ORIGINAL RESEARCH

Re-evaluating the Digital Gaming Profiles of Children and Adolescents during the COVID-19 Pandemic: A Comparative Analysis Comprising 2 Years of Pre-Pandemic Data

Süleyman Çakıroğlu[1] ⓘ, **Nusret Soylu**[2] ⓘ, **Vahdet Görmez**[1] ⓘ

[1]Department of Child and Adolescent Psychiatry, İstanbul Medeniyet University Göztepe Training and Research Hospital, İstanbul, Turkey
[2]Department of Child and Adolescent Psychiatry, İstanbul University İstanbul School of Medicine, İstanbul, Turkey

ORCID iDs of the authors: S.Ç. 0000-0002-4362-8880; N.S. 0000-0001-9418-7301; V.G. 0000-0002-2704-9520.

Main Points

- During the pandemic period, gaming and screen exposure increased significantly.
- During the pandemic period, boys spend more time on gaming and girls spend more time on social media.
- Behavioral addictions such as gaming disorder and excessive social media use are on the rise during the pandemic and have become increasingly important for children and adolescents.

Abstract

In this study, we aimed to examine the technology use behaviors and problematic gaming profiles of children and adolescents during the coronavirus disease 2019 pandemic lockdown period. We compared the findings with data collected before the pandemic. The Internet Gaming Disorder Questionnaire (IGDQ) was distributed online to students aged 10 to 18 years. More than half of the participants (54%) spent more time playing digital games during the pandemic. Compared with the data from May 2018, the time spent playing digital games and the total score of the IGDQ were significantly higher in boys than in girls (p<0.001). The percentage of students who spent over 40 hours a week playing digital games was 3.9% in May 2018 compared with 8.7% in June 2020. Before the pandemic, 43.6% of the participants reported that they had spent 8 hours or more per week on digital gaming, whereas this amount was as high as 68.3% during the pandemic. Male students spent more time on digital gaming, while female students spent more time on social media and texting. Despite the list of uncontrolled confounders in this study, children and adolescents are likely to spend more time on digital gaming. The subsequent psychosocial impact may require further attention, especially during lockdown restrictions.

Keywords: Coronavirus disease 2019, gaming disorder, coronavirus, behavioral addiction, screen time

Introduction

The novel coronavirus disease (COVID-19), which was first identified in Wuhan, China, has spread rapidly around the world and has impacted all of humanity (MacKenzie & Smith, 2020; World Health Organization, 2020). The epidemic, which quickly turned into a global public health problem, was declared a pandemic by the World Health Organization (WHO) on March 11, 2020. All countries have taken various measures to prevent disease spread. Physical distancing, social isolation, and lockdowns have been vigorously implemented to prevent disease transmission (Abel & McQueen, 2020). In Turkey, all educational institutions, sports centers, cultural venues (museums, theatres, and cinemas), and entertainment centers were temporarily closed.

Nevertheless, with weekend lockdowns and age-specific restrictions, Turkey has taken a different approach to tackle COVID-19. As of April 4, 2020, curfew restrictions were implemented for individuals aged below 20 years (Ministry of Health, 2020). Many private and public institutions, including schools, enacted policies allowing people to work from home as much as possible. All such practices, which led to youngsters staying indoors, caused significant disruptions to daily routines, education, and social interactions.

It has been reported that decreased movement, long periods spent indoors only, decreased social interaction, economic problems, and uncertainties regarding the course of the disease are associated with increased anxiety and stress (Brooks et al., 2020). According to the literature, many behaviors such as watching television, using social media, playing video games, substance use, gambling, watching pornography, and surfing the internet are generally intended to reduce stress and anxiety or relieve depressive mood (Billieux et al., 2015; Demetrovics et al., 2011; Kardefelt-Winther et al., 2017; Sugaya et al., 2019; Yee, 2006). It has also been stated that the addictive potential of these behaviors, which are arguably intended to get away from the stress and distressing thoughts of daily life, a process labeled "escapism," can create future problems as individuals remain indoors for extended periods (Kar et al., 2020). Therefore, it should be considered that in periods of crisis, such as the COVID-19 pandemic, the tendency to engage in specific behaviors can increase significantly and turn into addictions that are difficult to break afterward (Király et al., 2020).

One such behavior, which may have increased during the COVID-19 pandemic, is gaming disorder (GD). GD was placed third among conditions requiring further study in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) and was entered into an identification system for the first time (in the 2013 edition). The WHO identified GD as a health problem by adding it to the addictive disorders diagnosis group in the 11th edition of the International Classification of Diseases in 2018 (WHO, 2018). There is growing evidence that extreme game playing increases mental health problems, especially among teenagers (Bányai et al., 2017; Hou et al., 2019; Seong et al., 2019). Studies have shown that problematic game playing is associated with psychosocial problems such as insomnia, failure in school, loss of concentration, impaired life skills, and weak self-control (Männikkö et al., 2020). Considering that adolescence is a period of development of body, cognition, personality, emotion, and social changes, extreme game playing can cause permanent and important changes in the psychological and social development of adolescents (Van Den Eijnden et al., 2018). With regard to the etiology of behavioral addictions, such as GD, studies have reported on the impact of many factors (Lindenberg et al., 2020). Along with social and environmental factors, the importance of personal characteristics has been emphasized (Dailey et al., 2020; Sugaya et al., 2019). Basic subjective characteristics (such as personality, social cognition, psychopathology, instincts, and biopsychological structure) have been identified as important contributors to certain technology use disorders (Brand et al., 2016). Studies have also shown that factors such as personality characteristics (Braun et al., 2016), anxiety (Männikkö et al., 2020; Saunders et al., 2017), pleasure seeking, and avoidance (Chang & Lin, 2019) are related to problematic game playing. Moreover, during the COVID-19 pandemic, some individuals may develop a gaming model to ease their psychological problems (D. L. King et al., 2020). Considering the visible increase in online gaming, which interrupts professional and educational life for some individuals, it is more important to maintain a healthy work-life balance during the COVID-19 pandemic (Sun et al., 2020).

The temporary closure of educational institutions, restrictions regarding outdoor time for children, and the reality of online education have resulted in children spending most of their time in front of a screen. Playing digital games has become the most frequent activity for children, both online and offline (King et al., 2020; Perez, 2020). Moreover, many countries have reported up to 70% increase in their online gaming traffic (Lepido & Rolander, n.d.). However, the WHO has published guidelines stating that flat screen use and playing games at home are important issues affecting mental health (World Health Organization, 2020).

Playing games is an essential source of entertainment, especially for children and adolescents. However, it has been emphasized that children and adolescents are at greater risk of GDs, which can negatively affect their future mental health (D. King et al., 2019). Considering that pandemic-related social restrictions will continue for some time, children and adolescents are more likely to be exposed to digital games that are highly addictive. This situation may also cause problems in terms of adaptation to everyday life at the end of the crisis period. Against this backdrop, it will be necessary for future studies to examine the attitudes of children and adolescents in terms of playing digital games during the current pandemic.

In this study, we aimed to assess technology use and problematic gaming behaviors of children and adolescents during the lockdown period. The current data were compared with data from a study conducted 2 years ago in the same school setting with students of the same age range.

Methods

Study Design and Sample

The study sample consisted of children and adolescents aged 10 to 18 years in grades 5 to 12 in 2 schools in İstanbul. The data from the study (titled Adaptation of Internet Gaming Disorder Questionnaire [IGDQ] to Turkish) conducted by Çakıroğlu and Soylu in 2018 were compared with data from the pandemic period (Çakiroğlu & Soylu, 2019). In this study, 2 of the 4 private schools used in the previous study sample were contacted (n=581), and the data were collected by administering the same questionnaire to students in the same grades. The IGDQ was converted into an online form and sent to students studying in the same schools. Participation in the study was voluntary, and informed consent was obtained. The inclusion criterion was determined as "engaging in any activity related to a game that can be played online and/or offline on a desktop/laptop computer, tablet, smartphone, game console, or any other device." Prior to conducting the study, approvals

were obtained from the İstanbul Medeniyet University Clinical Research Ethics Committee (2020/0392) and the Ministry of Health.

Data Collection Instruments
The Gaming Activity Information Form was created by researchers to evaluate the sociodemographic features (age, sex, and grade) and internet and video gaming habits (such as accessing the internet, weekly gaming hour, and types of games) of the study participants.

The IGDQ was developed by Pontes et al. (2014) to evaluate GD symptoms. The questionnaire includes 6 dimensions and 20 items. Items 2 and 19 in the questionnaire are negative items and were reversely coded. The IGDQ is a 5-point Likert-type scale that offers the following options for each question: (1) totally disagree; (2) disagree; (3) neither agree

nor disagree; (4) agree; and (5) totally agree (Pontes et al., 2014). The scale items reflect 9 GD criteria from the DSM-5 and include a theoretical frame of the component model of addiction (salience, mood modification, tolerance, withdrawal, conflict, and relapse). In the Turkish validity and reliability study conducted by Çakıroğlu and Soylu (2019), the 2 cut-off scores were reported as 60 and 69. The individuals who scored 60 and higher were considered to be in the risky group, whereas those who scored more than 69 were considered to be in the GD group (Çakiroğlu & Soylu, 2019). The Cronbach alpha coefficient of the Turkish adapted version of the scale was 0.86.

Statistical Analysis
The statistical analysis was conducted using the Statistical Package for Social Sciences program, version 24.0 (IBM SPSS Corp.; Armonk, NY, USA) and Jamovi (R-based open statistical

Table 1.
Sociodemographic Data and Differences in Gaming Disorder Questionnaire Total Scores before and during COVID-19 Pandemic

Variable		Number	Percentage	IGD score (M±SD)	Number	Percentage	IGD score (M±SD)	t/z	p
		2018 May			**2020 June**				
Total	581	100%	41.72±11.86	410	100%	43.99±14.51	-2.701	0.007*
Gender	Male	326	56.1%	45.17±11.98	179	43.7%	48.56±14.37	-2.890	0.005*
	Female	255	43.9%	37.32±10.15	231	56.3%	40.45±13.63	-2.831	0.004*
Grade	5-8th grade	399	68.6%	41.68±12.06	135	32.9%	42.23±14.01	-.439	0.661
	9-12th grade	182	31.4%	41.81±11.45	275	67.1%	44.86±14.70	-2.358	0.019*
Weekly time spent-gaming	1-7 hours	305	52.5%	37.37±9.53	130	31.7%	35.74±11.70	2.262	0.586
	8-14 hours	130	22.4%	43.65±11.23	106	25.8%	41.88±11.72	1.862	0.237
	15-20 hours	74	12.7%	47.62±11.60	57	13.9%	44.77±12.06	1.370	0.284
	21-30 hours	34	5.8%	47.76±11.11	49	11.9%	52.59±12.19	-1.836	0.070
	31-40 hours	14	2.4%	44.79±10.52	32	7.8%	57.31±11.88	-3.400[a]	0.001*
	More than 40 hours	23	3.9%	59.61±14.53	36	8.7%	58.92±12.55	0.194	0.847
Male	1-7 hours	131	40%	39.98±9.62	31	17.3%	41.48±14.41	-.760	0.481
	8-14 hours	90	27.6%	45.04±11.61	48	26.8%	43.69±12.13	0.644	0.521
	15-20 hours	51	15.6%	49.25±9.93	32	17.8%	45.09±14.22	1.566	0.129
	21-30 hours	25	7.6%	49.92±11.43	24	13.4%	51.21±12.51	-.307	0.708
	31-40 hours	8	2.4%	49.38±10.72	20	11.1%	59.85±10.90	0.831[a]	0.029*
	More than 40 hours	21	6.4%	60.95±13.14	24	13.4%	60.04±10.58	0.235[a]	0.798
Female	1-7 hours	174	68.5%	35.40±8.99	99	42.8%	32.63±9.88	0.632	0.052
	8-14 hours	40	15.7%	40.53±9.73	58	25.1%	40.38±11.25	0.066	0.947
	15-20 hours	23	9.0%	44.00±14.23	25	10.8%	44.36±8.82	-.106[a]	0.917
	21-30 hours	9	3.5%	41.78±7.92	25	10.8%	53.92±11.98	-2.698[a]	0.007*
	31-40 hours	6	2.3%	38.67±6.95	12	5.1%	53.08±12.70	-2.762[a]	0.008*
	More than 40 hours	2	0.7%	45.50±27.58	12	5.1%	56.67±16.08	-.731[a]	0.465
>60 scores		44	7.5%	68.27±7.03	67	16.3%	67.62±6.79	0.483	0.630
>69 scores		17	2.9%	75.76±5.35	22	5.3%	75.86±5.15	-1.102[a]	0.918

Values shown with [a] are z values obtained from non-parametric tests

software). The participants' sociodemographic characteristics were determined by using descriptive statistics (number, percentage, average, and standard deviation). The association between sociodemographic characteristics and the questionnaires' total and subdimension scores was analyzed using the Pearson correlation analysis, and the difference was analyzed with the independent groups t-test. Independent groups t-tests were also used to compare the scores of the first study (2018) with those of this study.

Results

Sociodemographic Characteristics of the Participants

A total of 424 students (179 boys and 231 girls) between the ages of 10 and 18 (13.7 ± 2.00) years participated in the study. A total of 10 participants failed to tick the consent box and were excluded; 4 additional participants were excluded owing to missing data. Therefore, 410 participants were included in the analysis. Although the participants were students from the same schools and grades of the previous study, this study sample was not an exact match of the participants from the previous study. Table 1 summarizes the sociodemographic characteristics and the data about gaming.

Comparison of Sociodemographic Characteristics with the Scores from the Questionnaire and Gaming Hours

The student participants (n=410) were asked about the number of hours they spent playing digital games before and during the ongoing pandemic. More than half (54.4%; n=227) of them reported that their gaming time has increased during the pandemic (Figure 1). As shown in Table 2, only 2% of them spent more than 40 hours per week on digital gaming before the pandemic; however, the figure rose to 8.8% during the pandemic ($\chi^2 = 3486.000$, p<0.001). The study data were evaluated following the cut-off scores for GD (>60 risky; >69 possible presence of disorder) as reported in the first study (Çakıroğlu & Soylu, 2019). The results reporting >60 increased significantly to 16% (n=67), whereas the results reporting >69 increased significantly to 5.3% (n=22; χ^2 =2468.000, p<0.001).

Although the data about the amount of time spent gaming were collected categorically (1-7 hours/week, 8-14 hours/week, 15-20 hours/week, 21-30 hours/week, 31-40 hours/week, and more than 40 hours/week) in the previous study; in this study, we took the mean value of each of these categories, and our findings reveal that the mean number of weekly hours spent playing digital games increased from 10.67 ± 10.37 in May 2018 to 16.15 ± 13.07 in June 2020 (p<0.001). Table 1 shows the sociodemographic and gaming characteristics of the previous study and this study.

The total and subdimension score averages of the scales were compared for the 2 periods, and a significant difference was found in the total score and the salience, tolerance, and recurrence subdimension scores. Table 3 shows the analysis results.

Online Activity Profiles of the Participants During the COVID-19 Pandemic

The participants were asked how much time they spent per week on each of the digital activities listed in Table 4. It was revealed that although male students spent more time gaming, female stu-

dents spent more time on activities such as social media, texting, watching video series, and listening to music. In addition, female students allocated more time to educational activities. Table 3 shows the number of participants and how they used their time on digital activities.

Table 2.

Time Spent Playing Digital Games before and during COVID-19 Pandemic (n:410. June 2020 data)

Hours	Pre-pandemic (n/%)	Druing-pandemic (n/%)
1-7 hours	223 (54.4)	130 (31.7)
8-14 hours	92 (22.4)	106 (25.9)
15-20 hours	44 (10.7)	57 (13.9)
21-30 hours	29 (7.1)	49 (12.0)
31-40 hours	14 (3.4)	32 (7.8)
More than 40 hours	8 (2.0)	36 (8.8)
Time spent on digital gaming (n/%)		
Increased	227 (55.4)	
Decreased	40 (9.8)	
Same	143 (34.9)	

Table 3.

Evaluation of the Differences in Total and Sub-dimension Scores of the Questionnaire in Both Periods

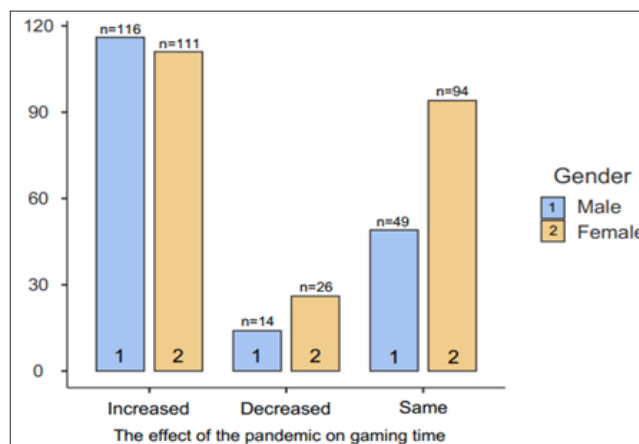| Sub-dimensions	2018 May (n:581) Mean±SD	2020 June (n:410) Mean±SD	t	p
Salience	5.79±2.53	6.42±2.79	-3.697	<0.001
Emotional reg	8.03±2.35	7.82±2.71	1.277	0.202
Tolerance	5.77±2.64	6.86±2.90	-6.135	<0.001
Withdrawal	5.69±2.76	5.89±2.79	-1.121	0.262
Conflict	10.54±2.72	10.39±3.79	0.702	0.483
Recurrence	5.92±2.64	6.62±3.07	-3.849	<0.001
Total	41.73±11.87	44.00±14.52	-2.701	0.007

Figure 1. Answers given to the question "How's the length of time you spent with digital games changed during the pandemic?" (n:410. June 2020 data)

Table 4.
Time Spent for Activities in which Mobile Phone, Tablet or Computer was used during COVID-19 (n:410)

Hour/day	Gaming		Social Media		Messaging		Watching Video/TV series		Listening to music		Education	
	M (n/%)	F (n/%)	M (n/%)	F (n/%)	M (n/%)	F (n/%)	M (n/%)	F (n/%)	M (n/%)	F (n/%)	M (n/%)	F (n/%)
1 h less	55 (13.4)	146 (%35)	94 (22.9)	105 (25.6)	116 (28.2)	139 (33.9)	74 (18.0)	71 (13.7)	113 (27.5)	123 (30.0)	77 (18.7)	58 (14.1)
1-2 h	39 (9.5)	48 (11.7)	44 (10.7)	42 (10.2)	33 (8.0)	51 (12.4)	43 (10.4)	53 (12.9)	33 (8.0)	61 (14.8)	41 (10.0)	71 (17.3)
2-4 h	45 (10.9)	20 (4.8)	17 (4.1)	48 (11.7)	18 (4.3)	26 (6.3)	31 (7.5)	54 (13.1)	13 (3.1)	23 (5.6)	29 (7.0)	49 (11.9)
4-6 h	14 (3.4)	7 (1.7)	15 (3.6)	24 (5.8)	9 (2.1)	5 (1.2)	16 (3.9)	36 (8.7)	11 (2.6)	8 (1.9)	16 (3.9)	31 (7.5)
6-8 h	4 (0.9)	4 (0.9)	7 (1.7)	6 (1.4)	2 (0.4)	5 (1.2)	9 (2.1)	10 (2.4)	1 (0.2)	5 (1.2)	5 (1.2)	13 (3.1)
8 h more	22 (5.3)	6 (1.4)	2 (0.4)	6 (1.4)	1 (0.2)	5 (1.2)	6 (1.4)	7 (1.7)	8 (1.9)	11 (2.6)	11 (2.6)	9 (2.1)

Discussion

This study examined the digital gaming behaviors of children and adolescents during the COVID-19 pandemic and compared the data with findings from a study conducted before the pandemic by the same authors.

In this study, more than half of the participants (54.4%) reported that their gaming time had increased during the pandemic. Compared with May 2018, the students reported that they played over longer hours during the pandemic. A significant increase was found in the number of individuals exceeding the cut-off score for a GD. The number of individuals who exceeded 69, the cut-off value for a GD, increased from 2.9% (prepandemic) to 5.4% (during the pandemic). Furthermore, the number of students who spent more than 40 hours a week on gaming increased to 8.7% from 3.9%. This value increased from 6.4% to 13.4% for male students and from 0.7% to 5.1% for female students. The average weekly time spent on digital gaming increased from 10.67 to 16.15 hours.

Several studies on gaming behavior during the pandemic have reported similar findings, that is, an increase in the average time spent gaming (Balhara et al., 2020; Kar et al., 2020; King et al., 2020). The reasons for this increase include that gaming is a way to socialize with peers and that it helps mediate lockdown-related stress (Balhara et al., 2020; Kar et al., 2020; King et al., 2020).

In Turkey, the prevalence rate reported for GD in the adult population is 1.6% (Ünübol et al., 2020). The rate is higher for children and adolescents, around 3% (Müller et al., 2015). One of the noteworthy findings of this study is that the proportion of individuals who exceeded the cut-off score of 60 (risk of GD) was as high as 16.3% and that of the individuals who exceeded the cut-off score of 69 (presence of GD) was 5.3% during the pandemic. These values were 7.5% and 2.9%, respectively, before the pandemic. Parallel to the increase in the time spent gaming, the scores of the IGDQ also went up during the pandemic. A significant increase was found in the total sample scores for both sexes and high school students compared with May 2018. Although there was an increase in gaming in secondary school students, this difference was not found to be significant, which could be explained by the fact that the students were less likely to have cell phones of their own, more likely to be under parental control, and might have been permitted less time for using electronic devices (Schneider et al., 2017; Shek et al., 2015).

Overall, female students recorded lower average scores than male students in both periods. This result is in line with the existing literature that male students have more problems related to gaming and are under greater risk (Gentile et al., 2011; Müller et al., 2015). A significant difference was found in the total scores of the IGDQ between May 2018 and June 2020. The significant increase observed in the salience, tolerance, and recurrence subdimensions was not observed in the emotional regulation, conflict, and withdrawal subdimensions. An increase in salience is likely to be correlated with increased tolerance, which has been reported in previous studies (Kuss & Griffiths, 2012; Sugaya et al., 2019). An increase in intolerance may have made it more challenging to break away from the game, causing an increase in the scores of the recurrence subdimension (Griffiths, 2005; Palaus et al., 2017).

The participants from the 2 periods were compared in the following categories in terms of the number of hours per week spent gaming (1-7, 8-14, 15-20, 21-30, 31-40, and more than 40), and a significant difference was found in the 31 to 40 hour group, which meant spending more than 30 hours per week playing games was associated with higher scores on the IGDQ. Although the number of hours spent gaming alone has limited power in describing GD, it has been stated that players with GD allocate more than 30 hours weekly to gaming (Király et al., 2014; Paulus et al., 2018; Pontes et al., 2014; Saunders et al., 2017).

The participants were asked about the digital activities in which they engaged during the pandemic. Games, social media, texting, watching TV series and videos, listening to music, and online learning were the most highly reported activities. In terms of sex, male students allocated more time for gaming, while female stu-

dents spent more time on social media and texting. This difference in sexes was found to be similar to the results reported in the literature (Tifferet, 2019; Twenge & Martin, 2020).

Limitations and Directions/Suggestions for Future Research

This study does have limitations, some of which are due to its methodology, thereby requiring a careful interpretation of the findings. The study's primary limitation was that the current sample was not an exact match of the previous study, although we used the same graders in the same schools. The comparison was conducted using 2 different samples from different periods. Both samples were nonrepresentative and were recruited from 2 schools using convenience sampling. Whether the 2 samples were significantly different from each other on relevant factors could not be fully determined. This type of design was weak in terms of making inferences about the causal nature of the changes. Changes could be because of other external influences and not just the pandemic or pandemic compounds of existing trends. However, with careful interpretation, an association between lockdown restrictions and increased time spent on digital gaming could be concluded. Despite the reported weakness, to the best of our knowledge, this is the only study to report on the gaming behavior of young people before and during the pandemic. The fact that the data were collected with an online self-report form was another limitation of this study.

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