aggression are prominent psychopathological characteristics of eating disorders (Wang & Borders 2018). The fact that aggression is a determinant of emotional eating suggests that it may be related to emotional eating as well as eating disorders.

Studies have found that playing video games is associated with reduced emotional functionality (Oswald *et al*. 2020), and that digital game addiction causes negative emotions such as anxiety, depression, stress, and aggression in adolescents (Fumero *et al*. 2020; Matthews 2015; Milani *et al*. 2020; Oswald *et al*. 2020). Studies have also reported a statistically significant relationships between adolescents' mean digital game addiction and aggression scores, suggesting that digital game addiction increases aggression in adolescents.

A systematic review reported a positive relationship between video game playing time and caloric intake, with adolescents consuming more calories during digital game play (Stiglic & Viner 2019). Studies have also reported that playing video games is associated with increased stress symptoms (Marsh *et al*. 2013), and consuming foods with high calories can help to reduce stress response (Hill *et al*. 2018; Marsh *et al*. 2013). This is called the stress-induced reward system. This study found that digital game addiction was associated with emotional eating in adolescents. Due to digital game addiction, adolescents may be at higher risk of emotional eating as a mechanism for coping with stress, aggression, or negative moods (Shank *et al*. 2019). Since digital game addiction is associated with emotional eating and the adolescents' mean daily time

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TABLE 5 *The determinants of the adolescents' emotional eating*

	Determinants Emotional eating							
	β	SE	*β*	*P*	95% CI	R^2	R^2 change	Model *P*
Model 1								
Gender	4.378	1.274	0.117	0.001	1.87–6.87	0.01		0.001
Model 2								
Gender	3.268	1.217	0.087	0.007	0.88–5.65	0.10*	0.096	<0.001
Aggression	0.292	0.031	0.311	<0.001	0.23–0.35			
Model 3								
Gender	−0.106	1.219	−0.003	0.931	−2.5 to 2.28	0.18*	0.079	<0.001
Aggression	0.155	0.033	0.164	<0.001	0.09–0.21			
DGAS-7	1.235	0.135	0.334	<0.001	0.97–1.5			

*Adjusted R^2 (Gender coded as female = 0, male = 1).

online was 5.5 hours, they were at risk of weight gain and obesity. This study was conducted during the COVID-19 pandemic while a curfew was imposed on those under the age of 18 years in Turkey. Adolescents are not allowed to go to school (UN News 2020), and they used only the internet for socializing. This stressful pandemic may have increased both the adolescents' digital game addiction and their emotional eating.

It is not known which specific components of emotional eating are related to digital game addiction, or how the mechanisms underlying the relationships between digital game addiction and emotional eating work. In this study, most of the relationship between digital game addiction, aggression, and emotional eating in adolescents can be explained by the overlap between digital game addiction and aggression.

There are studies suggesting a relationship between online behaviours and eating disorders (e.g., binge eating and bulimia; Butkowski *et al*. 2019; Holland & Tiggemann 2017; Melioli *et al*. 2015; Wilksch *et al*. 2020). Appearance-oriented play affects children's body satisfaction (Slater *et al*. 2017). Overuse of the internet is associated with adult body dissatisfaction (Carter *et al*. 2017). Adolescents who spend time online using social media and playing games have higher mean aggression, emotional eating, and digital game addiction scores than those who use the internet for studying (Table 2). The adolescents who use the internet mostly for surfing social media and playing digital games experience more aggression than those who use it for studying, and their emotional eating increases due to increased aggressive behaviours.

This study found that the male adolescents engaged in more emotional eating (Table 2), which suggests that there is a relationship between gender and emotional eating (Table 5). Other studies have also shown that digital game addiction is more common in male adolescents (Karaca *et al*. 2020; Milani *et al*. 2020; Yalçın Irmak & Erdogan, 2019). Higher mean digital game addiction and aggression scores affect males' emotional eating.

CONCLUSION

In this study, the polythetic assessment determined that one-third of the adolescents were digital game addicts. The male adolescents had higher mean digital game addiction, aggression, and emotional eating scores ($P < 0.05$). Digital game addiction was associated with aggression, and digital game addiction and aggression were associated with emotional eating. The literature includes studies of digital game addiction and related factors. However, no studies have shown that digital game addiction and aggression are determinants of emotional eating. As one of its strengths, this study demonstrates the relationship between emotional eating, digital game addiction, and aggression.

Future studies should examine the relationships between internet use purposes, emotional eating, and eating disorders. It is important to determine the relationships between emotional eating and other factors that cause anxiety and depressive symptoms in adolescents. It is also be determined which foods are consumed most by adolescents who are addicted to digital games. Finally, experimental studies should be conducted to determine and manage digital game addiction and emotional eating behaviours.

LIMITATIONS

In this study, the adolescents' mean daily time online was 5.55 ± 3.28 hours. Since this study was conducted

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during the COVID-19 pandemic while schools were administering online education in the pandemic, this figure does not reflect the time they spend online in normal daily life, so the routine internet usage times and purposes of adolescents may not be represented well. Anthropometric measurements of adolescents were also not performed due to distance education and isolation.

RELEVANCE FOR CLINICAL PRACTICE

Problematic internet use, social media and game addiction, aggression, and obesity are common problems among adolescents. There is a relationship between digital game addiction, aggression, and emotional eating behaviour in adolescents in this study. So it is necessary to determine adolescents' digital game addiction and to examine their emotional eating behaviours in interventions for digital game addiction. Aggression, emotional eating, and digital game addiction mean scores of adolescents who spend time on the internet to use social media platforms and play games are higher. Adolescents who have problematic internet use or game addiction as well as emotional eating habits because they limit physical activity have a high risk of developing obesity. Therefore, school health nurses should organize school-based intervention programmes to prevent obesity and weight gain in adolescents and help them to acquire healthy eating habits. Aggression is associated with emotional eating, so school health nurses should provide training to improve adolescents' anger management and stress coping skills. Interventional studies should be conducted on adolescents at high risk for emotional eating, aggression, and digital game addiction.

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ETHICAL CONSIDERATIONS

Prior to the study, ethical committee approval and written permission were obtained from the ethics committee (number KAEK-172, dated February 19, 2020) and the Provincial Directorate of National Education (number 50913635-605.01-E.97613). Informed consent was obtained from the children and their parents using an online form.

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