


ORIGINAL ARTICLE

Impact of the COVID-19 pandemic quarantine on gaming behavior among children and adolescents in the Eastern Province of Saudi Arabia

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ABSTRACT

Background: The coronavirus disease 2019 (COVID-19) originated in Wuhan City, China. As of May 4, 2020, COVID-19 had become a global pandemic, affecting millions worldwide. We aimed to assess the impact of the COVID-19 pandemic and quarantine on gaming behavior among children and adolescents in the Eastern Province of Saudi Arabia and its impact on child behavior, preference, and sleep and to assess parents' supervision of the usage of electronic devices.

Methodology: A cross-sectional study (web-based questionnaire) was carried out in the Eastern Province of Saudi Arabia. The survey included 747 participants who were Arabic speakers in the age range of 4-18 years. The present study excluded children below 4 years or above 18 years of age and non-Arabic speakers. The validated Arabic version of the web-based questionnaire was distributed randomly among the Saudi population of Eastern Province.

Results: The results showed a significant association between the quarantine period and the increasing duration of gaming activities among children and adolescents. With regard to video games' effect on child behavior, 20.4% became introverted and 14.5% became more aggressive after playing games. In addition, 282 participants were found to have sleeping disturbances, which is estimated to be 37.8% of the total sample. However, an increase in the duration of gaming activities may have an adverse effect on the children's mental health.

Conclusion: This study showed an increase in playing duration, thus impacting the child's behavior and sleep. Mental health professionals must provide advice on coping strategies for parents and educators to alleviate the pandemic-related stress in individuals. They must also pay attention to excessive gaming activity among at-risk individuals, such as children and teens, and its adverse effects, such as sleep disorders and psychological disturbance.

Keywords: COVID-19, gaming, children, psychological, parent.

Introduction

The coronavirus disease 2019 (COVID-19) originated in Wuhan City, China. On May 4, 2020, COVID-19 had become a global pandemic, affecting millions worldwide with no available vaccine [1]. Governments worldwide have adopted public safety protocols, such as quarantine, closure of workplaces and schools, and social distancing [2]. The fear of acquiring the infection, the idea of being quarantined, restrictions placed on movements, social isolation, and alarming information on the outbreak in the media could have an adverse impact on mental

health during epidemics and pandemics [3], a similar condition to that which happened during the outbreak of

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Received: 17 January 2021 | **Accepted:** 19 January 2021

severe acute respiratory syndrome in 2003. People need ways to cope with anxiety and stress [4]. Gaming has been recognized as a coping mechanism against stress [5]. During March 2020, when strict lockdown measures were taken, phone game download volume reached a high record (increasing by 19%) in Europe and a 75% rise in gaming in the United States [6]. In addition to that, a recent Indian study emphasized that gaming behavior among college students increased during the lockdown period [7]. Social interactions became limited among children and adolescents during the COVID-19 pandemic. Without attending school and other activities, children and adolescents can become isolated while playing games. Parents may overlook excessive gaming in their children. Therefore, the gaming disorder risk may increase during this pandemic [6]. Gaming disorder (GD) – also termed “video game addiction” – has been recognized as a disorder characterized by persistent gaming and impaired control, typically 8-10 hours or more per day and at least 30 hours per week, leading to social and functional impairment [8,9]. In 2013, GD was included in the Diagnostic and Statistical Manual, Fifth Edition (DSM-5) research appendix for further study [10]. DSM-5 has clearly defined the symptom criteria for GD, requiring five or more of the following nine diagnostic criteria (preoccupation with gaming, withdrawal symptoms such as sadness\anxiety\irritability, tolerance, unsuccessful attempts to quit gaming, loss of interest in previously enjoyed activities, continued use despite problems, deception of the family about the amount of time spent on gaming, use of gaming to escape a negative mood, and risk of loss friendships\education\jobs due to gaming) [11]. A previous study conducted in 2016 emphasized a correlation between video game addiction and certain psychiatric disorders like anxiety, depression, and attention deficit hyperactivity disorder (ADHD) [12]. Similar research also noted that adolescents with both GD and ADHD showed greater impulsivity and much severe hostility [13]. Another article published in 2011 found that the risk of sadness and suicidal ideation is higher in heavy gamers who spend more than 5 hours per day [14]. Gamers also exhibited complications, such as obesity and sleep disorders [15]. The lockdown in Saudi Arabia and elsewhere are eased. The minority that has used gaming as an unhealthy coping mechanism (where gaming is over-dependent as a means of escaping from reality) may suffer from psychological problems. For some, the pandemic impact may lead to excessive gaming persistence and result in negative consequences. In this study, we aimed to assess the impact of the COVID-19 pandemic quarantine on gaming behavior among children and adolescents in the Eastern Province of Saudi Arabia, to examine the impact of gaming on child behavior, preference, and sleep during the COVID-19 pandemic, and finally to assess the parents’ supervision role regarding electronic devices and action.

Subjects and Methods

It is a cross-sectional study (web-based questionnaire) carried out in the Eastern Province of Saudi Arabia. The survey included 747 participants who were Arabic

speakers with ages ranging from 4 to 18 years, excluding children below 4 years or above 18 years and non-Arabic speakers. The validated Arabic version of the web-based questionnaire was distributed randomly among the Saudi population of Eastern Province. This questionnaire was distributed to parents and caregivers. The data maintained privacy and confidentiality. The survey starts with the participant’s consent. Then, it consists of two parts. For children who live with both parents, it consists of 20-items and 18-items for children who live with one parent or a caregiver. The survey was developed and published between 3 September 2020 and 10 September 2020, and the data reflect children and adolescents gaming activity during the COVID-19 pandemic quarantine period. The survey took approximately 1-3 minutes to complete. After data were extracted, it was revised, coded, and fed into the statistical software IBM Statistical Package for the Social Sciences version 22 (SPSS, Inc. Chicago, IL). All statistical analysis was carried out using two-tailed tests. A p-value less than 0.05 was statistically significant. Descriptive analysis based on the frequency and percent distribution was carried out for all variables, including child and parent’s data, playing games and behaviors, preferences during gaming with the effect of games. Cross-tabulation was used to assess the distribution of children’s practice regarding games and their personal and parent characteristics, and also to determine the impact of gaming on the child’s behavior, preference, and sleep. The significance of relations in cross-tabulation was tested using Pearson’s chi-square test. For validation purposes, the questionnaire was first proposed to a children and adolescents psychiatric consultant who is an expert in the field of research to check if the questionnaire’s questions adequately measure the COVID-19 quarantine period on gaming behavior of children and adolescents. After that, the questionnaire was pretested by distributing the questionnaire to 20 participants who were excluded from the study later. Ethical clearance and permission was obtained from King Fahad Medical City’s ethics and research committee (KFMC). According to the Helsinki declaration and before filling the survey, a statement declaring that participants’ secrecy and privacy was guaranteed, and submission of the complete study answered was considered to agree to participate in the study. The survey was a web-based questionnaire with no expected adverse event. The research was distributed on social media, including WhatsApp, Twitter, and Telegram, with no participants contact.

Results

The study included 747 respondents whose children’s age ranged from 4 to 18 years old, with a mean age of 8.2 ± 3.6 years. The majority of respondents had male children (61.6%; 460) and the majority of the children lived with their parents (93.2%; 696). The father’s age ranged from 25 to 82 years, with a mean age of 42.6 ± 8.1 years. More than half of the fathers (55.4%; 414) were university graduated. Considering the mother’s age, it ranged from 19 to 60 years, with a mean age of

37.6 ± 7.4 years. More than half of the mothers were university graduates (54.2%; 405), and 21.8% of the families had a monthly income less than 5000 SR, while 12.7% had an income exceeding 20000 SR (Table 1). Table 2 demonstrates children's practice regarding videogames during the COVID-19 pandemic. A total of 589 children (78.8%) usually play video games, and only 35 (4.7%) did not play the games. Before starting the COVID-19 pandemic, 41% of the children who play games played for 1-2 hours daily, and 33.1% played for 3-6 hours daily. After the pandemic, 23% played for 1-2 hours every day, while 69.2% played for 3 hours or more daily. Regarding change in duration of playing before and after COVID-19, 497 (69.8%) increased their play duration daily. As for the type of games, 38.6% of the children play adventure and race games, while 27.2% play strategic and planning games. Table 3 illustrates the effect of videogames on child behavior, preference, and sleep during the COVID-19 pandemic. On asking about child preference of videogames or going out to play with peers, 57.3% of the parents reported that their child preferred both, while 20.6% stated the preference

for playing video games. As for behavior after playing games, no change was recorded among 57.4% of the children, while 20.4% became introverted and 14.5% became more aggressive. Regarding the effect of gaming on a child's social relationships, no change was reported among 54.2% of the children, while 18.3% said that their relationships were no longer as before. Sleep disturbance was reported among 58.8% of the children.

Table 4 shows the parents' supervision role regarding electronic devices usage and behavior, and 80.5% of the parents reported that they monitor their children's device usage. Regarding parents' attempts to reduce playing duration, 47.4% of the parents said they discussed the harms of addicting games with their children, but the children showed no response. In comparison, 39.2% of the parents addressed, and children reacted by decreasing their utilization period. For children who attempted to stop playing, precisely 23.8% tried to stop but failed, while 31.6% tried and succeeded in quitting playing. Table 5 shows the factors predicting playing videogames among children during the COVID-19 pandemic. 98.2% of the children aged 7-11 years play video games compared to 89.2% of those aged 4-6 years with recorded statistical significance ($p = 0.001$). All children who live with their mother play video games compared to 66.7% of those who live with their father ($p = 0.001$). Playing video games was reported among 96.6% of the children with secondary educated mothers compared to 90.5% of those with low educated mothers ($p = 0.036$). All children informed by parents regarding the effects of video games continued spending the same amount of time playing, compared to 64.3% of those who did not ($p = 0.001$). Table 6 demonstrates child behavior, sleep pattern, and preference concerning playing video games. A total of 52% of the children who play video games had no change in their behavior than those who did not, with statistical significance ($p = 0.001$). Also, sleep disturbance was recorded among 60% of those who play video games than 34.3% of those who did not ($p = 0.010$). Besides, 44.4% of children who play video games did not try to quit, 25% tried but failed, and 30% had successful attempts ($p = 0.001$).

Table 1. Child and family data for study respondents, Saudi Arabia, 2020.

Child and family data		No	%
Gender	Male	460	61.6
	Female	287	38.4
Age in years	4-6	231	30.9
	7-11	335	44.8
	12-18	181	24.2
Child lives	With parents	696	93.2
	With mother	39	5.2
	With father	12	1.6
Father age in years	< 35 year	105	14.1
	35-39	150	20.1
	40-49	333	44.6
	50+	159	21.3
Father education	Below secondary	136	18.2
	Secondary	197	26.4
	University/ more	414	55.4
Mother age in years	< 35 years	273	36.5
	35-39	135	18.1
	40-49	289	38.7
	50+	50	6.7
Mother education	Below secondary	105	14.1
	Secondary	237	31.7
	University/ more	405	54.2
Monthly income	<5000 SR	163	21.8
	5,000-1,000 SR	257	34.4
	11,000-20,000 SR	232	31.1
	>20,000 SR	95	12.7

Discussion

This study was carried out to assess children's and adolescents' gaming behaviors and their association with the psychological well-being during the COVID-19 pandemic in Eastern Province, Saudi Arabia. Our study showed a 69.8% increase in playing duration during the COVID-19 pandemic quarantine period. Also, there was a 70% increase in online gaming users in Italy during the lockdown period, while in the US, there was an increase of 75% [16]. An additional Indian study conducted on medical students showed that about 69.2% of them reported that their gaming behavior had increased because of the COVID-19 pandemic stress [17]. In line with these findings, another Indian study included that college students found that about 50.8% of them acknowledged that their gaming behavior had increased

Table 2. Children's practice regarding video games during the COVID-19 pandemic, Saudi Arabia.

Child practice of video games during the COVID-19 pandemic		No	%
Child play video games/ mobile games	Yes	589	78.8
	Sometimes	123	16.5
	No	35	4.7
Duration of daily playing games before the COVID-19 pandemic (n = 712)	< 1 hour	115	16.2
	1-2 hours	292	41.0
	3-6 hours	236	33.1
	>6 hours	69	9.7
Duration of daily playing games after the COVID-19 pandemic (n = 712)	< 1 hour	55	7.7
	1-2 hours	164	23.0
	3-6 hours	275	38.6
	> 6 hours	218	30.6
Change in duration of playing before and after COVID-19 (n = 712)	No change	164	23.0
	Less time	51	7.2
	More time	497	69.8
Type of games child interested in (n = 712)	Strategy and planning games	194	27.2
	Violence games	160	22.5
	Adventures aces and cars	275	38.6
	Do not know	83	11.7

Table 3. Effect of video games on the child's behavior, preference, and sleep during the COVID-19 pandemic.

Videogames effect on the child		No	%
Child preference of video games or going out to play with others	Prefer video games	147	20.6
	I prefer going out with others	157	22.1
	I prefer both of them	408	57.3
Behavior after playing games	No change	409	57.4
	More social	55	7.7
	Introvert	145	20.4
	Aggressive	103	14.5
Child's social relationships affected since playing games	No change	405	54.2
	Slightly affected	205	27.4
	Completely affected	137	18.3
The child has sleep disturbances	Not at all	308	41.2
	Sometimes	282	37.8
	Most times	157	21.0

in the lockdown period following the COVID-19 pandemic; this increase in gaming behavior was also associated with exam-related stress, as many of them believe that gaming helps to relieve their stress [7]. The results suggest that there is a correlation between the COVID-19 pandemic and gaming use. In other studies, gaming addiction was strongly associated with moderate and high-level stress [18]. During the quarantine, which is known to be a stressor period for most people, video games were a coping mechanism for quarantine and social

distancing. This study revealed that there is no significant relationship between the parent's education and family socioeconomic state and the number of children who are playing video games / mobile games. Regardless of these family factors, most children involved in this survey are interested in playing games. However, children who live with their father alone are in lower gaming rates than children who live with their mother alone or both parents. This could be attributed to many factors, including that fathers could have poor parental information about

Table 4. Parents' supervision role regarding electronic devices and behavior.

Parents supervision role		No	%
Has supervision on child electronic devices	Yes	601	80.5
	No	146	19.5
Discussed with child harms of video games addiction	Not at all	98	13.1
	Yes, with no effect	356	47.7
	Yes, decreased playtime	293	39.2
The child tried to quit playing video games	Never	333	44.6
	Yes, but failed	178	23.8
	Yes, stopped playing	236	31.6

Table 5. Factors predicting playing video games among children during the COVID-19 pandemic, Saudi Arabia.

Factors	The child plays video games/ mobile games.					p-value
	Yes		No			
	No	%	No	%		
Gender	Male	443	96.3%	17	3.7%	0.105
	Female	269	93.7%	18	6.3%	
Age in years	4-6	206	89.2%	25	10.8%	0.001*
	7-11	329	98.2%	6	1.8%	
	12-18	177	97.8%	4	2.2%	
Child lives	With parents	665	95.5%	31	4.5%	0.001*
	With mother	39	100.0%	0	0.0%	
	With father	8	66.7%	4	33.3%	
Father education	Below secondary	130	95.6%	6	4.4%	0.620
	Secondary	190	96.4%	7	3.6%	
	University/ more	392	94.7%	22	5.3%	
Mother education	Below secondary	95	90.5%	10	9.5%	0.036*
	Secondary	229	96.6%	8	3.4%	
	University/ more	388	95.8%	17	4.2%	
Monthly income	<5,000 SR	152	93.3%	11	6.7%	0.057
	5,000-1,000 SR	241	93.8%	16	6.2%	
	11,000-20,000 SR	228	98.3%	4	1.7%	
	>20,000 SR	91	95.8%	4	4.2%	
Has supervision on child electronic devices	Yes	572	95.2%	29	4.8%	0.714
	No	140	95.9%	6	4.1%	
Discussed with child harms of videogames addiction	Not at all	63	64.3%	35	35.7%	0.001*
	Yes, with no effect	356	100.0%	0	0.0%	
	Yes, decreased playtime	293	100.0%	0	0.0%	

p: Pearson χ^2 test.

* $p < 0.05$ (significant).

children's gaming behavior; fathers may use special strategies to monitor children's game usage. The sample size of children who live with their father alone is very small (12 participants) and is not sufficient to accurately predict gaming behavior.

The current generation of children is often more adept with computers and technology than their parents, which contributes to the level of concern for parents because

of their fear about their children's psychological and physical health [19]. Previous researchers have often believed that video games and online interactions are not strong enough to generate social isolation. However, these earlier studies aimed to find a direct relationship between exposure to online games and the psychologically harmful effects [20]. Regarding loss of interest, our research found that 20.6% of the children prefer video games over going out to play and interacting with peers.

Table 6. Child's behavior, sleep pattern, and preference concerning playing video games.

Effect of playing video games	Child play video games/ mobile games					p-value
	Yes		No			
	No	%	No	%		
Child relations affected since playing games.	No change	370	52.0%	35	100.0%	0.001*
	Slightly affected	205	28.8%	0	0.0%	
	Completely affected	137	19.2%	0	0.0%	
The child has sleep disturbances.	Not at all	285	40.0%	23	65.7%	0.010*
	Sometimes	275	38.6%	7	20.0%	
	Most times	152	21.3%	5	14.3%	
The child tried to quit playing video games.	Never	316	44.4%	17	48.6%	0.001*
	Yes, but failed	178	25.0%	0	0.0%	
	Yes, stopped playing	218	30.6%	18	51.4%	

p: Pearson χ^2 test.

*p < 0.05 (significant).

In comparison, 57.3% preferred both activities, which means they are still normative in a social context. In the other study, only 8.7% had a loss of interest [15]. This provides an index of genuine 'impaired interest' but not 'substituted interest', representing a relative preference for gaming, among other various desires.

There were a lot of previous studies that examined the relationship between video games and aggressive behavior. In this study, only 20.4% of the children showed introverted behavior after game playing, while only 14.5% showed some aggressive behavior. A study was conducted on college students in 1995 found little support for the theory of the relationship between playing games and being aggressive [21]. Other studies demonstrated that Japanese children also support that video games playing is not strongly associated with social maladjustment [19]. Also, a study was carried out to assess the association between video games and aggression in children. It explained that games-related behavior could be considered generalized aggression not directed to people; instead, it is directed to objects only [22]. However, future research is needed to examine the possible contributing factors leading to these types of behavior.

In our sample, 282 out of 747 participants were found to have sleep disturbance, which is estimated by 37.8% of the total sample and this is considered to be slightly lower than another similar study which was conducted in the US in 2014 and showed 57% of the total sample experienced moderate to high levels of sleep disturbance. In Britain, 20-30% of young children experience sleep problems [23]. These results remark that sleep disturbance was inversely related to subsequent screen time. Video games are known to affect sleep by displacing other activities like physical activity known to benefit sleep [24]. Additionally, exposure to video games can increase the psychophysiological arousal of children, therefore disrupting sympathetic control. Subsequently, arousal

may disrupt pre-bedtime relaxation and cause delayed sleep engagement and reduced sleep duration [23,24].

Previous studies on parental control of media usage by children - which is called parental mediation - showed that parental supervision and monitoring play an essential role in understanding and consuming media means [25]. Most parents, 80.5%, reported that they have supervision on their children's electronic devices, while 19.5% of them ignore the device's supervision role. Similarly, a survey conducted in 2017 on Iranian parents revealed that 86.5% of the parents "strongly agree" or "agree" that they are resorting to restrictive strategies to control the gaming activities of children [26]. However, only 39.2% of parents had successful attempts to make their children realize the harmful effects of video game addiction, resulting in decreased playing time, which means the discussion about harmful effects with children is not a very effective way to limit playing time. In this context, recent research suggests using restrictive strategies is more efficient in raising awareness and considerations of online risks and reducing online activities among adolescents [27]. This emphasizes parents' understanding of different types of parental mediation and each type's effectiveness.

Regarding children's own attempts to quit playing video games, 44.6% never thought of quitting, while 31.6% had successful attempts, which ended in them stopping. A study carried out in the Netherlands indicated that 78% of those with gaming disorder had unsuccessful attempts to quit playing [28]. However, this high number of children and adolescents who did not even intend to discontinue points to the increase in the probability of them having a gaming disorder during this period. In our survey, we relied on parent reports to determine their children's gaming condition. We have to consider that parents may not be aware of the children's gaming behavior, as they may conceal their gaming from parents. Insufficient parental information, along with recall bias,

could limit our findings. In addition to that, most children included in this study live either with both parents or mothers alone. The percentage of children who live with their father alone is very low to predict gaming behavior in this category. Moreover, this study assessed parental supervision in general but did not focus on different parental mediation strategies. The effectiveness also should be investigated for each strategy type in future studies. Furthermore, it should be recognized that the new generation of screen-based games used by young children does not necessarily mean that any associated behavior is secondary to games with ignoring the child's personality, psychological well-being, and other factors. Our instrument did not investigate these issues; therefore, this could be the focus of future research.

Conclusion

This study found a significant association between the quarantine period and increasing gaming activity duration among children and adolescents. Gaming habits are one of the most complicated challenges for parents, especially during the COVID-19 pandemic. This situation is a stressful factor; thereby, many children use games as an unhealthy coping mechanism. However, parents should guide their children in alternative ways of social interaction, encourage their learning motivation, arrange other enjoyable activities, and regulate children's gaming to minimize the risk of having gaming disorder and its related consequences. Although there was increased playing time duration, most children were not affected in their social context. On the other hand, sleep disturbance was found to be associated with excessive gaming behavior. Some children showed introverted and aggressive behavior after playing; however, this should be investigated more in further studies to exclude other leading factors.

List of Abbreviations

ADHD	Attention deficit hyperactivity disorder
COVID-19	Coronavirus disease 2019
DSM 5	Diagnostic and Statistical Manual, Fifth Edition
GD	Gaming disorder
KFMC	King Fahad Medical City
SPSS	Statistical Package for the Social Sciences

Conflict of interests

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

None.

Consent to participate

Written informed consent was obtained from all the participants.

Ethical approval

This study's protocol was approved by the King Fahad Medical City's ethics and research committee (KFMC). Riyadh, Saudi Arabia, via reference/letter number H01R012 dated: August 31 2020.

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References

1. World Health Organization. Coronavirus disease 2019 (COVID-19) situation report 105; 2020 [cited 2020 May 5]. Available from: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200504-covid-19-sitrep-105.pdf?sfvrsn=54cdda8af_
2. Amin KP, Griffiths MD, Dsouza DD. Online gaming during the COVID-19 pandemic in India: Strategies for work-life balance. *Int J Ment Health Addict*. 2020; 10:1–7. <https://doi.org/10.1007/s11469-020-00358-1>
3. Da Silva A, Miranda D, Diaz A, Teles A, Malloy-Diniz L, Palha A. Mental health: why it still matters in the midst of a pandemic. *Braz J Psychiatry*. 2020;42(3):229–31. <https://doi.org/10.1590/1516-4446-2020-0009>
4. Ko CH, Yen CF, Yen JY, Yang MJ. Psychosocial impact among the public of the severe acute respiratory syndrome epidemic in Taiwan. *Psychiatry Clin Neurosci*. 2006;60(4):397–403. <https://doi.org/10.1111/j.1440-1819.2006.01522.x>
5. Russoniello CV, O'Brien K, Parks JM. The effectiveness of casual video games in improving mood and decreasing stress. *J Cyber Ther Rehabil*. 2009;2(1):53–66.
6. Ko C, Yen J. Impact of COVID-19 on gaming disorder: monitoring and prevention. *J Behav Addict*. 2020;9(2):187–9. <https://doi.org/10.1556/2006.2020.00040>
7. Balhara YP, Kattula D, Singh S, Chukkali S, Bhargava R. Impact of lockdown following COVID-19 on the gaming behavior of college students. *Indian J Public Health* 2020;64:S172–6. https://doi.org/10.4103/ijph.IJPH_465_20
8. Essau C, Delfabbro P. Adolescent addiction: Epidemiology, assessment, and treatment (second edition). second edition ed. (Amsterdam, Netherlands), Elsevier, 2020:358. Accessed on Nov 2020. Available from: <https://www.barnesandnoble.com/w/adolescent-addiction-cecilia-essau/1134784162>
9. Paulus F, 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. <https://doi.org/10.1111/dmnc.13754>
10. Kuss D, Griffiths M, Pontes H. DSM-5 diagnosis of Internet Gaming Disorder: Some ways forward in overcoming issues and concerns in the gaming studies field. *J Behav Addict*. 2017;6(2):133–41. <https://doi.org/10.1556/2006.6.2017.032>
11. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. Arlington, VA: American Psychiatric Publishing; 2013. <https://doi.org/10.1176/appi.books.9780890425596>
12. Andreassen CS, Billieux J, Griffiths MD, Kuss DJ, Demetrovics Z, Mazzoni E, et al. The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: a large-scale cross-

- sectional study. *Psychol Addict Behav.* 2016;30:252–62. <https://doi.org/10.1037/adb0000160>
13. Yen J, Liu T, Wang P, Chen C, Yen C, Ko C. Association between Internet gaming disorder and adult attention deficit and hyperactivity disorder and their correlates: impulsivity and hostility. *Addict Behav.* 2017;64:308–13. <https://doi.org/10.1016/j.addbeh.2016.04.024>
 14. Messias E, Castro J, Saini A, Usman M, Peeples D. Sadness, suicide, and their association with video game and Internet overuse among teens: results from the Youth Risk Behavior Survey 2007 and 2009. *Suicide Life Threat Behav.* 2011;41:307–15. <https://doi.org/10.1111/j.1943-278X.2011.00030.x>
 15. Ko CH, Lin HC, Lin PC, Yen JY. Validity, functional impairment and complications related to Internet gaming disorder in the DSM-5 and gaming disorder in the ICD-11. *Aust N Z J Psychiatry.* 2020;54(7):707–18. <https://doi.org/10.1177/0004867419881499>
 16. Mulyadi S, Prabowo H, Salve HR, Ayuningsih AM. Sleep duration, Internet use duration and anxiety on university student during COVID-19 pandemic. *IEOM Society International.* 2020;3:2199–209.
 17. Shrestha M, Manandhar N, Sharma S, Joshi S. Gaming Disorder among Medical College Students during COVID-19 Pandemic Lockdown. *KUMJ.* 2020;18(2):48-2.
 18. Rajab AM, Zaghoul MS, Enabi S, Rajab TM, Al-Khani AM, Basalah A, et al. Gaming addiction and perceived stress among Saudi adolescents. *Addict Behav Rep.* 2020;11:100261. <https://doi.org/10.1016/j.abrep.2020.100261>
 19. Villani S. Impact of media on children and adolescents: a 10-year review of the research. *J Am Acad Child Adolesc Psychiatry.* 2001;40(4):392–401. <https://doi.org/10.1097/00004583-200104000-00007>
 20. Trepte S, Reinecke L, Juechems K. The social side of gaming: how playing online computer games creates online and offline social support. *Comput Human Behav.* 2012;28(3):832–9. <https://doi.org/10.1016/j.chb.2011.12.003>
 21. Wolfe RN, Johnson SD. Personality as a predictor of college performance. *Educ Psychol Measurement.* 1995;55(2):177–85. <https://doi.org/10.1177/0013164495055002002>
 22. Cooper J, Mackie D. Video games and aggression in children 1. *J Appl Soc Psychol.* 1986;16(8):726–44. <https://doi.org/10.1111/j.1559-1816.1986.tb01755.x>
 23. Cheung CH, Bedford R, De Urabain IR, Karmiloff-Smith A, Smith TJ. Daily touchscreen use in infants and toddlers is associated with reduced sleep and delayed sleep onset. *Sci Rep.* 2017;7(1):1–7. <https://doi.org/10.1038/srep46104>
 24. Falbe J, Davison KK, Franckle RL, Ganter C, Gortmaker SL, Smith L, et al. Sleep duration, restfulness, and screens in the sleep environment. *Pediatrics.* 2015;135(2):e367–75. <https://doi.org/10.1542/peds.2014-2306>
 25. Shin W, Huh J. Parental mediation of teenagers' video game playing: Antecedents and consequences. *New Media Soc.* 2011;13(6):945–62. <https://doi.org/10.1177/1461444810388025>
 26. Kousari M, Mehrabi M. Parental mediation of children's video game experiences: Iranian parents' strategies of mediation. *IAU Int J Soc Sci.* 2017;7(1):1–4.
 27. Steinfeld N. Parental mediation of adolescent Internet use: Combining strategies to promote awareness, autonomy and self-regulation in preparing youth for life on the web. *Educ Inform Technol.* 2020;22:1–24. <https://doi.org/10.1007/s10639-020-10342-w>
 28. Van Rooij AJ, Schoenmakers TM, Van de Mheen D. Clinical validation of the C-VAT 2.0 assessment tool for gaming disorder: a sensitivity analysis of the proposed DSM-5 criteria and the clinical characteristics of young patients with 'video game addiction'. *Addict Behav.* 2017;64:269–74. <https://doi.org/10.1016/j.addbeh.2015.10.018>