Original Article

Internet gaming disorder in medical students: Is it a risk factor for poor educational outcomes?

Negar Emrani[1] , Majid Khadem-Rezaiyan[2]*

[1]Student Research Committee, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran
[2]Department of Community Medicine, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

Abstract
Background: Today, computer games have taken a prominent place in the lives of children and teenagers, and statistics indicate that online gaming constitutes the majority of computer usage. Numerous studies have explored the detrimental effects of internet gaming on individuals. However, to date, no comprehensive research has been conducted specifically investigating the effect of online gaming on academic performance within a medical education context. To address this gap, we have conducted this study, focusing on the impact of online gaming on the academic performance of Iranian medical students.

Methods: In a cross-sectional study, 185 medical students from four disciplines ((basic sciences, Physiopathology, extern, intern) were selected through a multi-stage sampling method at Mashhad University of Medical Sciences. Internet gaming disorder (IGD) test as well as the grade point average (GPA) of the last academic semester, the average study hours on normal days and near the exam, the efficiency of study hours, the number of failed semesters, and academic satisfaction were assessed.

Results: In this study, a total of 185 medical students participated, of which 62.2% (115 students) were females. The prevalence of IGD was found to be 3.8%. Interestingly, the prevalence of IGD was approximately four times higher in males than in females (7.1% vs. 1.7%, $P=0.106$). Furthermore, both the overall daily study time ($P<0.001$) and the daily study time on days near exams ($P=0.031$) were found to be significantly higher in students without IGD compared to those with IGD. However, factors such as age, gender, being native to Mashhad, discipline level, last GPA, number of failed semesters, and satisfaction with education showed no correlation with IGD.

Conclusion: These findings may serve as a cautionary signal for educational authorities within the Iranian medical education system. However, to obtain more robust results, further investigations are recommended, particularly in other academic majors.

Introduction

As social beings, humans strive to contribute positively to their communities and establish meaningful connections with their peers in various societal structures. Engaging in games has long been a leisure activity for humans. Not only does it provide entertainment and foster a sense of competition, but it also serves as a unifying force, bringing people together.

In this modern era, where technological advancements have transformed many aspects of life, the nature of human entertainment has also evolved. With the progression of technology, there has been a shift towards computer and online gaming.[1,2] Today, digital games, as one of the most influential achievements of information and communication technology, have gained prominence.

Their high appeal and the intimate connection they establish with their audience have propelled them ahead of other media. Consequently, the number of their audience is increasing day by day.[3]

Today, computer games have taken a prominent place in the lives of children and teenagers, and statistics indicate that online gaming constitutes the majority of computer usage.[4] As the internet industry and online gaming continue to advance rapidly, the number of gamers in Iran has also seen a significant increase. According to the Digital Games Research Center (DIRC), the current gamer population has surpassed 28 million and is projected to reach 41 million by the year 2022.[5]

The findings from various studies on internet gaming addiction highlight the uncontrolled detriment this

*Corresponding author: Majid Khadem Rezaiyan, Email: khademrm@mums.ac.ir

condition can inflict on its users. The adverse effects of this condition can be categorized into four main areas: physical health issues, personal life disruptions, social life complications, and impacts on academic performance.[6,7] These findings led the American Psychiatric Association to recognize it as a disorder. This condition is characterized by the presence of at least five out of the following nine symptoms over the past 12 months: 1-preoccupation with videogames (i.e. "preoccupation"); 2- experiencing unpleasant symptoms when playing videogames (i.e. "withdrawal"); 3-the need to spend an increased amount of time involved in video games (i.e. "tolerance"); 4-failed attempts to control participation in videogames (i.e. "lose control"); 5-losing interest in past hobbies and entertainment as a result of, and with the exception of, videogames (i.e., "surrender from other activities"); 6-continue to use videogames despite having knowledge of psychosocial problems (i.e. "continuation"); 7-deceiving family members, therapists or others regarding the number of videogames (i.e. "fraud"); 8-using videogames to escape or eliminate negative feelings (i.e., "escape") and 9-harm or lose relationships, work, or education or significant career opportunities because of participation with videogames (i.e. "negative consequences").[8]

Numerous studies have explored the detrimental effects of internet games on individuals. Some of these studies have found a significant correlation between internet addiction and symptoms of depression in adolescents.[9] Moreover, a positive and significant correlation has been reported between internet addiction, depression, and suicidal thoughts in teenagers.[10]

Academic underperformance among students is a concern associated with internet usage. Several studies have been conducted to investigate the relationship between computer game usage and academic performance, particularly among high school students. The results of these studies indicate a significant correlation between the two.[11-15]

A review of the literature shows that global aspects of the educational system have been studied locally[16-20] and nationally[21] from the quality of services, motivation,[22] and career destiny[23] mostly from one angle view (i.e., educational perspectives). However, in a cross-discipline view to integrate psychological issues into the educational system, there is still work to do. For example, internet addiction was studied more than a decade ago and found a prevalence at 5.2% among medical students in Mashhad,[24] but to the best of our knowledge, there is no comprehensive study that examines the impact and the positive and negative effects of playing online games on academic performance in Iranian medical education environment. These findings serve as a warning within Iran's medical education system. In response, educational authorities can leverage this knowledge to devise tailored strategies to address this issue. Therefore, by analyzing these results and implementing measures to mitigate negative factors and enhance positive ones, we hope to see a continual improvement in the performance of our country's students.

Due to the aforementioned lack of knowledge, current study aimed to evaluate the prevalence of IGD in medical students alongside its' relationship with academic performance.

Materials and Methods

In a cross-sectional study conducted from 2020-2022, 185 medical students from four disciplines (basic sciences, Physiopathology, extern, intern) were selected through a multi-stage sampling method at Mashhad University of Medical Sciences.

Firstly, each of the aforementioned disciplines was considered as a separate stratum. Secondly, within each of these strata, a convenience sampling method was employed for data collection. The criteria for inclusion in this study were a willingness to participate and having completed at least two semesters of the medical course. The exclusion criteria were the failure to answer at least 50% of the questions in the questionnaire.

The sample size for this study was determined based on a previously published study, which reported the score of internet gaming disorder (IGD) to be 33.5 ± 15.5.[25] The sample size was determined using the formula for estimating a quantitative variable in a population, with an alpha error of 5% and a $d = 2.33$. This calculation resulted in a sample size of 172. However, to account for a potential dropout rate of 5%, the sample size was increased to 182.

Given the unique health situation due to the COVID-19 pandemic when this research was conducted, we opted for an electronic questionnaire instead of a paper one to adhere to health guidelines. The questionnaire link was disseminated via social networks. As the pandemic situation relatively improved and due to the incomplete sample size in each stratum, we transitioned to using paper versions of the questionnaires. Through coordination with professors, data collection was conducted in person at the beginning of classes. Informed consent was obtained from each participant at the beginning of the online questionnaires and verbally during the students' classes. The answers to the paper questionnaires were also collected with assurance of data confidentiality. To maintain data confidentiality, the questionnaire did not request any private information that could reveal the individual's identity, such as their first and last name, student ID, or national code. Furthermore, during the process of reviewing the students' questionnaire responses and converting them into statistical data, all questionnaires were initially translated into predefined codes. These coded responses were then evaluated for grading.

In this study, the internet game addiction questionnaire was used. The internet gaming disorder test (IGD-20 test)[26] has been introduced as a tool to investigate IGD.

The questionnaire comprises twenty statements, each reflecting one of nine distinct criteria. The IGD items are evaluated using a five-point Likert scale, including "completely disagree", "disagree", "neither agree nor disagree", "agree" and "completely agree" with a minimum score of one and a maximum score of five. The total score range for the questionnaire is between 20 and 100. A score exceeding 71 is indicative of a person meeting the diagnostic criteria for IGD. The validity and reliability of the Persian version of the questionnaire were confirmed in previous studies.[27] To ensure validity and reliability, the questionnaire was reviewed by ten professors from Tabriz University of Medical Sciences and Tabriz University. Their constructive feedback was then incorporated into the final version. The study's findings indicate that the Persian version of the IGD-20 test is a valid and reliable instrument, appropriate for research applications within the Iranian student population.[27] Moreover, a researcher-developed checklist was used to assess the students' academic performance. This checklist gathered information on various factors, including the students' grade point average (GPA) from the previous academic semester, average study hours during regular days and exam periods, efficiency of study hours, number of failed semesters, and their satisfaction with their own academic performance.

Ultimately, the data and outcomes of the study were analyzed using SPSS version 26. Quantitative variables were characterized using the mean and standard deviation, while qualitative variables were summarized by their frequency and percentage frequency. The relationships between qualitative variables were assessed using the Chi-square test. Quantitative variables were compared across two groups using Student's t-tests and across three groups using ANOVA. If the quantitative data did not adhere to a normal distribution, equivalent non-parametric tests were employed. All tests were two-tailed, with a significance level (P value) set at less than 0.05.

Results
In this study, a total of 185 medical students participated. Among them, 62.2% (115 students) were female. The ages of the participants ranged from 19 to 32 years, with an average age of 22.53 years ($\pm$2.27 standard deviation). Sixty percent (110 students) were natives of Mashhad and there was a relatively fair distribution among four different grades: basic science (21.6%, 40 students), physiopathology (16.2%, 30 students), extern (24.3%, 45 students) and intern (37.8%, 70 students). Regarding the educational outcomes, the GPA was 16.8$\pm$1.3, the failed semesters was 0.06$\pm$0.387, the overall daily study time was 2.3$\pm$1.6 hours, the daily study time in days close to exams (6.7$\pm$2.5 hours), study efficacy (6.8$\pm$16.1 percent), satisfaction from educational status (6.1$\pm$2.2 out of 10). In total, 3.8% (equivalent to 7 students) were identified as having an IGD. The detailed description of domains and total score is presented in Table 1.

As Table 2 shows, although the prevalence of IGD was four times higher in males than females (7.1% vs. 1.7%) these findings did not show a statistical significance ($P=0.106$). The incidence of IGD was zero among basic science students, reached its peak in the physiopathology grade, and then gradually decreased in the remaining two grades.

As Table 3 shows, students with IGD exhibited a significant decrease in study time, both overall ($P<0.001$) and near the exam period ($P=0.031$), compared to the other group. However, this was not observed in outcomes like study efficacy, study satisfaction, and even GPA.

Discussion
Given the increasing prevalence of internet games and

Table 1. The description of total internet gaming disorder scores and its' domains

Domain	Mean ± SD	Minimum-Maximum	Median (1st quartile-3rd quartile)
Salience	1.7±0.9	1.0-5.0	1.3 (1.0-2.3)
Mood Modification	2.6±1.1	1.0-5.0	2.6 (2.0-3.6)
Tolerance	1.7±0.8	1.0-5.0	1.3 (1.0-2.3)
Withdrawal Symptoms	1.7±0.8	1.0-4.6	1.3 (1.0-2.3)
Conflict	2.0±0.8	1.0-4.7	2.0 (1.5-2.5)
Relapse	1.7±0.9	1.0-4.6	1.3 (1.0-2.3)
Total IGD	38.9±15.7	20.0-92.0	35.0 (27.0-49.0)

IGD, internet gaming disorder.

Table 2. The comparison of Internet gaming disorder status based on demographic variables

Variable		Healthy	Internet gaming disorder	P value
Gender	Male	65 (92.9%)	5 (7.1%)	0.106
	Female	113 (98.3%)	2 (1.7%)	
Native of Mashhad	No	69 (95.8%)	3 (4.2%)	>0.99
	Yes	100 (96.4%)	4 (3.6%)	
Discipline	Basic science	40 (100)	0 (0%)	0.501
	Physiopathology	28 (93.3%)	2 (6.7%)	
	Extern	43 (95.6%)	2 (4.4%)	
	Intern	67 (95.7%)	3 (4.2%)	

Table 3. The comparison of Internet gaming disorder status based on education-related variables

Variable	Healthy	Internet gaming disorder	P value
GPA	16.8±1.3	16.1±1.5	0.147
Failed semesters	0.06±0.3	0.0±0.0	0.666
Overall daily study time (h)	2.4±1.6	0.86±0.6	<0.001
Daily study time in days close to exams (h)	6.7±2.4	4.7±1.7	0.031
Study efficacy (%)	67.6±16.1	73.5±14.9	0.341
Satisfaction from educational status (1-10)	6.1±2.1	5.0±3.3	0.170

GPA, grade point average.

the significant proportion of students in society, we chose to explore the impact of internet gaming addiction on medical students at Mashhad University of Medical Sciences. Firstly, the prevalence of IGD was approximately 4%. Furthermore, there was a significant difference observed in the average study hours, as well as the study hours close to the exam day, between healthy individuals and students with IGD.

Our findings indicate that there is no significant relationship between the parameters of age, gender, being native to Mashhad, discipline level, last GPA, number of failed semesters, and satisfaction with education in both healthy students and those diagnosed with IGD. A study by Mirgol et al in 2019 found a correlation between computer gaming addiction and the academic failure of students.[11] In a similar case, Safarian et al demonstrated that addiction to internet games leads to a decline in students' academic performance.[12] However, mirroring our findings, Kurnianingsih et al also did not identify any correlation between IGD and GPA.[28] It is hypothesized that self-control may serve as a moderating factor in the relationship between computer game addiction and academic performance.[6,29]

While our study did not reveal any gender differences in the prevalence of IGD, a study by Kurnianingsih et al found that male medical students in Indonesia were more susceptible to IGD (29.56%) compared to their female peers (10.04%).[28] Similarly, Siste et al[30] found that males were four times more likely to develop IGD than females. It is noteworthy to mention that contrary to these findings, a recent study reported significantly higher levels of stress among female medical students compared to their male counterparts.[31]

A recent study in India showed that the prevalence of problematic gaming among undergraduate MBBS medical students in Central Kerala was 6.98%. The authors have cautioned that the prevalence of problematic gaming is increasing among medical students, emphasizing the necessity for monitoring and timely remedial action.[32] While the prevalence of IGD in our study was nearly half of the previously reported rate in India, this could serve as a warning signal for the educational system. The ongoing COVID-19 pandemic may significantly affect these rates. To evaluate this hypothesis, Ismail et al[33] conducted a study and collected data during the second wave of the "Conditional Movement Control Order" (CMCO) in Malaysia in 2020. The prevalence of IGD was found to be 2.5% among medical students. Ismail et al[33] concluded that the prevalence of internet addiction escalated during the pandemic compared to the pre-pandemic period. However, the prevalence of IGD remained consistent with the rates reported before the pandemic.

A recent meta-analysis, which included a pooled cohort of 2236 medical students, revealed that the pooled prevalence of IGD among medical students from numerous countries is 6.2%. This rate is approximately twice as high as that observed in the general population.[34] Moreover, the pooled prevalence of IGD was found to be 10.9% (95% CI: 7.3–16.1%) in Egypt, 8.8% (95% CI: 5.7–13.2%) in Saudi Arabia, 6.1% (95% CI: 0.7–37.5%) in Indonesia and 3.8% (95% CI: 2.7–5.5%) in India.[34] In comparison to our findings, the prevalence of IGD in Mashhad, Iran was lower than the pooled estimates in Egypt, Saudi Arabia, and Indonesia. However, it was comparable to the IGD rate observed in India. This discrepancy in results could be attributed to the specific target population under study, which comprises medical students. It is crucial to take this factor into account. Moreover, in a study conducted among high school students in Shiraz, located in the northeast of Iran, the prevalence of internet addiction was found to be 3%, while the prevalence of internet gaming addiction was slightly higher at 4%. The researchers concluded that these two disorders can lead to depression and anxiety in students.[35] In a systematic review of 30 studies and a population of more than 130 000 people, the prevalence of internet addiction was estimated to be 20% (95% CI: 16-25%). The growth rate has been increasing from 2006 to 2015.[36] A study in Hong Kong on students showed that 94% used video or internet games and the prevalence of game addiction was 16%. Game addiction was associated with gender (male), academic performance decline, and multiplayer online games.[37] A study involving 1928 Norwegian adolescents, aged between 13 and 17 years, found that addiction to video games was associated with lower academic performance. Interestingly, the amount of time spent playing video games did not contribute to this adverse outcome.[38] A study conducted on Turkish high school students revealed a negligible correlation between internet gaming addiction and academic performance.[39] In summary, the prevalence of game addiction, whether internet-based or global and its' associated outcomes, such as a decline in academic performance, are strongly affected by the context (i.e., study population: students or medical students, etc) and social culture and norms.

A significant strength of our study was the examination of the relationship between IGD and academic performance in a type I medical university in a developing country, Iran. This provides valuable evidence for future decision-making. Another strength of our study is the broad age range of participants recruited through stratified sampling, encompassing four stages of medical education: basic sciences, Physiopathology, extern, intern students. This diversity enhances the reliability and generalizability of our study's results. However, as this study focused solely on medical students, the results are primarily generalizable to this group. We recommend future studies to explore other fields or groups of school students to determine the potential confounding effect of the 'field of study' factor on the research results.

The discrepancies between our findings and those of other studies underscore the necessity for further research in this field to obtain the most accurate results. Therefore, we recommend conducting additional studies across various primary majors, such as dentistry, paramedicine, pharmacy, nursing, etc., to obtain a more comprehensive understanding of the effects of internet games on the student community. Educational authorities can utilize these findings to decide on implementing screening for IGD. Based on the prevalence of students with IGD, they can design tailored interventions and policies to optimize student performance in both the university and broader society.

Competing Interests
The authors declare no conflict of interests.

Ethical Approval
The Ethics Committee at Mashhad University of Medical Sciences approved this study (IR.MUMS.MEDICAL.REC.1399.423).

References
1. Kuss DJ, Griffiths MD. Internet gaming addiction: a systematic review of empirical research. Int J Ment Health Addict. 2012;10(2):278-96. doi: 10.1007/s11469-011-9318-5.
2. Kuss DJ. Internet gaming addiction: current perspectives. Psychol Res Behav Manag. 2013;6:125-37. doi: 10.2147/prbm.s39476.
3. Seraji F, Alibakhshi M. Parents' worries about harm caused to adolescents by computer games: findings from a mixed methods research. Quarterly Journal of Family and Research. 2015;12(1):31-50. [Persian].
4. Lam LT. Internet gaming addiction, problematic use of the internet, and sleep problems: a systematic review. Curr Psychiatry Rep. 2014;16(4):444. doi: 10.1007/s11920-014-0444-1.
5. Islamic Republic News Agency. Iranian Gamers Will Reach 41 Million. Available from: https://irna.ir/xjxNDJ. Accessed March 25, 2023.
6. Mansouri M, Farhadi H. Computer games addiction, emotional and social anxiety with adolescent academic performance: the moderating role self-control. Information and Communication Technology in Educational Sciences. 2019;9(35):97-117. [Persian].
7. Zandi Payam A, Mirzaeidoostan Z. Online game addiction relationship with cognitive distortion, parenting style, and narcissistic personality traits in students. Iran J Psychiatry Clin Psychol. 2019;25(1):72-83. doi: 10.32598/ijpcp.25.1.72. [Persian].
8. Nasution FA, Effendy E, Amin MM. Internet gaming disorder (IGD): a case report of social anxiety. Open Access Maced J Med Sci. 2019;7(16):2664-6. doi: 10.3889/oamjms.2019.398.
9. Ha JH, Kim SY, Bae SC, Bae S, Kim H, Sim M, et al. Depression and internet addiction in adolescents. Psychopathology. 2007;40(6):424-30. doi: 10.1159/000107426.
10. Chiriţă V, Chiriţă R, Ştefănescu C, Chele G, Ilinca M. Computer use and addiction in Romanian children and teenagers--an observational study. Rev Med Chir Soc Med Nat Iasi. 2006;110(3):526-32.
11. Mirgol A, Mohseni S, Alisofi AN, Sheikhveisi H. Investigating the relationship between computer games addiction and academic failure in high school students in Zahedan. Journal of New Advances in Behavioral Sciences. 2019;4(30):1-12. [Persian].
12. Saffarian Hamedani S, Abdollahi M, Daeizadeh H, Bayat Y. The relationship between the amount of playing computer games and students' mental health and academic performance. Information and Communication Technology in Educational Sciences. 2013;3(11):5-20. [Persian].
13. Islam MI, Biswas RK, Khanam R. Effect of internet use and electronic game-play on academic performance of Australian children. Sci Rep. 2020;10(1):21727. doi: 10.1038/s41598-020-78916-9.
14. Hawi NS, Samaha M, Griffiths MD. Internet gaming disorder in Lebanon: relationships with age, sleep habits, and academic achievement. J Behav Addict. 2018;7(1):70-8. doi: 10.1556/2006.7.2018.16.
15. Benjet C, Orozco R, Albor YC, Contreras EV, Monroy-Velasco IR, Hernández Uribe PC, et al. A longitudinal study on the impact of internet gaming disorder on self-perceived health, academic performance, and social life of first-year college students. Am J Addict. 2023;32(4):343-51. doi: 10.1111/ajad.13386.
16. Yousefi M, Jahantab Z, Khadem-Rezaiyan M. Quality of educational services in a type one medical sciences university based on SERVQUAL model from the perspective of faculty members. Development Strategies in Medical Education. 2021;8(3):1-10. doi: 10.52547/dsme.8.3.1. [Persian].
17. Jahantab Z, Yousefi M, Mohammad Hoseinzadeh M, Khadem-Rezaiyan M. Evaluating the quality of educational services from the perspective of learners at Mashhad University of Medical Sciences in 2018. J Med Educ Dev. 2020;15(4):234-43. doi: 10.18502/jmed.v15i4.5901. [Persian].
18. Khadem-Rezaiyan M, Shekofteh K, Karimi FZ, Saghi M, Sahranavard M, Arekhi S, et al. Students' expressed items related to educational services in Mashhad University of Medical Sciences-based on SERVAQUAL model. Development Strategies in Medical Education. 2019;6(1):85-98. doi: 10.29252/dsme.6.1.85. [Persian].
19. Khadem-Rezaiyan M, Mousavi Bazaz SM. Quality gap in educational services based on SERVQUAL model in Mashhad medical school. Research on Medicine. 2016;40(1):17-23. [Persian].
20. Khadem-Rezaiyan M, Etezad Razavi M, Javadi B, Feyzabadi Z, Omidkhoda M, Saeedinejat S, et al. Educational quality gap from students' viewpoints; results from a survey in Mashhad University of Medical Sciences. Future Med Educ J. 2017;7(4):31-5. doi: 10.22038/fmej.2018.28836.1184. [Persian].

21. Arekhi S, Akhavan Rezayat A, Khadem-Rezaiyan M, Youssefi M. Educational quality of services in medical universities of Islamic Republic of Iran: a systematic review and meta-analysis. J Med Edu. 2019;18(2):e105673. doi: 10.22037/jme.v18i2.25116.

22. Khadem-Rezaiyan M, Omranzadeh A, Akhavan Rezayat A, Youssefi M. From Prestige to humanism: the experiences of medical students about motivational factors. J Med Educ Dev. 2019;12(34):14-21. doi: 10.29252/edcj.12.34.14.

23. Khadem-Rezaiyan M, Zeinalipour Z, Rashidtorabi Z, Youssefi M. The future of medical students; perspectives and expectations: a cross-sectional study in Mashhad University of Medical Sciences. Res Dev Med Educ. 2018;7(1):26-31. doi: 10.15171/rdme.2018.006.

24. Salehi M, Norozi Khalili M, Hojjat SK, Salehi M, Danesh A. Prevalence of internet addiction and associated factors among medical students from Mashhad, Iran in 2013. Iran Red Crescent Med J. 2014;16(5):e17256. doi: 10.5812/ircmj.17256.

25. Zandipayam A, Davoudi I, Mehrabizadeh M. The relationship of experiential avoidance, familial emotional atmosphere and self-control with online gaming addiction in bachelor student of Shahid Chamran University of Ahvaz. J Educ Community Health. 2016;3(1):28-35. doi: 10.21859/jech-03014. [Persian].

26. Yu SM, Pesigan IJ, Zhang MX, Wu AM. Psychometric validation of the internet gaming disorder-20 Test among Chinese middle school and university students. J Behav Addict. 2019;8(2):295-305. doi: 10.1556/2006.8.2019.18.

27. Vahidi M, Zamanzadeh V, Musavi S, Janani R, Namdar Areshtanab H. Validation of the Persian version of the internet gaming disorder-20 Test among the students of Tabriz University of Medical Sciences. J Torbat Heydariyeh Univ Med Sci. 2019;7(1):26-15. [Persian].

28. Kurnianingsih N, Ratnawati R, Yudhantara DS, Prawiro RB, Permatasari M, Rachma H, et al. Association between time spent for internet gaming, grade point average and internet gaming disorder risk among medical students. Res J Life Sci. 2018;5(3):140-8. doi: 10.21776/ub.rjls.2018.005.03.1.

29. Haghbin M, Shaterian F, Hosseinzadeh D, Griffiths MD. A brief report on the relationship between self-control, video game addiction and academic achievement in normal and ADHD students. J Behav Addict. 2013;2(4):239-243. doi:10.1556/JBA.2.2013.4.7.

30. Siste K, Hanafi E, Sen LT, Wahjoepramono POP, Kurniawan A, Yudistiro R. Potential correlates of internet gaming disorder among Indonesian medical students: cross-sectional study. J Med Internet Res. 2021;23(4):e25468. doi: 10.2196/25468.

31. Nader M, Youssefi M, Khadem-Rezaiyan M. The study on the prevalence of stressful factors among medical students of Mashhad University of Medical Sciences in 2020. J Med Educ Dev. 2021;16(4):244-56. doi: 10.18502/jmed.v16i4.8574. [Persian].

32. Bhaskar R, Babu BP, Sebastian SR. Internet gaming disorder among medical students: an observational study from Central Kerala, India. J Curr Res Sci Med. 2021;7(2):114-8. doi: 10.4103/jcrsm.jcrsm_28_21.

33. Ismail N, Tajjudin AI, Jaafar H, Nik Jaafar NR, Baharudin A, Ibrahim N. The relationship between internet addiction, internet gaming and anxiety among medical students in a Malaysian public university during COVID-19 pandemic. Int J Environ Res Public Health. 2021;18(22):11870. doi: 10.3390/ijerph182211870.

34. Chiang CLL, Zhang MWB, Ho RCM. Prevalence of internet gaming disorder in medical students: a meta-analysis. Front Psychiatry. 2021;12:760911. doi: 10.3389/fpsyt.2021.760911.

35. Ahmadi J, Amiri A, Ghanizadeh A, Khademalhosseini M, Khademalhosseini Z, Gholami Z, et al. Prevalence of addiction to the internet, computer games, DVD, and video and its relationship to anxiety and depression in a sample of Iranian high school students. Iran J Psychiatry Behav Sci. 2014;8(2):75-80.

36. Modara F, Rezaee-Nour J, Sayehmiri N, Maleki F, Aghakhani N, Sayehmiri K, et al. Prevalence of internet addiction in Iran: a systematic review and meta-analysis. Addict Health. 2017;9(4):243-52.

37. Wang CW, Chan CL, Mak KK, Ho SY, Wong PW, Ho RT. Prevalence and correlates of video and internet gaming addiction among Hong Kong adolescents: a pilot study. ScientificWorldJournal. 2014;2014:874648. doi: 10.1155/2014/874648.

38. Brunborg GS, Mentzoni RA, Frøyland LR. Is video gaming, or video game addiction, associated with depression, academic achievement, heavy episodic drinking, or conduct problems? J Behav Addict. 2014;3(1):27-32. doi: 10.1556/jba.3.2014.002.

39. Sahin M, Gumus YY, Dincel S. Game addiction and academic achievement. Educ Psychol. 2016;36(9):1533-43. doi: 10.1080/01443410.2014.972342.