

Video game use among secondary school students and associated factors

Ayşe Oflu, M.D. Assistant Professor^a and Sıdıka S. Yalçın, M.D., Ph.D. Professor^b

ABSTRACT

Introduction: The rapid progress of technology and widespread use of internet has increased the frequency of video gaming among children. The objective was to determine the frequency and patterns of video game use and video game addiction (VGA) in secondary school students and the relationship with socio-demographic, familial and individual factors.

Population and methods: This cross-sectional descriptive study was conducted in four secondary schools in varied sociodemographic characteristics. A structured questionnaire was applied to the parents who agreed to participate. 'Videogame Addiction Scale for Children (VASC)' was performed to the video-gamer students.

Results: 297 healthy students were included; 245 (82.5 %) reported as video game players. The rate of VGA was 1.6 % in our whole sample. The VGA rate was 3.1 % within the male students. VASC-Geometric Mean Score (VASC-GMS) was significantly higher in male and obese children ($p < 0.001$, $p = 0.022$, respectively). Students who use social media also had higher scores ($p = 0.034$). Gaming consoles, online games or games with multiplayer increase the VASC-GMS scores ($p = 0.028$, $p = 0.002$, $p = 0.016$, respectively). War and strategy games lead higher VASC-GMS ($p < 0.001$, $p = 0.034$, respectively). In contrast, mind and casual games were related to lower VASC-GMS ($p = 0.006$, $p = 0.004$, respectively).

Conclusions. It was observed that being male, being obese, use of social media, game console ownership, playing specific game genres (war or strategy games), online and multiplayer games are related to higher scores of video game addiction scale in secondary school students. Future prospective studies and preventive measures on VGA should focus on these factors. **Key words:** video game; addictive behavior; children; obesity.

<http://dx.doi.org/10.5546/aap.2019.eng.e584>

To cite: Oflu A, Yalçın SS. Video game use among secondary school students and associated factors. *Arch Argent Pediatr* 2019;117(6):e584-e591.

- a. Afyonkarahisar Health Sciences University, Department of Pediatrics, Afyonkarahisar, Turkey.
- b. Hacettepe University, Institute of Child Health, Department of Social Pediatrics, Ankara, Turkey.

E-mail address:
Ayşe Oflu, M.D.:
ayseoflu@gmail.com

Funding:
None.

Conflict of interest:
None.

Received: 11-23-2018
Accepted: 6-3-2019

INTRODUCTION

Video games and their effects have been increasing all around the world.¹ Video game applications have brought individual and social effects. They are accepted as a new entertainment method with the inclusion of thinking, feeling and acting.² Considering the spread of video games, their effects on children and young people has begun to be questioned.³ Pathological video gaming has been associated with numerous academic, social, psychological and physiological problems, including shortened sleep duration, reduced sleep quality, increased attention problems, diminished academic performance, increased caloric intake and obesity.⁴

Many studies on video games have attempted to define excessive gaming and game addiction and understand the differences between these two problematic behavior.⁵ No matter what terminology is used, researchers agree that the overuse of computer and video games can lead to behavioral addiction.⁶ The characteristics of the behavioral addiction can be defined as being extreme, compulsive, uncontrollable, and psychologically or physically destructive. According to this definition, Video game addiction (VGA) is the excessive and compulsive use of computer and video games, which results in social and/or emotional problems. It cannot be controlled by the gamer even the excessive use leads to such serious problems.⁷ 'Internet Gaming Disorder' has also been added as a temporary illness to the last edition (fifth edition) of Diagnostic and Statistical Manual of Mental Disorders (DSM-5).⁸ For Turkish children, Horzum et al.,⁹ developed the "Computer game addiction scales for children"

and Yilmaz et al.,¹⁰ proposed the 'Video game addiction scales for children (VASC)' based on the fact that video games can be played not only with computers but also with mobile phones, tablets and game consoles.

Because of the rapid progress of technology and the widespread use of internet, the frequency of playing video games has increased especially among children and teenagers.¹¹ The purpose of this study was to determine the frequency and patterns of video game use and video game addiction in secondary school students and the relationship with socio-demographic, familial and individual factors.

METHODS

Study design

This work was designed as a cross-sectional descriptive study, which was carried out between January 15, 2018 and February 15, 2018 in Afyonkarahisar in Turkey. Afyonkarahisar is a province in the western Anatolia. The number of secondary school is 35 in Afyonkarahisar. The students attending to the 5th and 6th classes in these schools were included in the study with the consent of their parents. Total number of students attending to the 5th and 6th classes was 6382. The sample size was calculated as 259 with a 97 % confidence interval using 'OpenEpi (<https://www.openepi.com/SampleSize/SSPropor.Htm>) calculator' according to $n = [DEFF * Np(1-p)] / [(d^2 / Z^2_{1-\alpha/2} * (N-1) + p*(1-p)]$ equation. The parameters were sustained as population size (N: 12764), % frequency of videogame addiction in the population according to (p): 16.8 % +/- 5 (12), confidence limits as % (d): 5 %.

Four different secondary schools were suggested by The Research and Development Unit of National Education Directorate of Afyonkarahisar, because of the fact that the students attending these schools were from various sociodemographic groups and representative throughout the city. Permission to carry out the study was approved by Afyon Kocatepe University's Clinical Research Ethics Committee (No: 2018/1-14 dated 05.01.2018). All study procedures were performed in accordance with the Declaration of Helsinki.

Data collection

The purpose and procedures of the study were described to the students. The consent forms were provided to be signed by the parents. The

video-gamer students whose parents' fulfilled the survey completed the addiction scale in the school. Body mass index (BMI) was calculated as [weight in kilograms divided by the square of the height in metres (kg/m²)]. BMI percentile was determined using the age and gender specific BMI percentile charts of the Centers of Disease Control and Prevention (CDC). Students with BMI percentile between 85-95^p were considered overweight and $\geq 95^p$ as obese based on the recommendations of the CDC.¹³

Structured survey

The following variables were collected in the survey: The socio-demographic characteristics; video gaming and use of social media status of the students and their families; frequency, skills and habits of video gaming; and the attitudes of the parents.

Videogame Addiction Scale for Children

VASC was applied to the video-gamer students. There are 21 items in this scale. It consists of a Likert type scoring scale, and each item is marked as none = 1, rarely = 2, sometimes = 3, generally = 4, or always = 5. The total score for each child were obtained by summing the grades of each item. The total score is in the range of 21 to 105. As suggested in the literature, 90 was accepted as the limit score for addiction.¹⁰

Statistical analysis

Descriptive statistics for the whole sample were generated as follows: Frequencies were used for the categorical variables and the chi-square test was used to compare the percentage distributions of the categorical data between groups. The normal distributions of the continuous variables were evaluated by the Shapiro Wilk test and histograms. Due to the VASC total scores were log-normal distributed, geometric mean and geometric standard deviation were used. Independent groups t test and one way variances analyse (ANOVA) were used to compare log-transformed data of VASC total scores. The reliability of the VASC was tested with Cronbach's alpha analysis and found as 0.90. Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) 21.0 package program. Values of $p < 0.05$ were considered statistically significant.

RESULTS

There were 428 students attending 5th and 6th grades of these schools. 311 parents agreed to participate. All parents who agreed to participate fully completed the survey. Fourteen students were excluded because of their chronic illnesses. A total of 297 healthy students were included in the study and 245 (82.5 %) of them reported as video game players. All videogamer students fulfilled the VASC completely. The four students whose scores were above 90, were classified as video game addicts. All of these students were boys. The frequency of VGA was measured as 1.6 % in the whole sample.

When VGA rate was examined according to the gender, it was found as 3.1 % for the male students. There was no game addict among the girls. The average VASC- Geometric Mean Score (VASC-GMS) of the whole video gamer sample was measured as 45.3 ± 1.4 . The relationship between sociodemographic factors and VASC-GMS are shown in *Table 1*. VASC-GMS was significantly higher in males (50.5 ± 1.3) than females (40.4 ± 1.4) ($p < 0.001$) and also higher

in students with BMI over the 95 % percentile ($p = 0.022$).

Effects of familial and individual factors on VASC-GMS are shown in *Table 2*. If the student uses social media ($p = 0.034$), especially facebook ($p = 0.002$) and twitter ($p = 0.001$), VASC-GMS scores were significantly higher.

The relations of video gaming patterns with VASC-GMS are given in *Table 3*. Students playing with game console and online games had higher scores than their peers ($p = 0.028$, $p = 0.002$, respectively). Students playing web-based games had significantly lower scores (< 0.001). Considering the number of players, we determined that students who play games with multiplayer had significantly higher VASC-GMS ($p = 0.016$). Comparing the game genres, war and strategy games scored significantly higher VASC-GMS ($p < 0.001$, $p = 0.034$, respectively). Unlikely, students who play mind and casual games had significantly lower VASC-GMS ($p = 0.006$, $p = 0.004$, respectively).

The relations of video gaming habits with VASC-GMS are shown in *Table 4*. Students who

TABLE 1. Relations of sociodemographic factors with VASC-GMS

		Video gamers, N (%)	Geometric mean score	GSD	p-value
Total		245 (100.0)	45.3	1.4	
Age (years)	<12	207 (69.7)	45.5	1.4	0.759
	≥12	90 (30.3)	44.9	1.4	
Gender	Boys	126 (51.4)	50.5 ^a	1.3	<0.001
	Girls	119 (48.6)	40.4 ^b	1.4	
BMI percentiles (p)	<85 p	156 (63.7)	44.4 ^a	1.4	0.022
	<95 p	39 (15.9)	44.9 ^a	1.4	
	≥95 p	50 (20.4)	50.4 ^b	1.3	
Residence	City center	198 (80.8)	44.8	1.4	0.210
	Village	47 (19.2)	47.7	1.4	
School type	Public	158 (64.5)	45.3	1.4	0.976
	Private	87 (35.5)	45.3	1.4	
Family type	Nuclear	208 (84.9)	45.4	1.4	0.810
	Other	37 (15.1)	44.8	1.4	
Number of child	1	26 (10.6)	45.6	1.4	0.754
	2	132 (53.9)	44.7	1.4	
	≥3	87 (35.5)	46.2	1.4	
Birth order	1.	121 (49.4)	46.2	1.3	0.320
	≥2.	124 (50.6)	44.4	1.4	
Maternal education	≤8 years	116 (47.3)	45.6	1.4	0.758
	>8 years	129 (52.7)	45.0	1.4	
Paternal education	≤8 years	73 (29.8)	44.8	1.4	0.727
	>8 years	172 (70.2)	45.5	1.4	
Maternal occupation	Working	93 (38.0)	45.4	1.4	0.905
	Housewife	152 (62.0)	45.2	1.4	
Internet access	Present	223 (91.0)	45.5	1.4	0.524
	Absent	22 (9.0)	43.7	1.4	

^{a,b}values having different letters are statistically different.

VASC-GMS: Video Game Addiction Scales for Children- Geometric Mean Score.

GSD: Geometric standard deviation.

play more than 4 hours in the weekdays and weekends had higher VASC-GMS ($p < 0.001$, $p < 0.001$, respectively). Students delaying their daily needs because of video gaming had higher scores than the students never delay their daily needs ($p < 0.001$). If a student always disregards his homework, his addiction score gets higher than his peers ($p = 0.001$). Reactions of a student to the parental video gaming limitations were queried. If a student obstinates, VASC-GMS is significantly high ($p = 0.002$).

DISCUSSION

The frequency of playing video games in adolescents was found in very high rates in most current published researches. In their study, Tejeiro Salguero at al.,¹⁴ found that 93 % of 207 adolescents played video games within the past year and 50 % of them plays regularly, at least once a week. Allahverdipour at al.,¹⁵ found that more than 93 % of adolescents play video games in Iran; Lenhart at al.,¹⁶ found 72 % of the adolescents

playing video games in their study from Spain. In 2016, Pontes at al.,¹⁷ found a frequency of playing video games as 82.1 % in a multi-center study on adolescents in Slovenia. We also found a similar frequency of playing video games as 82.5 % in our study. These results show that the habit of playing video games among adolescents is quite common all around the world, and a large frequency of adolescent is at risk of possible adverse effects of this widespread habit.

On the contrary prevalence rates of VGA differs considerably between studies from different countries, ranging from an estimated 0.6 % in a Norwegian survey up to an extreme of 10 % in China. In recent studies, the prevalence was also reported as 4 % in Korean and 3 % in German youth population.^{5,18} This can be related to the use of different instruments and cut-off values for diagnosis of VGA. Age composition of the samples might be the other reason. We determined the rate of VGA as 1.6 % in our whole sample and 3.1 % for boys.

TABLE 2. Relations of familial and individual factors with VASC-GMS

		N (%)	Geometric mean score	GSD	p-value
Social media usage of student	Yes	143 (58.4)	47.0	1.4	0.034
	No	102 (41.6)	43.1	1.4	
Facebook	Yes	110 (44.9)	48.5 ^a	1.4	0.002
	No	135 (55.1)	42.9 ^b	1.4	
Instagram	Yes	103 (42.0)	47.3	1.4	0.072
	No	142 (58.0)	43.9	1.4	
Twitter	Yes	26 (10.6)	55.3 ^a	1.4	0.001
	No	219 (89.4)	44.2 ^b	1.4	
Parents video gaming	At least one	66 (26.9)	46.6	1.3	0.414
	Neither	179 (73.1)	44.9	1.4	
Social media usage of parents	At least one	218 (89.0)	45.6	1.4	0.414
	Neither	27 (11.0)	43.2	1.4	
Sibling video gaming	Yes	141 (57.6)	45.9	1.4	0.472
	No	104 (42.4)	44.5	1.3	
Social media usage of sibling	Yes	111 (45.3)	45.8	1.4	0.646
	No	134 (54.7)	44.9	1.3	
Room ownership	Yes	221 (90.2)	42.5	1.4	0.211
	No	24 (9.8)	46.8	1.4	
Computer ownership	Yes	88 (35.9)	46.1	1.4	0.526
	No	157 (64.1)	44.9	1.4	
Tablet ownership	Yes	124 (50.6)	45.6	1.4	0.722
	No	121 (49.4)	45.0	1.4	
Smartphone ownership	Yes	153 (62.4)	46.1	1.4	0.266
	No	92 (37.6)	44.0	1.4	
Game console ownership	Yes	24 (9.8)	51.6 ^a	1.3	0.032
	No	221 (90.2)	44.7 ^b	1.4	
Television ownership	Yes	14 (5.7)	46.6	1.3	0.723
	No	231 (94.3)	45.2	1.4	

^{a,b}values having different letters are statistically different.

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Previous studies have revealed that VGA score is higher in males than females.^{7,10} Griffiths has also shown that males significantly play video games more regularly, start playing earlier and play more war games.¹⁹ A large study, which was carried among American youths between 8 and 18 years old, shows that male children are under the risk of internet gaming disorder five times more than girls. Gaming frequency and average gaming time of boys were also significantly higher than girls.²⁰ A 2-years long, longitudinal study performed on the general elementary and secondary school population in Singapore

demonstrated that the average playing time is significantly higher in boys. The male students are also more likely to meet pathological gaming criteria.²¹ There are only a few studies reported that there is no relation between gender and addiction.^{22,23} In our study, we also found that video game addiction scale mean score of boys was significantly higher than girls' ($p < 0.001$). Why are the male students more inclined and addictive on gaming? is an important question. In a study on adults, it has been shown that the part of the brain that generates rewarding feelings is more activated in men than women

TABLE 3. Relations of video gaming patterns with VASC-GMS

		N (%)	Geometric mean score	GSD	p- value
Gaming platforms					
Computer	Yes	129 (52.7)	46.0	1.4	0.430
	No	116 (47.3)	44.6	1.4	
Tablet	Yes	124 (50.6)	45.3	1.4	0.970
	No	121 (49.4)	45.3	1.4	
Mobile phone	Yes	201 (82.0)	46.1	1.4	0.069
	No	44 (18.0)	41.9	1.4	
Game console	Yes	29 (11.8)	51. ^a	1.4	0.028
	No	216 (88.2)	44.6 ^b	1.4	
Style of gaming					
Online	Yes	83 (33.9)	49.5 ^a	1.4	0.002
	No	162 (66.1)	43.3 ^b	1.3	
Offline	Yes	31 (12.7)	47.8	1.4	0.315
	No	214 (87.3)	45.0	1.4	
Web-based	Yes	93 (38.0)	41.3 ^a	1.3	<0.001
	No	152 (62.0)	47.9 ^b	1.4	
Number of player					
Single	Yes	114 (46.5)	44.5	1.4	0.413
	No	131 (53.5)	46.0	1.4	
Multiplayer	Yes	86 (35.1)	48.4 ^a	1.4	0.016
	No	159 (64.9)	43.7 ^b	1.4	
Genres of game					
Action-Adventure	Yes	65 (26.5)	48.4	1.4	0.051
	No	180 (73.5)	44.2	1.3	
War	Yes	54 (22.0)	52.5 ^a	1.3	<0.001
	No	191 (78.0)	43.5 ^b	1.4	
Strategy	Yes	65 (26.5)	48.6 ^a	1.3	0.034
	No	180 (73.5)	44.2 ^b	1.4	
Sport	Yes	26 (10.6)	49.3	1.4	0.154
	No	219 (89.4)	44.9	1.4	
Race	Yes	33 (13.5)	47.6	1.3	0.345
	No	212 (86.5)	45.0	1.4	
Mind	Yes	32 (13.1)	39.3 ^a	1.4	0.006
	No	213 (86.9)	46.3 ^b	1.4	
Role play	Yes	22 (9.0)	50.0	1.4	0.125
	No	223 (91.0)	44.9	1.4	
Casual	Yes	56 (22.9)	40.8 ^a	1.3	0.004
	No	189 (77.1)	46.8	1.4	

^{a,b}values having different letters are statistically different

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during video-game plays.²⁴ Gender differences were found when investigating activation and connectivity of brain regions associated with the mesocorticolimbic reward system. It has been proved that, gaming-related stimuli induce increased urges and provoke enhanced activation of the pathological gamers. These neuronal differences can be considered as the main reason of higher game-addiction risk for males.²⁵⁻²⁷ We also found that VGA score is higher in students with BMI over 95 % percentile. Recent studies demonstrated that there is a complex and indirect relationship between being overweight and video gaming. Sweet drink consumption during video-game sessions is one of the reasons to excess weight.⁵ Therefore this relationship should not be ignored while planning the treatment of obese children.

Having playstation and fast internet access were defined as risk factors for the addiction

in the prior studies.^{20,28} However, our results prove that having a game console promotes the game addiction whereas the internet access did not change the addiction score. Gaming style is another entity that has an effect on the addiction. Previous researches established that online gaming causes more problematic gaming behaviors.^{29,30} Especially Massively Multiplayer Online Role-Playing Games (MMORPGs) have more addictive effect than offline games.³¹ Our results support these previous findings; multiplayer and online games are significant enhancers for the game addiction. Männikkö at al., favored strong positive association between the problematic gaming behavior symptoms and the game genres such as MMORPGs, strategy-management and shooting games, which is coincided with previously established findings.^{29,32,33} According to our results, the war and strategy games are more addictive game

Table 4. Relations of video gaming habits with VASC-GMS

		N (%)	Geometric mean score	GSD	p-value
VG time on weekdays	<2 hours	190 (77.6)	43.4 ^a	1.4	<0.001
	2-4 hours	39 (15.9)	51.1 ^a	1.3	
	>4 hours	16 (6.5)	55.6 ^b	1.5	
VG time on weekends	<2 hours	115 (46.9)	42.3 ^a	1.4	<0.001
	2-4 hours	90 (36.7)	45.9 ^a	1.3	
	>4 hours	40 (16.3)	53.5 ^b	1.4	
Buying game	Yes	17 (6.9)	52.1 ^a	1.4	0.047
	No	228 (93.1)	44.6 ^b	1.4	
Playing at home	Yes	232 (94.7)	45.4	1.4	0.646
	No	13 (5.3)	43.6	1.5	
Playing at friends home	Yes	15 (6.1)	41.0	1.4	0.202
	No	230 (93.9)	45.6	1.4	
Playing at gamer saloon	Yes	8 (3.3)	54.4	1.7	0.332
	No	237 (96.7)	45.0	1.4	
Delay of daily needs	Always	17 (6.9)	57.2 ^a	1.5	<0.001
	Sometimes	45 (18.4)	49.2 ^b	1.3	
	Rarely	60 (24.5)	47.2 ^b	1.4	
	Never	123 (50.2)	41.7 ^b	1.4	
Prefer VG to activities they like	Always	44 (18.0)	45.9	1.4	0.125
	Sometimes	72 (29.4)	48.1	1.4	
	Rarely	57 (23.3)	45.1	1.3	
	Never	72 (29.4)	42.5	1.4	
Skip homework to play	Always	17 (6.9)	54.6 ^a	1.5	0.001
	Sometimes	35 (14.3)	48.6 ^b	1.4	
	Rarely	52 (21.2)	48.7 ^b	1.3	
	Never	141 (57.6)	42.4 ^b	1.4	
Reaction of student to parental limitations for VG	Obey	158 (64.5)	43.3 ^a	1.4	0.002
	Obstinate	87 (35.5)	49.2 ^b	1.4	

^{a,b}values having different letters are statistically different.

VASC-GMS: Video Game Addiction Scales for Children- Geometric Mean Score.

GSD: Geometric standard deviation. VG: video game.

genres. On the contrary we found that mind and casual games have inverse effect on VASC-GMS. This interesting finding for casual games is similar to the previous findings, which detected the lowest problematic gaming behavior among the casual gamers. Anti-addictive effects of mind and casual games are needed to be elucidated by further researches.

We found that using social media, Facebook (social networking site) and Twitter (status update site) increases the VASC-GMS. Müller et al. suggested that synergistic use of gaming and social network can be related to the subliminal inquires for the socializing of good gamers. Facebook games are also easy to reach and suitable for single or multiplayer.³⁴ However there is not a study yet about the risk of Twitter usage for the video game addiction, which can be based on the smartphone addiction.

Gentile²⁰ puts forth habits for the youths to be determined as pathological gamers; played for years, played frequently and for long times, received worse grades in school, were more likely to have troubles for paying attention in school, were more likely to have been diagnosed with an attention-deficit disorder, had more health problems that were likely to have been exacerbated by long hours of playing video games. Our findings denote the habits of students who have more addictive potentials as: playing for long times both in the weekdays and weekends, delaying of daily needs, skipping homeworks due to excessive gaming, obstinating to the parental game limitations and spending money for games.

There are several limitations to be taken into account in our study. First, it was a descriptive study so any outcome related to the causality is not possible to allege. Second, we couldn't reach our planned sample size at the beginning due to the refusals of the parents. Third, it was a selfreporting survey and scale study, which might have risks of perfunctory, exaggeration, concealment and short-term memory biases. Fourth, our findings represent only short-term features of participants. Prospective studies are needed to find out whether the addicted students will stay addicted in the future.

CONCLUSIONS

This study identifies the current features of video gamer students, which may relate to the addiction behaviours. The findings of the present study showed that being male, being obese, using

social media, game console ownership, online gaming, multiplayer games and playing specific game genres (war or strategy games) are related to the presence of higher scores of video game addiction scale. Further studies with longitudinal data and nationwide studies are needed to identify if these factors are real determinants of the game addiction problem. ■

Acknowledgments

The authors would like to thank Ladin Özer, Sukru Can Duman, Fatime Ergul, Yusuf Alioglu, Ipek Camoglu, Senanur Saygi for their contribution to the acquisition of data.

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