ORIGINAL RESEARCH   ORİJİNAL ARAŞTIRMA

Computer Game Addiction and Quality of Life in Preadolescents: A Cross-Sectional Study

Preadölesanlarda Bilgisayar Oyun Bağımlılığı ve Yaşam Kalitesi: Kesitsel Bir Araştırma

Zehra ÇALIŞKAN[a], Elif Tuba KOÇ[b], Emine ERDEM[c]

[a]Department of Nursing, Division of Pediatric Nursing, Nevşehir Hacı Bektaş Veli University Semra and Vefa Küçük Faculty of Health Sciences, Nevşehir, Türkiye
[b]Department of Nursing, Division of Pediatric Nursing, Kırşehir Ahi Evran University Faculty of Health Sciences, Kırşehir, Türkiye
[c]Department of Nursing, Division of Pediatric Nursing, Erciyes University Faculty of Health Sciences, Kayseri, Türkiye

This study was presented as a poster at the 5th International 16th National Nursing Congress, November 5-8, 2017, Ankara, Türkiye

ABSTRACT Objective: This study was conducted to determine the rate and risk factors of computer game addiction and its relation with the quality of life in preadolescents. **Material and Methods:** The sample of this descriptive and cross-sectional study consisted of 439 (n_{girls}=239, n_{boys}=200) preadolescents. Data were collected using a family and child information form, the Computer Game Addiction Scale for Children (CGASC), and the Pediatric Quality of Life Inventory child form. Data were assessed using descriptive statistics, the independent samples t-test, one-way analysis of variance (Post-hoc Tukey), Pearson correlation, and univariate and multiple logistic regression analysis. **Results:** According to the CGASC scores of the preadolescents, 12.8% were determined as "risky users". Multiple binary logistic regression analysis results revealed the most important factors affecting the possibility of preadolescents' becoming risky users for computer game addiction as gender, weekend computer gaming duration (hours/day), and the quality of life scores (p<0.01). There was a negative, weak and (p<0.001) significant relationship between computer game addiction scores and quality of life scores of preadolescents. The increase in quality of life scores of preadolescents decreased the possibility of being a "risky user" in terms of computer game addiction (p<0.001). **Conclusion:** It is recommended to attempt to increase the quality of life of preadolescents in order to protect them from computer game addiction.

Keywords: Computer game addiction; preadolescents; quality of life

ÖZET Amaç: Bu çalışma, preadölesanlarda bilgisayar oyun bağımlılığını, etkileyen risk faktörlerini ve yaşam kalitesi ile ilişkisini belirlemek amacıyla yapılmıştır. **Gereç ve Yöntemler:** Kesitsel ve tanımlayıcı tipte olan bu çalışmanın örneklemini, 439 preadölesan (kız: n=239, erkek: n=200) oluşturmuştur. Veriler, aile ve çocuk bilgi formu, Çocuklar için Bilgisayar Oyun Bağımlılığı Ölçeği ve Pediatrik Yaşam Kalitesi Envanteri çocuk formu kullanılarak toplanmıştır. Veriler, tanımlayıcı istatistikler, bağımsız örneklem t-testi, varyans analizi (Post-hoc Tukey), Pearson korelasyon, "univariate" ve "multiple" lojistik regresyon analizi kullanılarak değerlendirilmiştir. **Bulgular:** Preadölesanların, Bilgisayar Oyun Bağımlılığı Ölçeği puanlarına göre %12,8'inin "riskli kullanıcı" olduğu belirlenmiştir. Yapılan multiple lojistik regresyon analizi sonuçlarına göre preadölesanların bilgisayar oyun bağımlılığı açısından "riskli kullanıcı" olma durumlarını etkileyen en önemli faktörlerin; cinsiyet, hafta sonu bilgisayar oyun süresi (h/gün) ve yaşam kalitesi puanları olduğu bulunmuştur (p<0,01). Preadölesanların, bilgisayar oyun bağımlılığı puanları ile yaşam kalitesi puanları arasında negatif yönde ve zayıf düzeyde anlamlı bir ilişki bulunmuştur (p<0,001). Preadölesanların yaşam kalitesi puanlarındaki artış, bilgisayar oyunu bağımlılığı açısından "riskli kullanıcı" olma olasılığını azaltmıştır (p<0,001). **Sonuç:** Preadölesanları bilgisayar oyun bağımlılığından korumada onların yaşam kalitelerini artırmaya yönelik girişimlerin yapılması önerilmektedir.

Anahtar Kelimeler: Bilgisayar oyun bağımlılığı; ergenler; yaşam kalitesi

Play is the child's most important activity for recognizing and expressing himself. Through play, the child adapts to the outside world, construct events in daily life and learn to cope with situations.[1] Playing games as active, such as running and jumping, regulates the activities of the cardiovascular, respiratory and excretory system; helps to maintain physical and psychological health.[2]

The advances in computer technology and increased use in the last 20 years has resulted in a substantial modification of the spare time activities of children.[3] Children used to spend their time playing in the streets, parks in the past. Nowadays, they have started to spend their time mostly at home, and digital games have replaced traditional games as a result of rapid technological developments.[3-5] Despite the positive effects of digital games such as providing player satisfaction, facilitating coping with stress, they have also been reported to result in addiction.[6]

Computer game addiction is defined as the inability to stop playing, perceiving the game as real life, and failing to take care of daily tasks.[3,5] The interest in these games and the time spent is constantly increasing, leading to more significant computer game addiction. The American Psychiatric Academy considered excessive use of digital games as a mental disorder in the Diagnostic and Statistical Manual of Mental Disorders-V.[7] Computer game addiction causes deterioration in social relationships, loneliness, depression, anxiety, decrease in academic success, early maturation, musculoskeletal system problems, pain and obesity, especially in school-age children.[2,8,9] Also, focusing only on the computer games, thinking about the next game, having bad mood and irritability when unsuccessful, and not being able to reduce the playing time are other problems.[10] No study has been found in the literature examining the relationship between children's computer game addiction and quality of life. However, it is believed that computer game addiction, as mentioned in the mentioned studies, negatively affects the quality of life of children by causing deterioration in their physical, mental, and social health.[11] The quality of life, is a multi-dimensional concept consisting of various components such as those related to physical and psychological aspects and so-

cial well-being.[12] Determining life quality in children differs from adults. Their quality of life is influenced by physical factors such as being able to perform activities that the peers can do and demonstrating physical success in games. Other factors are social such as school adjustment, peer relationships, playing with friends, and school success.[13] Spending most of one's time in an inactive way, moving away from the social environment and avoiding responsibilities negatively affects the quality of life in all aspects. Computer gaming, a sedentary life style, fast food preference, and excessive consumption of high-calorie junk food are accepted as some of the risk factors for obesity.[2] Besides, studies show that the body mass index (BMI) and computer game duration are positively related.[14-17] Increasing BMI causes restriction of movement, peer rejection, and decreased body satisfaction in adolescents.[18]

Due to the developments in game technology, traditional games have been replaced by virtual games. This situation was also affected by the rapid progress in technology.[19] However, the insecurity of out-of-home environments, mothers' participation in working life, and economic accessibility to computers and the internet seem to have resulted in computer game addiction.[2] In addition, being of the male gender, low parental education level, poor family and friend relationships, low parental supervision are among the factors affecting computer game addiction.[10,11,19,20]

The risk of computer game addiction in adolescents is increasing.[21] One out of every 5 adolescents applying to psychiatry outpatient clinics plays computer games every day, and digital game addiction has become very serious, especially in America, China and Taiwan. The establishment of treatment centers for digital game addiction in America, Southeast Asia and Europe shows the seriousness of the situation.[2,11] Computer game addiction is a global problem and geographical differences are low.[10] International studies indicate that the prevalence of game addiction varies between 0.3% and 50%.[2] Although there is no comprehensive research in Türkiye, regional studies show that computer game addiction is increasing. The rate of computer game addiction ranges between 2-6%, previously, while in

the recent studies this rate is between 22-28%.[1,2,22-24] However, transition of schools to online education and curfews worldwide due to the coronavirus disease-2019 pandemic in early 2020 increased the rates of computer game addiction.[25]

Recognizing computer game addiction and the factors affecting the quality of life, determining risky children, and preventing addiction are important for enhancing the quality of life of these children. In our country, although there are studies on computer game addiction levels of preadolescent children and factors affecting computer game addiction, there is no study evaluating the relationship between computer game addiction and quality of life.[2,20,26,27]

Pre-adolescents have easy access to digital technology devices and computer games. They are frequently rewarded in computer games, which leads them to prefer these games over other activities. They belong to a group at risk for computer game addiction. Therefore, this study was conducted with pre-adolescents to detect computer game addiction at an early stage and take preventive measures. The main purpose of this study is to investigate the relationship between computer game addiction and quality of life of preadolescents with affecting factors.

◼ MATERIAL AND METHODS

STUDY DESIGN AND POPULATION

This descriptive and cross-sectional study was conducted with 10-12 year-old preadolescents attending 18 secondary schools affiliated with the Ministry of National Education and located in regions at different socioeconomic levels at a city center located in the Cappadocia region of Türkiye. A total of 4,800 preadolescents attended schools during the study period and constituted the population of the study. The sample size was calculated as 370 using the TURCOSA (Turcosa Analytics Ltd Co, Türkiye, www.turcosa.com.tr) software, using a power of 0.8 (beta=0.2), alpha value of 0.05, and the mean score of Horzum's study.[5]

After determining the sample size, the stratified random sampling method was chosen. Preadolescent children (n=439) randomly selected from the class lists of the schools in proportion to the number of students, and stratified by gender and age.

All children who accepted to participate and whose parents provided verbal and written consent were included in the study. Participation was not accepted by a total of 35 preadolescent children or their parents. The study was completed with 439 preadolescent children.

DATA COLLECTION TOOLS

Data were collected between 16 February and 30 March 2015 using family-child information form, Computer Game Addiction Scale for Children (CGASC), and Pediatric Quality of Life Inventory (PedsQL 4.0) child form.

Family-Child İnformation Form

Form includes questions about the socio-demographic characteristics of the preadolescents and their parents, whether they had a computer and internet access at home, the computer game playing duration on all week, the sleeping and dietary habits (30 questions in total).

Anthropometric Measurements

The BMI was calculated by measuring height and weight (BMI=body weight (kg)/Height (m)^2). A steel tape measure was used for measuring the height and was recorded as "cm". Weight measurements were made with light clothes on using an electronic scale (Tefal/Premiss-France) with an accuracy of ±100 g, and value recorded as "g". Growth curves developed by Neyzi et al. for Turkish children were used to assess the BMI.[28]

CGASC

The scale developed by Horzum et al. in Türkiye (Cronbach's alpha=0.85) is of the five-point Likert type (*never*=1, *rarely*=2, *sometimes*=3, *often*=4, *always*=5) and consists of 21 items. It has 4 factors including "Being unable to stop playing computer games and being annoyed when prevented from doing so" (Factor I=10 items), "Living the computer game in the imagination and associating it with real life" (Factor II=4 items), "Neglecting duties due to playing computer games" (Factor III=3 items), and

"Preferring playing computer games to other activities" (Factor IV=4 items). The scale score range is 21-105 points and 21-49 points means "normal user", 50-79 points "risky user", and 80-105 points "addicted user".[5] Cronbach's alpha value for the scale was 0.85.

PEDSQL 4.0 Child Form

The Turkish validity and reliability study of the inventory developed by Varni et al. (2001) (Cronbach's alpha=0.88) was conducted by Sönmez and Başbakkal (Cronbach's alpha=0.78). The scale has 4 subscales including "physical functioning", "emotional functioning", "social functioning", and "school functioning". The 23-items, 5-point Likert type scale is composed of two parallel forms: Child form and parent form. The child form of the inventory was used in this study. During the total score calculation of the inventory, a linear transformation is applied and score is converted into 0-100 points (0=100, 1=75, 2=50, 3=25, 4=0). The mean score for each dimension represents the total of the items answered divided by the number of items. The total score represents the sum of all the items divided by the number of items answered on all the scales. Higher scores indicate a better quality of life.[29] In this study, the Cronbach's alpha value was 0.83.

DATA COLLECTION

The study was conducted in accordance with the principles of the Declaration of Helsinki. Following ethics committee approval and written institutional permission, the data collection forms were completed by the students during the counseling class at the study school under the inspection of the researcher. After they completed the forms, anthropometric measurements were taken by the researcher. A screen was used during anthropometric measurements to prevent students seeing each other and to protect privacy. It took 20-30 minutes for each preadolescent to complete data collection process.

ETHICS

Ethics committee approval (Nevşehir Hacı Bektaş Veli University Non-Interventional Ethics Committee 2014/12.06, December 18, 2014) and institutional permission (2014/24512418/605) were obtained. The purpose of the study was explained to the preadolescents whom verbal and written consent were obtained from the parents, and voluntary participation was ensured.

STATISTICAL ANALYSIS

The data were evaluated with the IBM SPSS Statistics for Windows, Version 18.0., (IBM Corp., Armonk, NY, USA) program. Descriptive statistics were shown as number, percentage, mean and standard deviation. Categorical variables were compared with the chi-square test. The independent t-test was used in binary comparisons, and analysis of variance (Posthoc: Tukey) was used to compare more than 2 groups. The relationship between the sub-dimensions of the scale was assessed with Pearson correlation analysis. Univariate and multiple (Method: Backward Wald) binary logistic regression analyses were performed to determine the risk factors influencing the possibility of becoming a "risky user". The statistical significance level was identified as $p<0.05$.

RESULTS

Of the preadolescents; 172 were 12 years old, 239 were girls, and 165 were 5th graders. Besides, 243 of the preadolescents had internet access, 354 had a computer at their homes, 39.4% played computer games for 1-2 hours per day on weekdays, 49.0% played computer games for 1-2 hours per day on weekends, 46.5% slept for 6-8 hours per day (h/d), and 49.2% ate fast food every week.

In addition, 117 were overweight-obese (equal to or over the 85th BMI percentile), and 160 were dissatisfied with their own body weight. Of the preadolescents; 87.2% were "normal users", 12.8% were "risky users" according to the game addiction scores, while there were no "addicted users" (Table 1).

It was determined that the quality of life PedsQL 4.0 scores of preadolescents who had a risky level of game addiction, were not satisfied with their current body weight, and played computer games for ≥3 h/d on week ($p<0.001$) were statistically significantly lower ($p<0.05$) (Table 2).

The CGASC scores were significantly higher ($p<0.05$) in preadolescents who were male, had a

TABLE 1: Descriptive characteristics of the preadolescents.

Descriptive characteristics	n	%
Age (year)		
10	113	25.8
11	154	35.0
12	172	39.2
Gender		
Girl	239	54.4
Boy	200	45.6
Class		
5	165	37.6
6	155	35.3
7	119	27.1
Having a computer		
No	85	19.4
Yes	354	80.6
Having internet access		
No	196	44.6
Yes	243	55.4
Playing duration on the computer on weekdays, h/day		
None	255	58.1
1-2	173	39.4
≥3	11	2.5
Playing duration on the computer on weekends, h/day		
None	141	32.1
1-2	215	49.0
≥3	83	18.9
Sleep duration, h/day		
<6	63	14.4
6-8	204	46.5
9-10	160	36.4
>10	12	2.7
Fast food consumption frequency		
Every day	38	8.7
Every other day	117	26.6
Once a week	216	49.2
Rarely	68	15.5
Body mass index (kg/height (m)^2)		
≤84.9	322	73.3
≥85.0 (overweight-obese)	117	26.7
Satisfaction with body weight		
Satisfied	279	63.6
Not satisfied	160	36.4
Computer game addiction levels*		
Normal (21-49 pn)	383	87.2
Risky (50-79 pn)	56	12.8
Total	**439**	**100.0**

*According to Computer Game Addiction Scale for Children.

computer and internet access at their homes, and played computer games for ≥3 h/d on week (Table 2).

As regards the computer game addiction levels of preadolescents, the risk factors were male gender, internet access at home, and a weekend play duration of ≥3 hours/day (p<0.05). We also found lower quality of life scores in "risky users" (p<0.05) (Table 3).

A negative and weak correlation was found between the CGASC total and subscale mean scores and the PedsQL 4.0 child form total and subscale mean scores of the preadolescents (p<0.001 for all) (Table 4).

According to the multiple binary logistic regression analysis results, the most important factors influencing whether preadolescents were "risky users" for computer game addiction were gender, weekend computer gaming duration, and the quality of life scores (p<0.01). The possibility of being a "risky user" in terms of computer game addiction was 4.6-fold higher in boys compared to girls [odds ratio (OR)=4.666, 95% confidence interval (CI): 2.306-9.421], and 4.3-fold higher for subjects whose gaming duration was ≥3 h/d compared to non-gamers (OR=4.356, 95% CI: 1.878-10.102) (Table 5).

DISCUSSION

The rapid and irregular urbanization, decrease in outside play areas and safe environments have resulted in children spending more of their spare time at home. The ease of accessing computers and tablets with technological developments in the last 30 years have also increased computer use and modified how children play games at home.[27,30]

This present study found that the factors affecting computer game addiction of preadolescents were gender, having computer and internet access at home, computer game time (hours/day) and quality of life scores (Table 2, Table 3). The computer game addiction score of the preadolescents who had internet access (55.4%) and a computer (80.6%) at home and played computer games ≥3 h/d was found to be high in this study (p<0.05) (Table 2). Bedises, the possibility of being a "risky user" was 4.3-fold higher for those with a gaming duration ≥3 h/d compared to non-gamers (p<0.05) (Table 5). Studies have stated that having a computer, internet access and the game-playing duration are associated with game addic-

TABLE 2: Some variables of the preadolescents with the Computer Game Addiction Scale for Children and the Pediatric Quality of Life Inventory mean score comparisons.

Some variables of the preadolescents	Computer Game Addiction Scale for Children			Pediatric Quality of Life Inventory child form		
	X̄±SD	Test	p value	X̄±SD	Test	p value
Gender						
Girl	32.11±10.39	**-6.462***	**<0.001**	81.73±13.04	-0.305*	0.760
Boy	39.00±11.92			82.10±12.34		
Having a computer at home						
No	31.24±11.18	**-3.001***	**0.003**	80.39±13.69	-1.562*	0.119
Yes	35.43±11.13			82.83±12.01		
Having internet access at home						
No	33.49±11.10	**2.886***	**0.004**	82.37±12.54	-0.703*	0.483
Yes	36.66±11.86			81.51±12.86		
Computer game addiction levels						
Normal	32.00±8.12	**-22.437***	**<0.001**	83.26±12.10	**6.101**	**<0.001**
Risky	57.46±6.4			72.59±13.03		
Satisfaction with body weight						
Satisfied	35.06±11.32	-0.432*	0.666	83.74±11.65	**4.087***	**<0.001**
Not satisfied	35.56±12.16			78.68±13.84		
Fast food consumption frequency						
Every day	38.05±13.20[b]	**5.630****	**0.001**	79.71±15.69	2.540	0.056
Every other day	37.38±11.90[b]			80.32±12.64		
Once a week	35.00±11.56[b]			82.10±12.52		
Rarely	30.76±8.91[a]			85.19±11.10		
Playing duration on the computer on weekdays, h/day						
None	32.25±10.27[a]	**22.601****	**<0.001**	83.60±11.26[a]	**13.721****	**<0.001**
1-2	39.21±11.59[b]			80.45±13.47[b]		
≥3	42.36±19.27[b]			65.11±17.92[c]		
Playing duration on the computer on weekends, h/day						
None	31.77±10.54[a]	**30.296****	**<0.001**	82.77±11.99[a]	**5.425****	**0.005**
1-2	34.42±10.67[a]			82.90±12.38[a]		
≥3	43.29±12.11[b]			77.80±14.04[b]		
Sleep duration, h/day						
<6	33.75±11.76	0.614	0.542	78.72±14.20	2.340	0.098
6-8	35.46±11.56			82.59±12.36		
9 or more	35.55±11.67			82.24±12.46		

*Independent t-test; **One-way analysis of variance test; Alphabetic superscripts: According to multiple comparison tests, the same letters represent the similarity of the groups and the different letters represent a statistically significant difference between the groups; SD: Standard deviation.

tion.[2,3,9] With the current technological advancements, a computer and internet access have become available in many houses, making it more difficult to supervise children. The fact that adolescents with a computer prefer computer games for spare time activities and join online games increases their feeling of success and the time spent on the game, and both are considered risk factors in developing addiction.[5] It is fortunate that there were no computer game "addicted users" in this study but 12.8% of them were identified as "risky users". International studies have reported a computer game addiction prevalence of 0.3-50%, while studies conducted in Türkiye have reported rates of 22-28%.[1-3,21,24,31] This difference in study results may be associated with the measurement tools and the characteristics of the groups. Also, the differences between the cultural and socioeconomic levels of the study groups could have altered the computer game addiction level as significant factors for internet access.

TABLE 3: Computer game addiction levels according to some variables of the preadolescents.

Some variables of the preadolescents	Computer game addiction levels	
	Normal user	Risky user
Gender	n (%)	n (%)
Girl	225 (58.7)	14 (25.0)
Boy	158 (41.3)	42 (75.0)
	χ^2=22.433 p<0.001	
Having a computer at home		
No	79 (20.6)	6 (10.7)
Yes	304 (79.4)	50 (89.3)
	χ^2=3.075 p=0.080	
Having internet access at home		
Yes	205 (53.5)	38 (67.9)
No	178 (46.5)	18 (32.1)
	χ^2=4.061 p=0.044	
Fast food consumption frequency		
Every day	31 (8.1)	7 (12.5)
Every other day	96 (25.1)	21 (37.5)
Once a week	191 (49.9)	25 (44.6)
Rarely	65 (10.7)	3 (5.4)
	χ^2=8.456 p=0.037	
Playing duration on a computer on weekdays, h/day		
None	237 (61.9)	18 (32.1)
1-2	139 (36.3)	34 (60.7)
≥3	7 (1.8)	4 (7.1)
	χ^2=20.341 p<0.001	
Playing duration on a computer on weekends, h/day		
None	131 (34.2)	10 (17.9)
1-2	195 (50.9)	20 (35.7)
≥3	57 (14.9)	26 (46.4)
	χ^2=32.085 p<0.001	
Total quality of life scores		
X̄±SD	83.26±12.10	72.59±13.03
	Test*=6.101	
	p<0.001	

*Independent t-test; SD: Standard deviation.

found that the center provides pleasure mechanisms and behavioral control in the male brain has higher activity than that of women with gaming addiction.[33] It is thought that male gender is a risk factor for computer game addiction, and male computer users should be evaluated and monitored more carefully as regards preventing addiction.

During adolescence, a daily sleep of at least 7-8 hours is necessary for a healthy life. Early school hours, lack of family supervision and use of electronic devices contribute to short sleeping hours. Various studies have reported computer game addiction to be associated with the daytime sleepiness/fatigue by decreasing the nightly sleep duration.[16,17] Biological maturation and environmental factors cause delays in the adolescents' sleeping time. Sleep may be affected negatively due to the effects of electronic devices such as the increased emotional and biological stimuli and the bright screen. Computer games are reported to cause changes in the heart rate, respiratory rate, blood pressure, and also sleep quality. No significant difference was found between daily sleep duration and computer game addiction scores in this study (p>0.05) (Table 2). However, there are studies showing that there is significant negative relationship between computer game addiction and sleep quality.[2,20]

Increased time spent on the computer leads to a sedentary lifestyle and unhealthy eating. Preadolescents start eating in front of the computer because computer games increase the joyful time and provide a feeling of success. There is a negative correlation of computer game addiction with physical activity and a positive and strong correlation with fast-food consumption.[34] The computer game addiction scores of the preadolescents who had a very low rate of fast food consumption were lower in the study as well (Table 2) (p<0.05).

Aksoy and Erol found that adolescents with digital game addiction had an unhealthy diet and there was a relationship between technology addiction and malnutrition.[2] In the preadolescent period, children prefer to play computer games at home or arcades instead of playing with their peers on the street. While this situation decreases physical activity, unhealthy

The computer game addiction scale scores were higher in males than in females (p<0.001) and the possibility of being "risky user" was higher in boys (Table 2, Table 4). Similarly, it has been reported by other studies that boys have higher computer game addiction scores.[2,6,26] This may be due to the fact that children's interest in games differs by gender. Besides, studies investigating the neurobiological effects of digital games have revealed that the reward center in the male brain is stimulated more easily during games, and game addiction may be associated with a biochemical and biological abnormality.[32] A study

TABLE 4: The relationship between the computer game addiction and the Pediatric Quality of Life Inventory mean scores of preadolescents according to pearson correlation analysis.

Pediatric Quality of Life Inventory	Computer Game Addiction Scale for Children				
	Factor I	Factor II	Factor III	Factor IV	Total computer game addiction
	r	r	r	r	r
Physical functioning	-0.284**	-0.203**	-0.224**	-0.155**	-0.289**
Emotional functioning	-0.265**	-0.184**	-0.155**	-0.161**	-0.261**
Social functioning	-0.205**	-0.221**	-0.105**	-0.151**	-0.185**
School functioning	-0.249**	-0.152**	-0.242**	-0.198**	-0.266**
Total quality of life	-0.320**	-0.241**	-0.253**	-0.201**	-0.340**

r=Pearson correlation coefficient; **p<0.01.
Pearson r
0 <r<0.20: Very weak correlation.   0.20 ≤r <0.40: Weak correlation.   0.40 ≤r<0.60: Moderate correlation.   0.60 ≤r<0.80: Good correlation.   0.80 ≤r≤1: Strong correlation.

nutrition increases and poses a strong risk for overweight and obesity. Playing computer games causes consumption of high-calorie foods that are not related to hunger.[14] In a study, spending more than 3 hours a day in front of the screen was associated with obesity in preadolescents.[35] We found that 26.7% of preadolescents were overweight-obese (Table 1). No statistically significant difference was found between computer game addiction and BMI. This may be due to the fact that there were no "addicted users" according to the CGASC in the study. When early measures are not taken for computer game addiction, the increasingly sedentary lifestyle is seen as a high-risk factor for obesity in adolescence.[21] The increase in energy intake and decrease in energy expenditure during computer games can be said to confirm this risk.

The quality of life, which is affected by many factors from physiological health to school and social relations, is an important factor affecting the healthy development of adolescents.[2] In this study the quality of life scores were lower in the preadolescents who were at the risky level for game addiction and played computer games for ≥3 h/d on week (p<0.05) (Table 2). Prolonged and repeated computer gaming has been reported to cause cognitive deficits and decreased peer relationships, and negative changes in sleep quality.[20,21] Spending a long time on computer games by adolescents, who are also trying to establish their identity, has a negative effect on many factors as academic success, relationship with friends, social,

physical and emotional health. The result is a decrease in satisfaction with life, as all these factors influence the quality of life. In this study, logistic regression analysis revealed that increased quality of life scores was a protective factor for computer game addiction (p<0.001). These results indicate a need to provide training and information to parents so that they can support preadolescents. Such parental support could contribute to increasing the preadolescents' quality of life. Other factors that could contribute to the quality of life in preadolescents by making a change in the academic success and psychosocial health functions include their expression of their feelings by using the correct communication methods, attending school, and support of activities increasing attention and motivation. Preadolescents with increased quality of life would be expected to be influenced less significantly from computer game addiction.

Also, the quality of life scores were low in the preadolescents who were not satisfied with their current weight (p<0.001), play computer games for ≥3 hours/day on week (p<0.001) and consumed fast-food every day (p>0.05) (Table 2). With the increase in computer gaming duration, preadolescents postpone their daily tasks, decrease physical activities, and develop fast-food style eating habits which may lead to obesity.[15] All these factors affect the self-esteem and body image of adolescents, and can cause some psychosocial problems, thus impairing the quality of life.[13]

TABLE 5: Factors influencing becoming a "risky user" in terms of computer game addiction in preadolescents according to univariate and multiple binary logistic regression analysis.

Some variables of the preadolescents	Univariate binary logistic regression	Multiple binary logistic regression (Model: Backward Wald)
Gender	OR (CI)	OR (CI)
Girl	1.0	1
Boy	**4.272**	**4.661**
	(2.257-8.087)	**(2.306-9.421)**
	p<0.001	**p<0.001**
Having a computer at home		
No	1	-
Yes	2.166	
	(0.896-5.233)	
	p=0.086	-
Having internet access at home		
Yes	**1.833**	
	(1.010-3.326)	
	p=0.046	-
No	1	-
Fast food consumption frequency		
Every day	1.671	-
	(0.890-3.137)	
	p=0.110	
Every other day	1.725	-
	(0.687-4.329)	
	p=0.245	
Once a week	0.353	-
	(0.103-1.207)	
	p=0.097	
Rarely	1	-
Playing duration on a computer on weekdays, h/day		
None	1	-
1-2	**3.221**	
	(1.753-5.918)	
	p<0.001	-
≥3	**7.524**	
	(2.013-28.126)	
	p=0.003	-
Playing duration on a computer on weekends, h/day		
None	1	1
1-2	1.344	1.494
	(0.609-2.963)	(0.651-3.431)
	p=0.464	p=0.344
≥3	**5.975**	**4.356**
	(2.704-13.204)	**(1.878-10.102)**
	p<0.001	**p=0.001**
Total quality of life scores		
X̄±SD	**0.997**	**0.997**
	(0.997-0.998)	**(0.996-0.998)**
	p<0.001	**p<0.001**

OR: Odds ratio; CI: Confidence interval; SD: Standard deviation.

LIMITATIONS

No study has been found in the literature examining the relationship between children's computer game addiction and quality of life. This is considered a strong aspect of our study. The sectional quality of the data, and data on addiction and life quality were obtained from self-reports of preadolescents are limitations. Querying the sleeping habits (day/night, weekday/weekend sleep times, sleep hours, wake-up hours, etc.) of preadolescents along with their daily sleep times and assessing the sleep quality could contribute to obtaining more comprehensive data for determining the relationship with computer game addiction.

CONCLUSION

There were no "addicted users" in this study, while every 13 out of 100 preadolescents were "risky users" regarding computer game addiction. Preadolescents who were male, played for ≥3 hours a day on weekend, and had a low quality of life were among the disadvantaged group. Computer game addiction requires a multidisciplinary approach. Regular screening and school visits are recommended in order to recognize and prevent changes related to the disorder in early childhood. Gender should be recognized as a special factor in the prevention and treatment of addiction. Parents and students should be supported with training and counseling about computer usage and daily routines. "Risky users" should be directed towards activities in line with their interests and abilities to promote behavioral change. In addition, an attempt should be made to improve the quality of life of preadolescents to protect them from computer game addiction.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Zehra Çalışkan, Elif Tuba Koç, Emine Erdem;* ***Design:*** *Zehra Çalışkan, Elif Tuba Koç, Emine Erdem;* ***Control/Supervision:*** *Zehra Çalışkan, Elif Tuba Koç, Emine Erdem;* ***Data Collection and/or Processing:*** *Elif Tuba Koç;* ***Analysis and/or Interpretation:*** *Zehra Çalışkan, Emine Erdem;* ***Literature Review:*** *Zehra Çalışkan, Elif Tuba Koç, Emine Erdem;* ***Writing the Article:*** *Zehra Çalışkan, Elif Tuba Koç;* ***Critical Review:*** *Zehra Çalışkan, Elif Tuba Koç, Emine Erdem;* ***References and Fundings:*** *Zehra Çalışkan, Elif Tuba Koç, Emine Erdem.*

REFERENCES

1. Irmak AY, Erdoğan S. Predictors for digital game addiction among Turkish adolescents: A cox's interaction model-based study. J Addict Nurs. 2019;30(1):49-56. [Crossref] [PubMed]

2. Aksoy Z, Erol S. Digital game addiction and lifestyle behaviors in Turkish adolescents. Clin Exp Neurol. 2021;11:589-97. [Crossref]

3. Paulus FW, Ohmann S, von Gontard A, Popow C. Internet gaming disorder in children and adolescents: a systematic review. Dev Med Child Neurol. 2018;60(7):645-59. [Crossref] [PubMed]

4. Gentile D. Pathological video-game use among youth ages 8 to 18: a national study. Psychol Sci. 2009;20(5):594-602. Erratum in: Psychol Sci. 2009;20(6):785. [Crossref] [PubMed]

5. Horzum BM, Ayas T, Çakır Balta Ö. Çocuklar için bilgisayar oyun bağımlılığı ölçeği [Computer game addiction scale for children]. Turkish Psychol Couns Guid J. 2008;3(30):76-88. [Link]

6. Stockdale L, Coyne SM. Parenting paused: Pathological video game use and parenting outcomes. Addict Behav Rep. 2019;11:100244. [Crossref] [PubMed] [PMC]

7. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders DSM-5. 5th ed. Washington: APA; 2013. [Crossref]

8. Kaya A, Dalgiç Aİ. How does internet addiction affect adolescent lifestyles? results from a school-based study in the mediterranean region of Turkey. J Pediatr Nurs. 2021;59:e38-e43. [Crossref] [PubMed]

9. Karaca S, Karakoc A, Can Gurkan O, Onan N, Unsal Barlas G. Investigation of the online game addiction level, sociodemographic characteristics and social anxiety as risk factors for online game addiction in middle school students. Community Ment Health J. 2020;56(5):830-8. [Crossref] [PubMed]

10. Esposito MR, Serra N, Guillari A, Simeone S, Sarracino F, Continisio GI, et al. An investigation into video game addiction in pre-adolescents and adolescents: a cross-sectional study. Medicina (Kaunas). 2020;56(5):221. [Crossref] [PubMed] [PMC]

11. Seok HJ, Min Lee J, Park C, Young Park J. Review Understanding internet gaming addiction among South Korean adolescents through photovoice. Child Youth Serv Rev. 2018;94:35-42. [Crossref]

12. Resaland GK, Aadland E, Moe VF, Kolotkin RL, Anderssen SA, Andersen JR. Effects of a physical activity intervention on schoolchildren's health-related quality of life: The active smarter kids (ASK) cluster-randomized controlled trial. Prev Med Rep. 2018;13:1-4. [Crossref] [PubMed] [PMC]

13. Çam HH, Üstüner Top F. Overweight, obesity, weight-related behaviors, and health-related quality of life among high-school students in Turkey. Eat Weight Disord. 2020;25(5):1295-302. [Crossref] [PubMed]

14. Lissak G. Adverse physiological and psychological effects of screen time on children and adolescents: Literature review and case study. Environ Res. 2018;164:149-57. [Crossref] [PubMed]

15. García-Hermoso A, Alonso-Martinez AM, Ramírez-Vélez R, Izquierdo M. Effects of exercise intervention on health-related physical fitness and blood pressure in preschool children: a systematic review and meta-analysis of randomized controlled trials. Sports Med. 2020;50(1):187-203. [Crossref] [PubMed]

16. Goodman W, Jackson SE, McFerran E, Purves R, Redpath I, Beeken RJ. Association of Video game use with body mass index and other energy-balance behaviors in children. JAMA Pediatr. 2020;174(6):563-72. [Crossref] [PubMed] [PMC]

17. Phan TT, Tucker JM, Siegel R, Christison AL, Stratbucker W, Werk LN, et al. Electronic gaming characteristics associated with class 3 severe obesity in youth who attend the pediatric weight management programs of the COMPASS network. Child Obes. 2019;15(1):21-30. [Crossref] [PubMed] [PMC]

18. Kaakinen P, Kyngäs H, Kääriäinen M. Technology-based counseling in the management of weight and lifestyles of obese or overweight children and adolescents: A descriptive systematic literature review. Inform Health Soc Care. 2018;43(2):126-41. [Crossref] [PubMed]

19. Ankara HG, Baykal D. The socioeconomic and sociodemographic factors affecting digital gaming addiction among Generation Z. Telemat Informatics Reports. 2022;8:100032. [Crossref]

20. Küçükturan AG, Horzum MB, Korkmaz G, Üngören Y. Investigating the relationship between personality, chronotype, computer game addiction, and sleep quality of high school students: A structural equation modelling approach. Chronobiol Int. 2022;39(4):590-601. [Crossref] [PubMed]

21. Aziz N, Nordin MJ, Abdulkadir SJ, Salih MMM. Digital addiction: Systematic review of computer game addiction impact on adolescent physical health. Electronics. 2021;10(9):1-18. [Crossref]

22. Çakır H. Bilgisayar oyunlarına ilişkin ailelerin görüşleri ve öğrenci üzerindeki etkilerin belirlenmesi [Taking the opinions of parents and specifying the effects on students about computer games]. Mersin Univ J Fac Educ. 2013;9(2):138-50. [Link]

23. Dündar A, Güllü M, Arslan C, Murathan F. İlköğretim öğrencilerinin bilgisayar oyun bağımlılıklarının incelenmesi [Research about computer game addıctıons of elemantary students]. Adiyaman Univ J Soc Sci. 2013;5(9):89-100. [Link]

24. Göldağ B. Lise öğrencilerinin dijital oyun bağımlılık düzeylerinin demografik özelliklerine göre incelenmesi [The investigation of the digital play dependency levels of high school students with respect to demographic characteristics]. YYU J Educ Fac. 2018;15(1):1287-315. [Link]

25. Kaya A, Pazarcıkcı F. Structural equation modeling analysis of risk factors for digital game addiction in adolescents: A web-based study. Arch Psychiatr Nurs. 2023;43:22-8. [Crossref] [PubMed]

26. Karayağiz Muslu G, Aygun O. An analysis of computer game addiction in primary school children and its affecting factors. J Addict Nurs. 2020;31(1):30-8. [Crossref] [PubMed]

27. Oflu A, Yalcin SS. Video game use among secondary school students and associated factors. Arch Argent Pediatr. 2019;117(6):e584-e91. English, Spanish. [Crossref] [PubMed]

28. Neyzi O, Günöz H, Furman A, Bundak R, Gökçay G, Darendeliler F, et al. Türk çocuklarında vücut ağırlığı, boy uzunluğu, baş çevresi ve vücut kitle indeksi referans değerleri [Reference Values of body weight, stature, head circumference, and body mass index in Turkish children]. J Pediatr. 2008;51(1):1-14. [Link]

29. Sönmez S, Başbakkal Z. Türk çocuklarının pediatrik yaşam kalitesi 4.0 envanterinin (PedsQL 4.0) geçerlilik ve güvenilirlik çalışması [A validation and reliability study for the pediatric quality of life inventory (PedsQL 4.0) on Turkish children]. Turkiye Klin J Pediatr. 2007;16:229-37. [Link]

30. Karaca S, Gök C, Kalay E, Başbuğ M, Hekim M, Onan N, et al. Ortaokul öğrencilerinde bilgisayar oyun bağımlılığı ve sosyal anksiyetenin incelenmesi [Investigating the association between computer game addiction and social anxiety in secondary school students]. Clin Exp Heal Sci. 2016;6(1):14-9. [Crossref]

31. Lemmens J, Valkenburg P, Peter J. Development and validation of a game addiction scale for adolescents. Media Psychol. 2009;12(1):77-95. [Crossref]

32. Han DH, Lyoo IK, Renshaw PF. Differential regional gray matter volumes in patients with on-line game addiction and professional gamers. J Psychiatr Res. 2012;46(4):507-15. [Crossref] [PubMed] [PMC]

33. Hoeft F, Watson CL, Kesler SR, Bettinger KE, Reiss AL. Gender differences in the mesocorticolimbic system during computer game-play. J Psychiatr Res. 2008;42(4):253-8. [Crossref] [PubMed]

34. Fullerton S, Taylor AW, Dal Grande E, Berry N. Measuring physical inactivity: do current measures provide an accurate view of "sedentary" video game time? J Obes. 2014;2014:287013. [Crossref] [PubMed] [PMC]

35. Nightingale CM, Rudnicka AR, Donin AS, Sattar N, Cook DG, Whincup PH, et al. Screen time is associated with adiposity and insulin resistance in children. Arch Dis Child. 2017;102(7):612-6. [Crossref] [PubMed] [PMC]