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Prevalence and Prediction of Video Gaming Addiction Among Saudi Adolescents, Using the Game Addiction Scale for Adolescents (GASA)

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Background: Understanding the prevalence and predictors of video game (VG) addiction is crucial in the Saudi context for improving the quality of life for adolescents and youths. We aim to determine the prevalence, types, and predictors of VG addiction disorders among Saudi adolescents using the validated Arabic-translated Game Addiction Scale for Adolescents (GASA).

Methods: A cross-sectional study of 787 adolescents was conducted via SurveyMonkey with the validated Arabic-translated GASA. The tool has seven domains, each containing three items, scored on a 5-point Likert scale. Data were collected on adolescent demographic characteristics (gender, age, education level, school performance, interaction, socialization, exercising, prayer, the parent's marital status, and education) and VG-related characteristics (age when child started playing VG, duration of playing VG per day, number of children in the family playing VG, parent's permission to play, parent's perception about the positive influence of VG). Logistic regression analysis was performed to identify the predictors of VG addiction. Significance was considered at $p < 0.05$.

Results: Of the 787 adolescents, 8.3% were addicted gamers, 33.4% were problem gamers, and 2.2% were highly engaged. Being an addicted gamer was significantly associated with male gender (OR = 1.36, p = 0.038), higher fathers' education (OR = 1.62, p = 0.001), and favorable perception of parents to VG (OR = 1.51, p = 0.007). When the ROC curve was applied, a cut-off score of 85 was the optimum GASA score above which the adolescent was likely to be an addicted gamer, with 76.9% sensitivity, 84.2% specificity, and an area under the curve of 88.5%.

Conclusion: Our study could be a pilot study for similar studies in other Arab countries. Potential community-based educational programs, parental involvement strategies, or activities to promote alternative hobbies of adolescents are recommended. Additional studies are necessary on how cultural differences might influence gaming addiction and the applicability of Western-based tools like GASA to Saudi contexts.

Keywords: addicted gamer, game addiction scale, behavioral addiction, polythetic addiction, monothetic addiction, problem gamer, highly engaged gamer

Background

Video gaming (VG), also known as digital games or e-games, has various definitions, and several scholars have conceptualized the term from different perspectives. Some conceptualize VG as a technological platform that requires a set of audio-visual materials and specific technical connections, such as a television set, a computer, tablet devices, or mobile phones.[1,2] Others conceptualize VG as a rewarding and enjoyable technique that uses a motive approach for physical and psychological engagements that enhance cognitive and psychomotor skills.[3–5] Depending on the players' interests, adolescents play VG for several reasons, including adventure, action, wrestling, racing, role-playing, and simulation.[3–5] However, Brock and Johnson(2021)[6] claimed that beyond playing for enjoyment, adolescent gamers view VG as a craft-consuming activity that derives "material consciousness as they rehearse actions to achieve goals".

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The global pooled prevalence of VG addiction ranges between 1% and 9%.[7] According to Stevens et al, the global gaming disorder is 3.05%.[8] The prevalence of VG addiction varies from one country to another because of social aspects differences, and it depends on the assessment tools that have been used to measure the addiction. For instance, the prevalence of VG addiction among adolescents in Europe ranged between 1% and 15%[9–12] In the United States (US), it ranged from 3% to 8.5%.[12,13] However, it was highest in the United Kingdom (UK) and Iran, reaching approximately 14% and 17%, respectively.[11] In Saudi Arabia, previous studies in different regions reported a prevalence of VG addiction among Saudi adolescents that ranged from 3.5% to 62.1%.[11,14–18] Different methodologies used to assess the prevalence of VG addiction might influence the difference in these figures.

Cultural differences play a significant role in shaping behaviors and attitudes toward gaming, including addiction.[19,20] Cultural attitudes towards gaming, where gaming may be viewed as either a harmless or a cause for concern in Saudi Arabia, where traditional cultural beliefs may impact leisure activities.[21,22] Social Structures, where family game nights and other communal interactions may be more prevalent in Saudi culture, may help to lessen the isolation that is frequently linked to addiction.[23–25] Saudi Arabian restrictions and censorship have a major impact on the accessibility of gaming content. Islamic principles are important in shaping Saudi Arabian society standards and can affect perceptions of gaming.[12,16,26] Cultural differences can be significant in terms of knowledge and availability of resources regarding gaming addiction.[12,16,20,26] People in Saudi Arabia may turn to gaming as a preferred social outlet due to a need for social connection and interaction, especially in a digital age where opportunities for other forms of socializing may be limited.[23–25]

Recent studies have highlighted several negative influences of VG on adolescents. These include detrimental impacts on academic performance, physical health, mental health, and social skills. Regarding academic performance, evidence indicates that online game addiction is linked to reduced motivation for academic achievement.[26–28] This is partly due to decreased learning engagement and increased adolescent sensation-seeking behaviors.[26,27,29] Furthermore, excessive gaming can lead to poorer parent-adolescent relationships, negatively affecting students' motivation and academic success.[27,30] Excessive internet use, including online gaming, has been associated with physical and mental health issues. These issues include problems with self-consciousness, peer relationships, and increased stress and anxiety levels.[31–33]

Immersive gaming can lead to a loss of self-awareness and neglect of physical self-care, further exacerbating these problems.[34–36]Further, prolonged exposure to VGs can hinder the development of crucial social skills, as children struggle with face-to-face interactions and interpreting nonverbal cues, which are essential for effective communication and social relationships.[33,37,38] The current high-technology environment and the virtual-based world endorsed in VGs have led the younger generations to become more addicted to such games.[39] Thus, it often impacts adolescents' energy and various brain abilities, including lack of sleep, increased stress levels and bullying, low interactions and socialization, and increased aggressive behaviors.[1,40–46]

However, evidence proposes that VG has positive behavioral effects among adolescents. It reduces their stress, promotes positive feelings, enriches their lives, and helps them socialize with others in their comfort zone.[2,43,47–49] They also indicate that VG, mainly e-sport games, fosters physical activities, cognitive abilities, mental health, and relationships and strengthens adolescents' social ties.[49–52] The notion of VG is a helpful tool for encouraging introverted adolescents to interact with their peers in real-life situations.[37] Effective use of VG can enhance socialization among adolescents with mental or psychological disabilities. For instance, a qualitative study indicated that VG enhances the socialization of autistic adolescents and empowers positive adolescent-parent interactions and relationships, which improves their quality of life.[53] Thus, they require a deeper understanding through a constructed scientific methodology to examine the effect of such factors and the level of VG addiction.

In Saudi Arabia, previous studies with their reported prevalence ranging from too low (3.5%) to too high (62.1%)[11,14–18] have not provided us with the answer to the question of whether VG addiction is a problem among Saudi adolescents due to different methodologies. Therefore, the aims of this study were 1) to estimate the prevalence and types of VG addiction among Saudi Adolescents using the Arabic-validated Game Addiction Scale for Adolescents (GASA),[54,55] and 2) to identify the significant predictors of VG addiction in the Saudi context. GASA is one of the most frequently used questionnaires for game addiction. The scale was theoretically based on the DSM-5 criteria for

pathological gambling, namely salience, tolerance, mood modification, withdrawal, relapse, conflict, and problems.[54,55] The DSM-5 requires half (or more) of its criteria to be met when diagnosing pathological gamblers. This tool has solid psychometric properties and can be used for diagnosis and research. It has not been used in any previous studies on Saudi adolescents. This study may be a pilot study for similar studies in Saudi Arabia and the Arab world.

Methods

Study Design

This study was a cross-sectional study using an online questionnaire via Survey Monkey (https://www.surveymonkey.com/r/5KQDH2Y) restricted to one participant per unique internet protocol (IP) address. The survey had two parts, which included a) an online debriefing page, which includes a general overview of the study, its purpose, instructions on how to use the online questionnaire, and the agreement to participate in the survey, and b) the online self-administrative questionnaire, which explored all the participants throughout the study period, between July and August 2022.

Study Participants

A convenient sampling technique was used to select the participants. These included Saudi adolescents who lived in the Riyadh region, spoke and read in Arabic, had internet access, and agreed to participate in the study. Any adolescent with physical, mental, or psychological conditions that prevented them from comprehending the study questionnaire was excluded. The sample size was calculated based on a previous study's prevalence of 9% VG addiction among adolescents,[54] With a 95% confidence limit and a 2% margin of error, the estimated sample size was 786; those who responded to a completed questionnaire were 787 participants.

Data Collection

The investigators developed questions covering the following:

A) Adolescent demographic data included gender, age, education level, school performance, interaction, socialization, physical exercise, prayer, the parents' marital status, and parents' education.
B) The videogame-related characteristics included the age at which the adolescent started playing the VG, the duration of playing the VG in hours during the day, the number of children in the family who are playing a VG, the Parent's permission to play, the parent's perception about the positive influence of VG.
C) Game Addiction Scale for Adolescents (GASA): The GASA tool developed by Lemmens et al[54] to measure seven pathological criteria, or what we call it here in this study VG addiction domains, which include salience, tolerance, mood modification, withdrawal, relapse, conflict, and problems. According to Lemmens et al[54] videogame addiction was classified into monothetic and polythetic formats. In the polythetic addiction format, the adolescent should endorse at least half of the criteria to conclude a positive diagnosis of video game addiction when using it often or very often as at the cut-off point. The scale is a validated tool with Cronbach's alpha = 0.81. The tool has seven domains, each containing three items, where all the domains' items were scored on a 5-point scale by the adolescents (never = 1, almost never = 2, sometimes = 3, often = 4, very often = 5). The tool has a validated Arabic-translated version. The Arabic version was validated by Assad et al,[55] with an internal consistency (Cronbach's alpha = 0.811). The questionnaire's reliability was assessed using κ statistics; values ranged from 0.535 to 1.000.
    i. Using the polythetic addiction format, the prevalence of game addiction in each of the seven domains of the VG scale was calculated based on Assad et al (2019),[55] and adolescents were classified into addicted gamers, problem gamers, highly engaged, and non-problem. Respondents who endorse all four domains tapping core addiction criteria (relapse, withdrawal, conflict, problems) are categorized as addicted gamers, while those who endorse 2 or 3 of the core criteria are classified as problem gamers[54] Respondents who endorse all three domains tapping gaming engagement (salience, tolerance, mood modification), whereas fulfilling none or one

of the core addiction criteria are categorized as highly engaged gamers. Non-addicted/nonproblem/non-high engaged gamers endorse less than the above scores.

ii. Using the monothetic addiction format, the total GASA scores for each adolescent were obtained by summing the adolescents' response scores for all domains. Total scores ranged from 21 to 105. ROC curve was applied to determine the optimum cut-off score of the GASA above which an addicted gamer is predicted. The optimum cut-off's validity was defined in terms of sensitivity and specificity.

Data Analysis

Data entry and statistical analysis were performed with the statistical package for the social science (SPSS) software program for Windows (version 28.0.1.1, © Copyright IBM Corporation, Armonk, NY, USA). Descriptive statistics such as percentages, means, and standard deviations were calculated. The Pearson chi-square test and Chi-square test for linear trend were applied for categorical data, and the Student's *t*-test was used for continuous data. Logistic regression analysis was performed to identify the significant predictors of VG addiction, with adolescent gender, school performance, father's education, and parents' perception of VG positivity as independent variables. ROC curve was applied to determine the optimum cut-off score of the GASA above which an addicted gamer is predicted. Statistical significance was considered at $p < 0.05$ for all analyses.

Results

Adolescent Characteristics

Table 1 shows 787 Saudi adolescents; most of them (59.2%) were females under the age of 16 (90.7%) and in intermediate school (59.8%). Nearly one-half of all adolescents reported an average school performance (48.9%) and being sociable (55.6%). Most adolescents reported being interactive (71%) and regularly praying (76.7%), while regular exercising was reported by only (31.9%) of all adolescents.

Parent's Characteristics

Most adolescents (80.1%) reported living with both of their parents. Nearly half (53.5% and 46.9%) reported that their mothers and fathers had a bachelor's or higher education.

Videogame-Related Characteristics

Most adolescents reported starting VG at the age of 5–6 (53.2%), playing for more than 2 hours a day (72%), and having one or more kids in the family playing VG (63.9%). Nearly all adolescents reported that their parents permitted them to play VG (95.4%), while those who said their parents favored VG playing represented only 56.6% of all adolescents.

Table 2 and Figure 1 show adolescents' responses to the game addiction scale, comprising 21 items in 7 domains: salience, tolerance, mood modification, relapse, withdrawal, conflict, and problems. The statement preceded every item:

Table 1 Personal and General Characteristics of Saudi Adolescents and Their Parents

A- Adolescent Characteristics	Frequency (n=787)	%
Gender		
- Female	466	59.2
- Male	321	40.8
Age		
- 10–12 years	377	47.9
- 13–15 years	337	42.8
- 16–17 years	73	9.3

(*Continued*)

Table 1 (Continued).

Education level		
- Primary school	196	24.9
- Intermediate school	471	59.8
- Secondary school	120	15.2
School performance		
- Poor	77	9.8
- Average	385	48.9
- Good	325	41.3
Adolescent Interaction		
- Less interactive	228	29.0
- Interactive	559	71.0
Socialization		
- Less sociable	349	44.4
- Sociable	438	55.6
Physical Activity		
- Irregular	536	68.1
- Regular	251	31.9
Praying		
- Irregular	173	23.3
- Regular	604	76.7
Parents marital status		
- Couple parent	630	80.1
- Single Parent	157	19.9
Father's education		
- Secondary school or less	418	53.1
- Bachelor/postgraduate	369	46.9
Mother's education		
- Secondary school or less	366	46.5
- Bachelor/postgraduate	421	53.5
B- Videogame-related characteristics		
Age of starting the videogame		
- 5–6 years	419	53.2
- 7–8 years	204	25.9
- 9–12 years	164	20.8
Duration of playing a videogame/day		
- 2 hours or less	220	28.0
- More than 2 hours	567	72.0
No of children in the family who play a videogame		
- Only One child	284	36.1
- Two kids	320	40.6
- Three Kids or more	183	23.3
Parent's permission to play videogame		
- No	36	4.6
- Yes	751	95.4
Parent's perception of the positive influence of video gaming		
- Strongly disagree	89	11.3
- Disagree	253	32.1
- Agree	302	38.4
- Strongly agree	143	18.2

Table 2 Adolescents' Responses to the Game Addiction Scale for Adolescents (GASA) Domains

Addiction scale Domains	Never		Rarely		Sometimes		Often		Very often	
	No	%	No	%	No	%	No	%	No	%
Gaming engagement										
Salience										
Did you think about playing a game all day long?	88	11.2	151	19.2	148	18.8	253	32.1	147	18.7
Did you spend much free time playing games?	48	6.1	111	14.1	140	17.8	293	37.2	195	24.8
Have you felt addicted to a game?	67	8.5	122	15.5	143	18.2	258	32.8	197	25.0
Tolerance										
Did you spend increasing amounts of time on games?	50	6.4	120	15.2	119	15.1	270	34.3	228	29.0
Did you play longer than intended?	57	7.2	124	15.8	161	20.5	282	35.8	163	20.7
Were you unable to stop once you started playing?	49	6.2	121	15.4	171	21.7	265	33.7	181	23.0
Mood Modification										
Did you play games to forget about real life?	58	7.4	110	14.0	169	21.5	278	35.3	172	21.9
Have you played games to release anger or stress?	52	6.6	129	16.4	138	17.5	268	34.1	200	25.4
Have you played games to feel better?	58	7.4	118	15.0	138	17.5	253	32.1	220	28.0
Core addiction criteria										
Relapse										
Have others unsuccessfully tried to reduce your game use?	43	5.5	107	13.6	141	17.9	287	36.5	209	26.6
Were you unable to reduce your game time?	55	7.0	108	13.7	153	19.4	266	33.8	205	26.0
Have you failed when trying to reduce game time?	44	5.6	152	19.3	129	16.4	253	32.1	209	26.6
Withdrawal										
Have you felt bad when you were unable to play?	54	6.9	93	11.8	124	15.8	272	34.6	244	31.0
Have you become angry when you are unable to play?	41	5.2	146	18.6	131	16.6	291	37.0	178	22.6
Have you become stressed when unable to play?	54	6.9	94	11.9	126	16.0	250	31.8	263	33.4
Conflict										
Did you have fights with others (eg, family and friends) over the time you spent playing games?	42	5.3	103	13.1	144	18.3	268	34.1	230	29.2
Have you neglected others (eg, family, friends) because you were playing games?	61	7.8	130	16.5	181	23.0	242	30.7	173	22.0
Have you lied about time spent on games?	40	5.1	146	18.6	178	22.6	274	34.8	149	18.9
Problem										
Have you neglected other important activities (eg, school, work, sports) to play games?	56	7.1	95	12.1	105	13.3	314	39.9	217	27.6
Has your time spent playing games caused sleep deprivation?	41	5.2	114	14.5	150	19.1	275	34.9	207	26.3
Did you feel bad after playing for a long time?	55	7.0	115	14.6	172	21.9	275	34.9	170	21.6

"How often during the last 6 months?" Players rated all game addiction items on a 5-point continuum scale: 1 (never), 2 (rarely), 3 (sometimes), 4 (often), 5 (very often). The prevalence of addiction for each of the seven domains when using often or very often as a cut-off point. It ranged from 40.5% prevalence for the "salience" domain to 50.2% for the "withdraw" domain.

Table 3 shows the prevalence of VG addiction categories according to some adolescents, parent-related, and VG characteristics. Using often or very often as a cut-off point, 8.3% of all adolescents were considered addicted gamers, 33.4% were problem gamers, and 2.2% were highly engaged. The tendency for VG addiction was significantly more with male gender (X2LT =4.13, $p = 0.04$), above average school performance (X2LT = 13.06, $p < 0.001$), higher father's education (X2LT = 8.06, $p = 0.005$), and favorable parent's perception to VG (X2LT = 7.00, $p = 0.008$). The percentage

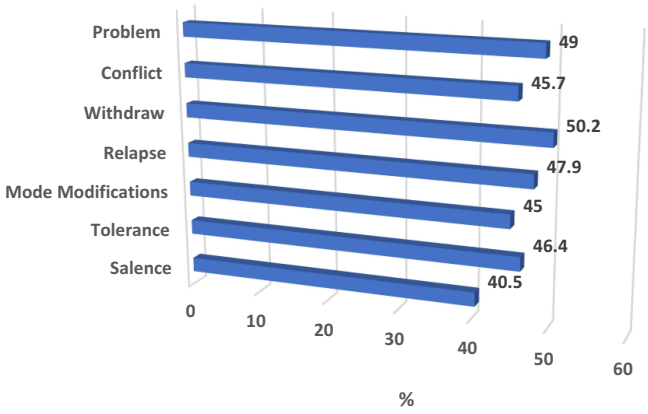

Figure 1 Prevalence of addiction for each of the seven GASA domains.

VG addiction mean score was significantly associated with adolescent high school education (t=2.20, p=0.03), adolescent regular interaction (t=2.70, p=0.007), adolescent normal socialization (t=2.60, p=0.009), regular physical activity (t=2.31, p=0.021), regular praying (t=2.34, p=0.02), VG for 2 hours or less during the day (t=2.13, p=0.034), and favorable parent's perception to VG (t=5.47, p<0.001).

After adjusting for all possible confounders, gaming addiction disorders were significantly predicted with male gender (OR=1.36, p=0.038), higher fathers' education (OR=1.62, p=0.001), and favorable perception of parents to VG (OR=1.51, p=0.007), Table 4.

When the ROC curve was applied (Figure 2), an optimum VG score of 85 was the threshold above which the adolescent was more likely to be an addicted gamer. At this cut-off point, the sensitivity will be 50/65=76.9%, the specificity will be 608/722=84.2%, and the area under the curve will be 88.5%.

Discussion

This study investigated the prevalence and predictors of VG addiction among Saudi adolescents, focusing on various demographic and socio-cultural factors. Our findings align with existing literature, confirming that males,[3,11,14,15,45,56] and those with favorable parental perceptions of gaming are at a higher risk of gaming addiction.[14,45,57,58] Additionally, the association of higher father's education with increased addiction risk highlights a potential cultural shift in attitudes toward gaming as a leisure activity. To our knowledge, no previous study was conducted addressing the role of the parent's educational background, mainly fathers', and its association with VG addiction among adolescents. However, Farchakh et al highlighted a significant association between the father's education and the level of academic attention and cognitive abilities of Lebanese adolescent video gamers.[59] Previous research also suggests that parental attitudes and family dynamics play a significant role in adolescent gaming behavior, including special needs adolescents.[60,61] For instance, according to Hughes et al (2024), VG has been shown to enhance socialization in autistic adolescents, fostering better adolescent-parent relationships.[53]

Our study also reveals that adolescents with above-average school performance were more likely to be problem gamers. This aligns with the findings by Dou and Shek (2021), who highlighted a complex relationship between internet use and academic values.[28] It suggests that for some adolescents, gaming might serve as a coping mechanism to alleviate academic stress. Evidence indicates that online game addiction is linked to reduced motivation for academic achievement.[26–28] This is partly due to decreased learning engagement and increased adolescent sensation-seeking behaviors.[26,27,29] However, our study findings contradict some earlier findings that associated poor academic performance with higher addiction risk.[26–29,62] For instance, Rajab et al indicated that game-addicted Saudi adolescents had lower academic achievements compared to those who were not addicted (38.5% vs 51.2%).[12] Our study contradicts Dou and Shack's (2021) study, which highlighted that internet addiction was a key predictor of decreasing satisfaction with academic performance among Chinese adolescents (b = −0.07, p < 0.001, and Cohen's f2 = 0.004).[28] One possible

Table 3 Prevalence of Videogame Addiction Categories According to Some Adolescents, Parent-Related, and Videogame Characteristics

	Addicted gamers	Problem gamers	Highly engaged	Non-problematic	X^2_{LT}	P-value	PMS±SD	*t*-test	P-value
	No (%)	No (%)	No (%)	No (%)					
Total	65 (8.3)	263 (33.4)	17 (2.2)	442 (56.2)					
A. Adolescents' Characteristics									
Gender								1.72	0.09
Female	37 (7.9)	142 (30.5)	11 (2.4)	276 (59.2)	4.13	0.04*	70.4±16.8		
Male	28 (8.7)	121 (37.7)	6 (1.9)	166 (51.7)			72.4±15.0		
Age								1.32	0.19
≤ 12 Years	33 (8.8)	121 (32.1)	7 (1.9)	216 (57.2)	0.13	0.72	70.4±16.8		
> 12 Years	32 (7.8)	142 (34.6)	10 (2.4)	226 (55.2)			71.9±15.4		
Education								2.20	0.03*
< High School	51 (7.6)	220 (33.2)	15 (2.2)	381 (57.0)	2.45	0.12	70.7±16.3		
High school	14 (11.7)	43 (35.8)	2 (1.7)	61 (50.8)			74.0±14.9		
School performance								2.12	0.03*
Average or below	31 (10.6)	114 (39.1)	7 (2.4)	140 (47.9)	13.06	<0.001*	70.2±17.1		
Above average	34 (6.9)	149 (30.1)	10 (2.0)	302 (61.0)			72.6±14.5		
Adolescent interaction								2.70	0.007*
Irregular interaction	18 (7.9)	74 (32.5)	4 (1.8)	132 (57.8)	0.31	0.58	68.6±18.3		
Regular interaction	47 (8.4)	189 (33.8)	13 (2.3)	310 (55.5)			72.3±15.0		
Socialization								2.60	0.009*
Irregular socialization	29 (8.3)	108 (30.9)	11 (3.2)	201 (57.6)	0.74	0.39	69.5±17.8		
Regular socialization	36 (8.2)	155 (35.4)	6 (1.4)	241 (55.0)			72.6±14.5		
Physical Activity								2.31	0.021*
Irregular	47 (8.8)	177 (33.0)	10 (1.9)	302 (56.3)	0.03	0.87	70.4±17.1		
Regular	18 (7.2)	86 (34.3)	7 (2.8)	140 (55.7)			73.0±13.7		
Praying								2.34	0.02*
Irregular	15 (8.2)	50 (27.4)	3 (1.6)	115 (62.8)	3.24	0.07	68.5±18.8		
Regular	50 (8.3)	213 (35.3)	14 (2.3)	327 (54.1)			72.0±15.2		
B- Parent's Social Characteristics									
Marital Status								0.071	0.94
Couple parent	48 (7.6)	217 (34.4)	13 (2.1)	352 (55.9)	0.00	0.99	71.2±16.0		
Single Parent	17 (10.8)	46 (29.3)	4 (2.5)	90 (57.4)			71.3±16.6		

Father's Education								1.35	0.179
Secondary or less	31 (7.4)	123 (29.4)	9 (2.2)	255 (61.0)	8.06	0.005*	70.5±17.1		
Bachelor/postgraduate	34 (9.2)	140 (37.9)	8 (2.2)	187 (50.7)			72.0±14.8		
Mother's Education								1.63	0.103
Secondary or less	23 (6.3)	120 (32.8)	11 (3.0)	212 (57.9)	2.25	0.13	70.2±16.3		
Bachelor/postgraduate	42 (10.0)	143 (34.0)	6 (1.4)	230 (54.6)			72.1±15.9		
C- Videogame-based Characteristics									
Age at starting the videogame								0.79	0.430
< 9 Years	51 (8.2)	216 (34.7)	12 (1.9)	344 (55.2)	1.03	0.31	71.0±16.5		
≥ 9 Years	14 (8.5)	47 (28.7)	5 (4.0)	98 (59.8)			72.1±14.7		
Duration of playing a videogame								2.13	0.034*
2 hours or less	17 (7.7)	78 (35.5)	7 (3.2)	118 (53.6)	0.33	0.57	73.0±13.2		
More than 2 hours	48 (8.5)	184 (32.5)	10 (1.8)	324 (57.2)			70.5±17.1		
No of children in the family play videogame								0.27	0.79
Only One child	30 (10.6)	90 (31.7)	6 (2.1)	158 (55.6)	0.44	0.52	71.4±15.8		
More than one	35 (7.0)	173 (34.4)	11 (2.2)	284 (56.4)			71.1±16.3		
Parent's permission to play videogame								0.50	0.620
Yes	2 (5.6)	13 (36.0)	1 (2.8)	20 (55.6)	0.01	0.91	71.2±16.2		
No	63 (8.4)	250 (33.3)	16 (2.1)	422 (56.2)			72.5±13.6		
Parent's perception of the positive influence of video gaming								5.47	0.000*
Disagree/strongly disagree	22 (6.4)	104 (30.4)	6 (1.8)	210 (61.4)	7.00*	0.008	67.5±18.9		
Agree/Strongly agree	43 (9.7)	159 (35.7)	11 (2.5)	232 (52.1)			74.0±12.9		

Notes: X^2_{LT}__Chi square for linear trend, *T*-test__Student's *t*-test, PMS__percent mean score of video gaming addiction, *__statistically significant association.

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Table 4 Logistic Regression of the Predictors of Gaming Addiction Disorders Among Adolescents

Predictors of gaming addiction disorders	B	S.E.	p-value	OR	95% C.I.	
					Lower	Upper
Gender [male@ versus female]	0.310	0.150	0.038*	1.364	1.017	1.828
Adolescent education [≥secondary@ versus others]	0.214	0.203	0.292	1.238	0.832	1.843
Adolescent Interaction [yes@ versus no]	−0.009	0.173	0.959	0.991	0.706	1.392
Socialization [Yes@ versus no]	0.052	0.155	0.738	1.053	0.777	1.427
Physical activity [regular@ versus irregular]	−0.101	0.169	0.548	0.904	0.649	1.258
Praying [regular@ versus irregular]	0.318	0.187	0.088	1.375	0.953	1.982
Fathers' education [high@ versus others]	0.485	0.148	0.001*	1.624	1.214	2.173
Duration [≥2hrs/day@ versus others]	0.125	0.171	0.463	1.134	0.811	1.584
Parents' perception of video gaming[favorable@ versus unfavorable]	0.409	0.153	0.007*	1.505	1.116	2.030
Constant	−1.148	0.226	0.000	0.317		

Notes: B__beta coefficient, SE__standard error, CI__confidence interval, *__statistical significance. Gaming addiction disorders include addicted gamers, problem gamers, and highly engaged categories.

explanation is that high-performing students might use gaming as stress relief in our study. However, after adjustment for confounders, the association between gaming addiction and school performance was not significant.

Recent studies have highlighted several negative influences of VG on adolescents, and that include detrimental impacts on physical health, mental health, and social skills. Furthermore, excessive gaming can lead to poorer parent-

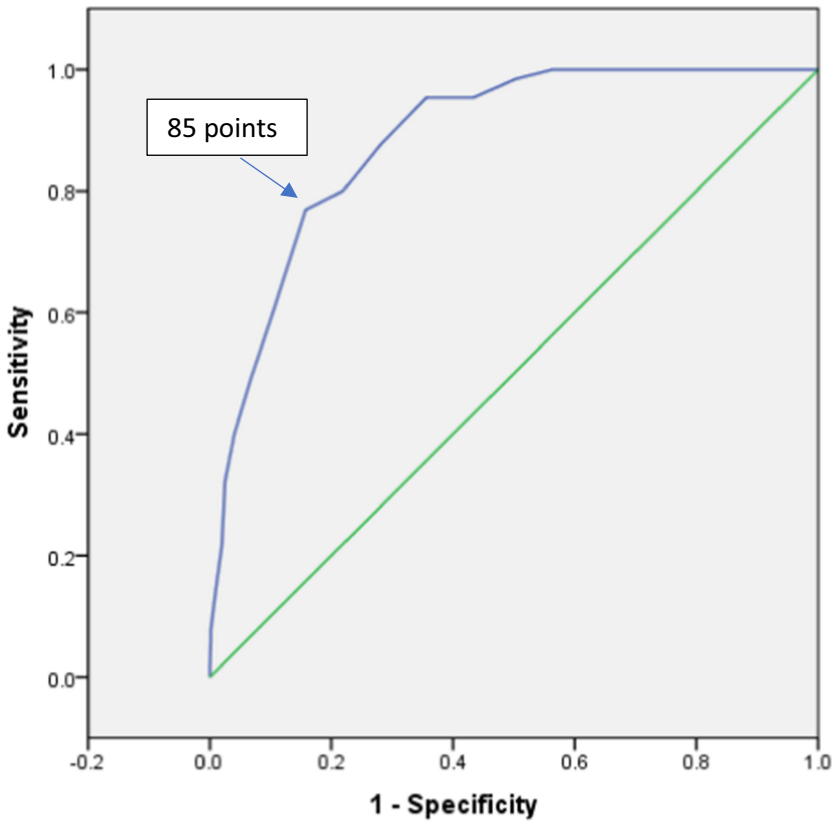

Figure 2 Receiver operating characteristic curve of the cut-off score of addicted gamers on GASA.

adolescent relationships, negatively affecting students' motivation and academic success.[27,30] Excessive internet use, including online gaming, has been associated with physical and mental health issues. These issues include problems with self-consciousness, peer relationships, and increased stress and anxiety levels.[31–33] In our study, the tendency for VG addiction was significantly higher with above-average school performance, adolescent high-school education, regular interaction, normal socialization, regular physical activity, praying, and VG for 2 hours or less during the day.

However, after adjustment, all these associations disappeared. Farchakh et al (2020) highlighted a significant association between the father's education and the level of academic attention and cognitive abilities of Lebanese adolescent video gamers.[59] In Saudi Arabia, several factors could influence gaming addiction and the applicability of Western-based tools like the Gaming Addiction Scale Assessment (GASA). In Western cultures, gaming is often viewed as a mainstream form of entertainment, fostering significant community engagement. Conversely, in Saudi Arabia, where conservative cultural beliefs may influence leisure activities, gaming might be considered a legitimate pastime or a potential source of concern. These differing attitudes can impact how individuals engage with games and perceive gaming addiction.

Our study showed that 8.3% of all adolescents were considered addicted gamers, 33.4% were problem gamers, and 2.2% were highly engaged. This prevalence of 8.3% gaming addiction mirrors global trends that emphasize the escalating engagement of youth with VG.61. This figure agrees with the 9% figure in a previous study on Dutch adolescents.[26] It supports the assertion by the WHO that disordered gaming behavior is a significant concern, warranting its inclusion in the ICD-11. However, our study indicated that VG prevalence is lower than other national studies. For instance, Alrahili et al reported a prevalence of VG addiction among 393 Saudi adolescents reached up to 62.1%.11 Based on Alfaifi et al, the prevalence of 62.1%. VG addiction among Saudi adolescents.[14] Saquib et al reported a prevalence of 16% among 276 students in Buraidah, Al-Qassim.[15] Alhamoud et al reported a prevalence of 21.85% in Dammam.[16] Bumozah et al reported a prevalence of 19%17 among secondary-grade schools in Al-Ahsa. However, Alghadmi and Alghamdi (2023) reported a prevalence rate of VG addiction of 3.5% only among the Saudi adolescents in Al bahah region.[18] Further, Rajab et al found that the prevalence of VG addiction was 5%; however, they correlated to the level of stress among Saudi adolescents who live in Al-Qassim region.[12] These different figures for the prevalence of gaming addiction in various regions of Saudi Arabia could be attributed to different methodologies used in the operational definition of addicted gamers. Thus, the need for a consensus on a single operational definition with a single detection methodology is recommended.

The use of the GASA provides a robust framework for assessing addiction across multiple domains, such as salience, tolerance, and withdrawal. According to Lemmens et al[54,55] Videogame addiction was classified into monothetic and polythetic formats. In the polythetic addiction format, the adolescent should endorse at least half of the criteria to conclude a positive diagnosis of video game addiction. In the monothetic format, which may be easier than the polythetic format as a screening method for game addiction, the total GASA scores are obtained by summing the adolescents' response scores. Total scores range from 21 to 105; a cut-off score is defined above which the adolescent is considered an addicted gamer. A previous study on Dutch adolescents[54] recommends that a score above 90 indicates a possible addiction to VG. It has been noticed that when using the cut-off point of 85 in our study with the Arabic version of GASA, the sensitivity will be 79.6%, the specificity will be 84.2%, and the area under the curve is 88.5%. However, this is not a diagnostic tool but only an indicator that an adolescent might be addicted to VG. Only an in-depth clinical assessment could provide such a diagnosis. Although our findings pertain only to Saudi adolescents, we hope that our scale will contribute to the general measurement of game addiction and provide a better and easier estimate of the prevalence of addicted gamers in other communities.

Strengths and Limitations

Our study could be a pilot study of similar studies in different countries of the region. The study's strength lies in its large sample size of Saudi adolescents. However, this study has some limitations: First, it was conducted on a sample of Saudi adolescents from a particular region (Riyadh), and it's unclear if the results can be extrapolated to the entire Saudi adolescent population or other cultural contexts. This could affect the generalizability of the study's conclusion. Second, it is self-reported; thus, it might be subjected to recall bias. Third, the reliance on convenience sampling via online

platforms like SurveyMonkey could introduce biases. Adolescents with frequent internet access may have been over-represented, leading to skewed results. Fourth, the study is a cross-section design, which does not guarantee the cause-and-effect relationship between the level of VG addiction as an outcome and the predictors, such as adolescents' educational background, school performance, interactions, socialization, physical activities, praying, and duration of playing VG. Future research could explore longitudinal designs to understand better the causal relationships between the identified factors and video game addiction. Some potential confounding factors, such as socioeconomic status, types, and mode of video games, might have influenced the results but were not accounted for in the analysis. Further, lacking consistent tools to measure VG addiction was one of the challenges that led to a lack of comprehensive comparison with the prevalence figures from national or international sources.

Conclusion

This study could be a pilot study for similar studies in other countries of the region. Male adolescents of educated fathers and those with favorable parental perceptions of gaming are at a higher risk of gaming addiction. These findings may redirect the scientific approach toward the positive parental role in VG that fits the global view of e-sporting and VG sports. However, these findings indicate the need for more extensive research and serve to highlight vital next steps needed in future papers, such as identifying predicting factors that could aid in the early detection of video gaming addiction in adolescents. Additional studies are necessary on how cultural differences might influence gaming addiction.

The use of the polythetic addiction format for gaming addiction screening with GASA is recommended, with a cut-off score of 85 to predict addicted gamers. However, further studies are necessary to apply Western-based tools like GASA to Saudi contexts. Modifying Western-based instruments like GASA to better represent regional cultural norms, values, and social dynamics to evaluate and treat gaming addiction in Saudi Arabia could be required. This could entail considering regional viewpoints, implementing community involvement techniques, and gaining a deeper comprehension of the social ramifications of gaming in a particular cultural setting. Further, community-based potential educational programs, parental involvement strategies, or activities to promote alternative hobbies are recommended. Cultural differences play a significant role in shaping behaviors and attitudes toward gaming, including addiction.

Data Sharing Statement

Most of the data supporting our findings is contained within the manuscript, and all others, excluding identifying/confidential patient data, will be shared upon request.

Ethics Approval and Consent to Participate

Participation in this study was voluntary. In electronic informed consent, participants' parents or guardians were assured that their adolescents' responses would remain anonymous. In addition to the consent form, an electronic informed assent form was used to indicate the adolescent's willingness to cooperate in the study. This informed assent form has two parts: (1) an information sheet that gives information about the study and (2) a certificate of assent, which you sign if you agree to participate. Adolescents were asked to respond to the survey if they agreed to the assent. The Institutional Review Board (IRB) of the Ministry of National Guard-Health Affairs (MNG-HA) approved the study, with reference # NRC22R/321/07. This study was conducted following the Declaration of Helsinki.

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Author Contributions

All authors made substantial contributions to the conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agreed to be accountable for all aspects of the work.

Disclosure

The authors declare that they have no competing interests.

References

1. Marchica LA, Mills DJ, Derevensky JL, Montreuil TC. The Role of Emotion Regulation in Video Gaming and Gambling Disorder: a Systematic Review. *Can J Addict*. 2019;10(4):19–29. doi:10.1097/CXA.0000000000000070
2. Halbrook YJ, O'Donnell AT, Msetfi RM. When and How Video Games Can Be Good: a Review of the Positive Effects of Video Games on Well-Being. *Perspect Psychol Sci*. 2019;14(6):1096–1104. doi:10.1177/1745691619863807
3. Quwaider M, Alabed A, Duwairi R. The impact of video games on the players behaviors: a survey. *Procedia Comput Sci*. 2019;151(2018):575–582. doi:10.1016/j.procs.2019.04.077
4. Merino-Campos C, del-Castillo H, Pascual-Gómez I. Enhancing adolescent reasoning skills through a video game program. *Educ Inf Technol*. 2023;28(10):12737–12756. doi:10.1007/s10639-023-11691-y
5. Nguyen A, Bavelier D. Play in video games. *Neurosci Biobehav Rev*. 2023;153(August). doi:10.1016/j.neubiorev.2023.105386
6. Brock T, Johnson MR. Video gaming as craft consumption. *J Consum Cult*. 2021;2005. doi:10.1177/14695405211016085
7. Limone P, Ragni B, Toto GA. The epidemiology and effects of video game addiction: a systematic review and meta-analysis. *Acta Psychol*. 2023;241(June 2022):104047. doi:10.1016/j.actpsy.2023.104047
8. Stevens MW, Dorstyn D, Delfabbro PH, King DL. Global prevalence of gaming disorder: a systematic review and meta-analysis. *Aust N Z J Psychiatry*. 2021;55(6):553–568. doi:10.1177/0004867420962851
9. Rehbein F, Kliem S, Baier D, Mößle T, Petry NM. Prevalence of internet gaming disorder in German adolescents: diagnostic contribution of the nine DSM-5 criteria in a state-wide representative sample. *Addiction*. 2015;110(5):842–851. doi:10.1111/add.12849
10. Colasante E, Pivetta E, Canale N, et al. Problematic gaming risk among European adolescents: a cross-national evaluation of individual and socio-economic factors. *Addiction*. 2022;117(8):2273–2282. doi:10.1111/add.15843
11. Alrahili N, Alreefi M, Alkhonain IM, et al. The Prevalence of Video Game Addiction and Its Relation to Anxiety, Depression, and Attention Deficit Hyperactivity Disorder (ADHD) in Children and Adolescents in Saudi Arabia: a Cross-Sectional Study. *Cureus*. 2023;15(8):1–12. doi:10.7759/cureus.42957
12. Rajab AM, Zaghloul MS, Enabi S, et al. Gaming addiction and perceived stress among Saudi adolescents. *Addict Behav Reports*. 2020:11. doi:10.1016/j.abrep.2020.100261
13. Gallegos C, Connor K, Zuba L. Addressing internet gaming disorder in children and adolescents. *Nursing*. 2021;51(12):34–38. doi:10.1097/01.NURSE.0000800088.75612.0f
14. Alfaifi AJ, Mahmoud SS, Elmahdy MH, Gosadi IM. Prevalence and factors associated with Internet gaming disorder among adolescents in Saudi Arabia: a cross-sectional study. *Med*. 101(26):E29789. doi:10.1097/MD.0000000000029789
15. Saquib N, Saquib J, Wahid AW, et al. Video game addiction and psychological distress among expatriate adolescents in Saudi Arabia. *Addict Behav Reports*. 2017;6(June 2017):112–117. doi:10.1016/j.abrep.2017.09.003
16. Alhamoud AAA, Althunyan AK. Internet gaming disorder: its Dammam, Saudi Arabia. *Orig Artic*. 93–101; doi:10.4103/jfcm.jfcm
17. Bumozah HS, Al-Quwaidhi AJ, AL-Ghadeeb R. Prevalence and Risk Factors of Internet Gaming Disorder Among Female Secondary School Students in Al-Ahsa, Kingdom of Saudi Arabia. *Cureus*. 2023;15(6). doi:10.7759/cureus.40375
18. Alghamdi MH, Alghamdi MM. Prevalence of Internet Gaming Disorder Among Intermediate and High School Students in Al baha, Saudi Arabia: a Cross-Sectional Study. *Cureus*. 2023;15(4):4–9. doi:10.7759/cureus.37115
19. Muriel D, Crawford G. *Video Games as Culture: Considering the Role and Importance of Video Games in Contemporary Society.*; 2018. doi:10.4324/9781315622743
20. Al-Khamees OA Saudi-Arab Emerging Video Game Cultures, Archetypes, Narratives, and Saudi-Arab Emerging Video Game Cultures, Archetypes, Narratives, and User Experiences User Experiences. 2023. Available from: https://ro.uow.edu.au/theses1. Accessed November 7, 2024.
21. Esports S, No F. Discipline Regulation. 2023;1–40.
22. Leber A. Making Moves: reading Saudi Social Change through Commercial Tabletop Games. *Arab Humanit*. 2020;14:1–16. doi:10.4000/cy.6291
23. Alshehri AG, AMAS M. The Relationship Between Electronic Gaming and Health, Social Relationships, and Physical Activity Among Males in Saudi Arabia. *Am J Mens Health*. 2019;13(4). doi:10.1177/1557988319873512
24. Khrad H, Marhoomi AA, Alkhiri A, Al-Shamrani AA, Bajabir D, Mosli M. Prevalence of Internet Gaming Disorder among Saudi Arabian university students: relationship with psychological distress. *Heliyon*. 2022;8(12):e12334. doi:10.1016/j.heliyon.2022.e12334
25. Al Asqah MI, Al Orainey AI, Shukr MA, Al Oraini HM, Al Turki YA. The prevalence of internet gaming disorder among medical students at King Saud University, Riyadh, Saudi Arabia: a cross-sectional study. *Saudi Med J*. 2020;41(12):1359–1363. doi:10.15537/smj.2020.12.05584
26. Kaya A, Türk N, Batmaz H, Griffiths MD. Online Gaming Addiction and Basic Psychological Needs Among Adolescents: the Mediating Roles of Meaning in Life and Responsibility. *Int J Ment Health Addict*. 2023;0123456789. doi:10.1007/s11469-022-00994-9
27. Sun RQ, Sun GF, Ye JH. The effects of online game addiction on reduced academic achievement motivation among Chinese college students: the mediating role of learning engagement. *Front Psychol*. 2023;14(July):1–12. doi:10.3389/fpsyg.2023.1185353
28. Dou D, Shek DTL. Predictive Effect of Internet Addiction and Academic Values on Satisfaction With Academic Performance Among High School Students in Mainland China. *Front Psychol*. 2021;12(December. doi:10.3389/fpsyg.2021.797906
29. Tian Y, Yu C, Lin S, Lu J, Liu Y, Zhang W. Sensation seeking, deviant peer affiliation, and internet gaming addiction among Chinese adolescents: the moderating effect of parental knowledge. *Front Psychol*. 2019;9(JAN):1–7. doi:10.3389/fpsyg.2018.02727
30. Szász-Janocha C, Magann M, Gold H, Lindenbergorcid K, Delfabbroorcid P, King DL. Problem gaming-related harm experienced by partners and parents of individuals with gaming problems and their help-seeking experiences. *J Behav Addict*. 2023;2013. DOI:10.1556/2006.2023.00003
31. Király O, Koncz P, Griffiths MD, Demetrovics Z. Gaming disorder: a summary of its characteristics and aetiology. *Compr Psychiatry*. 2023;122. DOI:10.1016/j.comppsych.2023.152376
32. Putra PY, Fithriyah I, Zahra Z. Internet Addiction and Online Gaming Disorder in Children and Adolescents During COVID-19 Pandemic: a Systematic Review. *Psychiatry Invest*. 2023;20(3):196–204. doi:10.30773/pi.2021.0311

33. Şalvarli SI, Griffiths MD. Şalvarlı-Griffiths2021_Article_InternetGamingDisorderAndItsAs.pdf. *Int J Ment Health Addict*. 2021;19:1420–1442.
34. Kim D, Nam JEK, Keum C. Adolescent Internet gaming addiction and personality characteristics by game genre. *PLoS One*. 2022;17 (2 February):1–14. doi:10.1371/journal.pone.0263645
35. Qu X. An Overview of Online Games and Their Effects on Adolescents. *Open J Soc Sci*. 2023;11(11):310–320. doi:10.4236/jss.2023.1111021
36. Marques LM, Uchida PM, Aguiar FO, Kadri G, Santos RIM, Barbosa SP. Escaping through virtual gaming—what is the association with emotional, social, and mental health? A systematic review. *Front Psychi*. 2023;14(November). doi:10.3389/fpsyt.2023.1257685
37. Wan A, Yang F, Liu S, Feng W. Research on the Influence of Video Games on Children's Growth in the Era of New Media. *BMC anesthe*. 2020;468 (Iccessh):187–190. doi:10.2991/assehr.k.200901.037
38. Xu K, Geng S, Dou D, Liu X. Relations between Video Game Engagement and Social Development in Children: the Mediating Role of Executive Function and Age-Related Moderation. *Behav Sci*. 2023;13(10). doi:10.3390/bs13100833
39. Torres I, Charisi V, De Prato G, et al. *Next Generation Virtual Worlds*.; 2023. doi:10.2760/51579.
40. Noor MH, Omar MA, Md Ramli A, Wong MSC. The Effect of Online Gaming on the Students' Sleeping Pattern: a Case Study in University Malaysia Sabah. *Int J Acad Res Bus Soc Sci*. 2021;11(5):139–155. doi:10.6007/ijarbss/v11-i5/9890
41. Bandyopadhyay A *What Is Sleep Deprivation*?; 2019. Available from: https://www.thoracic.org/patients/patient-resources/resources/sleep-deprivation.pdf. Accessed November 7, 2024.
42. Peracchia S, Curcio G. Exposure to video games: effects on sleep and on post-sleep cognitive abilities. A systematic review of experimental evidences. *Sleep Sci*. 2018;11(4):302–314. doi:10.5935/1984-0063.20180046
43. King DL, Delfabbro PH, Billieux J, Potenza MN. Problematic online gaming and the COVID-19 pandemic. *J Behav Addict*. 2020;9(2):184–186. doi:10.1556/2006.2020.00016
44. WHO. Inclusion of "gaming disorder. *ICD-11 Departmennew*. Available from: https://www.who.int/news/item/14-09-2018-inclusion-of-gaming-disorder-in-icd-11. Accessed November 7, 2024.
45. Othman N, Khedir R, Azeez G, Qadir K. Effect of Video Game on School Achievement in School Age Children in Erbil/City. *Erbil J Nurs Midwifery*. 2022;4(2):86–95. doi:10.15218/ejnm.2021.10
46. Masya H, Setiawan MA, Hamid A, Fajriani I, Dewantari T. An Islamic Perspective on Factors and Behaviors of Adolescent Addiction to Online Gaming. *Proc Raden Intan Int Conf Muslim Soc Soc Sci*. 2020;492(RIICMuSSS 2019):124–128. doi:10.2991/assehr.k.201113.023
47. Billieux J, Flayelle M, Rumpf H-J, Stein DJ. High Involvement Versus Pathological Involvement in Video Games: a Crucial Distinction for Ensuring the Validity and Utility of Gaming Disorder. *Curr Addict Reports*. 2019;6(3):323–330. doi:10.1007/s40429-019-00259-x
48. Lufkin B How online gaming has become a social lifeline. 2020. Available from: https://www.bbc.com/worklife/article/20201215-how-online-gaming-has-become-a-social-lifeline. Accessed November 7, 2024.
49. Ningning W, Wenguang C. The effect of playing e-sports games on young people's desire to engage in physical activity: mediating effects of social presence perception and virtual sports experience. *PLoS One*. 2023;18(7 JULY):1–18. doi:10.1371/journal.pone.0288608
50. Sanford J Video Games for the Win: examining the Net Positive Impact on Emotional, Cognitive, and Social Aspects of Mental Health in Today's Youth. 2023. Available from: https://scholarsarchive.byu.edu/studentpubhttps://scholarsarchive.byu.edu/studentpub/370.
51. Meriläinen M, Hietajärvi L, Aurava R, Stenros J. Games in everyday life: profiles of adolescent digital gaming motives and well-being outcomes. *Telemat Info Repo*. 2023;12(October. doi:10.1016/j.teler.2023.100104
52. Comeras-Chueca C, Marin-Puyalto J, Matute-Llorente A, Vicente-Rodriguez G, Casajus JA, Gonzalez-Aguero A. Effects of active video games on health-related physical fitness and motor competence in children and adolescents with overweight or obesity: systematic review and meta-Analysis. *JMIR Serious Games*. 2021;9(4). doi:10.2196/29981
53. Hughes CN, Nguyen L. Socialization via Online Gaming: perspectives of Five Autistic Adolescents and Their Parents. *J Child Fam Stud*. 2024;33 (3):777–792. doi:10.1007/s10826-023-02727-5
54. Lemmens JS, Valkenburg PM, Peter J. Development and validation of a game addiction scale for adolescents. *Media Psychol*. 2009;12(1):77–95. doi:10.1080/15213260802669458
55. Asaad T, Morsy KE, Hasan H, El Din MH, El Meguid MA. Game Addiction Scale for Adolescents: Arabic Version Validation. *Addict Disord Their Treat*. 2019;18(4):223–228. doi:10.1097/ADT.0000000000000167
56. Özçetin M, Gümüstas F, Çag Y, Gökbay IZ, Gökbay A. The relationships between video game experience and cognitive abilities in adolescents. *Neuropsychiatr Dis Treat*. 2019;15:1171–1180. doi:10.2147/NDT.S206271
57. Kim S, Chun JS. The Impact of Parental and Peer Attachment on Gaming Addiction among Out-of-School Adolescents in South Korea: the Mediating Role of Social Stigma. *Int J Environ Res Public Health*. 2023;20(1). doi:10.3390/ijerph20010072
58. Krossbakken E, Torsheim T, Mentzoni RA, et al. The effectiveness of a parental guide for prevention of problematic video gaming in children: a public health randomized controlled intervention study. *J Behav Addict*. 2018;7(1):52–61. doi:10.1556/2006.6.2017.087
59. Farchakh Y, Haddad C, Sacre H, Obeid S, Salameh P, Hallit S. Video gaming addiction and its association with memory, attention and learning skills in Lebanese children. *Child Adolesc Psychiatr Ment Health*. 2020;14(1):1–11. doi:10.1186/s13034-020-00353-3
60. Zhou J, Zhao H, Wang L, Zhu D. The vicious cycle of family dysfunction and problematic gaming and the mediating role of self-concept clarity among early adolescents: a within-person analysis using random intercept cross-lagged panel modeling. *J Behav Addict*. 2023;12(4):920–937. doi:10.1556/2006.2023.00054
61. Fithria F, Wardani E, Usman S, Maulida R, Darmawati D, Husna C. The Adverse Effect of Gaming Disorder on the Family System in the Society. *Open Access Maced J Med Sci*. 2022;10(E):531–535. doi:10.3889/oamjms.2022.7249
62. Mahmud S, Jobayer MAA, Salma N, Mahmud A, Tamanna T. Online gaming and its effect on academic performance of Bangladeshi university students: a cross-sectional study. *Heal Sci Reports*. 2023;6(12). doi:10.1002/hsr2.1774