

Exploring the Risk Factors Associated with Video Game Addiction among Adolescent School Children in Chennai District, Tamil Nadu, India: A Cross-sectional Study

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ABSTRACT

Introduction: Video game addiction has emerged as a significant concern among adolescent children in recent years. With the widespread availability of technology and the increasing popularity of video games, a substantial number of adolescents are displaying addictive behaviours.

Aim: To estimate the prevalence of video game addiction among adolescent school children in Chennai, Tamilnadu, India and find out the various risk factors associated with it.

Materials and Methods: A cross-sectional study was conducted at the Department of Community Medicine, Chettinad Hospital and Research Institute, Chettinad Academy of Research and Education, Chengalpattu, Chennai, Tamil Nadu, India among 300 school children aged 10-17 years from four private schools in Chennai, Tamil Nadu, India from February 2023 to June 2023. Data collection involved the Gaming Addiction

Scale for Adolescents (GASA) and a pretested semistructured questionnaire. Data analysis was performed using Statistical Package for Social Sciences (SPSS) version 22.0.

Results: The study revealed that approximately 31.7% of the participants had video game addiction. Categorical variables were analysed using the Chi-square test, with a significance level of $p < 0.05$. Bivariate logistic regression was utilised to determine unadjusted odds ratios, and variables with $p < 0.05$ were included in the multivariate model to calculate adjusted odds ratios and construct 95% confidence intervals.

Conclusion: Video game addiction among adolescent school children is a significant issue with multiple associated risk factors. By promoting awareness, encouraging healthy coping mechanisms, and fostering balanced lifestyles, we can effectively address video game addiction and enhance the well-being of adolescent school children.

Keywords: Anger, Sedentary behaviour, Sleep deprivation, Technology addiction

INTRODUCTION

The role of technology in our daily lives has significantly increased in recent years, with video games becoming a popular form of entertainment. The World Health Organisation (WHO) has included "Gaming Disorders (GD)" in the list of mental health conditions in the 11th Revision of the International Classification of Diseases (ICD-11 [1]). According to World Health Organisation (WHO), GD is characterised by impaired control over gaming, giving gaming increasing priority over other activities to the extent that it supersedes other interests and daily activities, and persisting in gaming despite negative consequences [2].

Video game addiction has raised concerns among adolescent school children in recent times. The proliferation of high-tech gaming devices like smartphones, gaming consoles, and tablets, along with the widespread availability of affordable internet access, has made gaming more appealing, addictive, convenient, and cost-effective. Consequently, video game addiction has become a significant worry among adolescent school children, impacting their physical health, mental well-being, academic performance, and social interactions [3].

The impact of video game addiction on adolescents is multifaceted. Excessive gaming can lead to sedentary lifestyles, contributing to physical health issues such as obesity, musculoskeletal problems, and sleep disturbances. Additionally, the immersive nature of video games can negatively affect mental health, increasing stress, anxiety, depression, and overall well-being decline [4]. Academic performance may suffer due to decreased focus, reduced study time, and poor time management skills. Excessive gaming can also disrupt social

interactions, leading to isolation, relationship difficulties, and reduced participation in real-world activities.

Understanding the risk factors associated with video game addiction among adolescent school children is crucial for developing effective preventive measures and intervention strategies. Various personal, environmental, game-related, and socio-cultural factors contribute to the development and maintenance of addictive behaviours. Personal factors may include underlying psychological issues, impulsivity, and poor coping mechanisms. Environmental factors, such as video game accessibility, parental influence, and peer pressure, significantly affect adolescents' gaming behaviours [5].

Game-related factors, such as design features and in-game purchases, can increase the addictive potential of video games. Moreover, socio-cultural factors, including cultural norms, attitudes, and media influence, contribute to the prevalence of video game addiction among adolescents [6]. However, there is a lack of literature on video game addiction and potential risk factors associated with it among adolescent children in India.

MATERIALS AND METHODS

A cross-sectional study was conducted at the Department of Community Medicine, Chettinad Hospital and Research Institute, Chettinad Academy of Research and Education, Chengalpattu, Chennai, Tamil Nadu, India from February 2023 to June 2023 among 300 school children aged 10-17 years from four private schools in Chennai, Tamil Nadu, India. Children studying in middle school, secondary school, and higher secondary school in Chennai were included as study participants. Ethical clearance for the present

study was obtained from the Institutional Human Ethics Committee on Human Subjects (Approval No: 002/SBMC/IHEC/2021/1641).

Inclusion criteria: Children aged 10-17 years studying in grades 6th to 12th were included in the study.

Exclusion criteria: Children under treatment for any known psychiatric illness were excluded.

Sample size calculation: Based on a study by Goswami V and Singh DR, the prevalence of gaming addiction was found to be 24.5% among school children [7]. Using this prevalence value and applying it in the formula Z^2PQ/L^2 , where $Z=1.96$ (95% CI), $P=24.5$, $Q=75.5$, and the absolute precision (L) was set at 5%, the required sample size was calculated as 284 and rounded-off to 300 ($n=300$).

Study Procedure

Out of the 15 zones in Chennai [8], four zones were randomly selected using the lottery method, and one school from each zone was chosen from the school database using the same method. A list of students studying in grades 6th to 12th in the four schools was obtained. Each sample unit meeting the inclusion criteria was selected using simple random sampling until the required sample size of 300 was achieved.

The principals of each school were personally met, and all study details, including the purpose and confidentiality of the study participants, were explained. After obtaining permission from the school authorities, a parent-teacher meeting was organised to explain the study details and objectives to the parents. Written informed consent was obtained from each parent, and written or oral assent was obtained from their children depending on their age.

Data was collected through personal interviews with eligible participants using a pretested semistructured questionnaire. The questionnaire was developed after rigorous pilot testing and included questions related to socio-demographic details, gaming patterns, and various physical, psychological, and social health factors associated with gaming. Data collection from children was done in the presence of their parents, allowing them to seek help if needed.

A pilot study involving 30 children was conducted using the semistructured questionnaire, and based on the responses and feedback received, the questions were modified. The internal validity of the questionnaire was analysed using reliability analysis, with a Cronbach's alpha of 0.82 indicating good consistency in internal validity.

Face validity: Experts in psychiatry, community medicine, and the general population rated the questionnaire on a 5-point Likert scale to evaluate its face validity.

Content validity: Inter-rater reliability was assessed using Kappa statistics, with Cohen's kappa coefficient indicating good agreement between raters.

The questionnaire consisted of two parts: Part 1 focused on the socio-demographic profile and gaming patterns of the participants, while Part 2 included questions related to physical, psychological, and social factors associated with gaming addiction.

To assess the prevalence and degree of gaming addiction among participants, the Gaming Addiction Scale for Adolescents (GASA) developed by Lemmens JS et al., was used [9]. The GASA scale measures seven criteria of gaming addiction: salience, tolerance, mood modification, withdrawal, relapse, conflict, and problems, each rated on a 5-point Likert scale, with a cut-off point at the midpoint. Meeting 4 or more criteria indicated addiction according to the polythetic format.

STATISTICAL ANALYSIS

Collected data were entered using Microsoft excel and analysed using SPSS version 22.0. Categorical variables were expressed in

frequencies and percentages. The significance test for categorical variables was conducted using the Chi-square test, with a p-value < 0.05 considered statistically significant. Bivariate logistic regression was performed to obtain unadjusted odds ratios. Variables with a p-value < 0.05 were included in the multivariate model to calculate adjusted odds ratios. Additionally, a 95% confidence interval was constructed to assess the estimates.

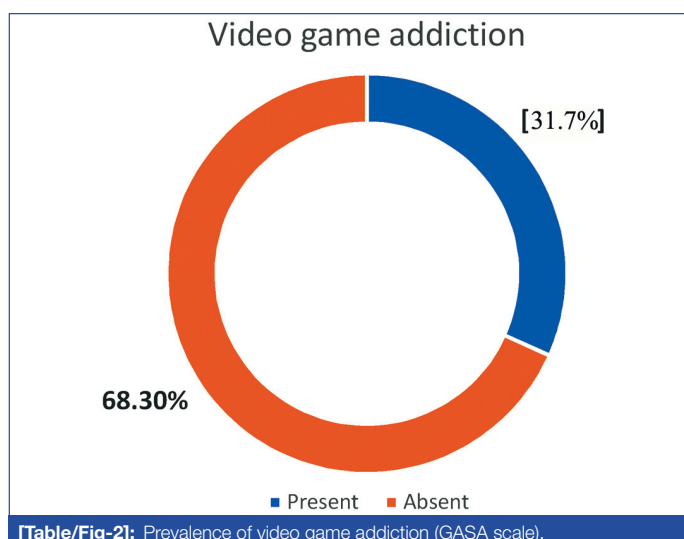
RESULTS

Among the study participants, approximately 168 (56%) were females and 132 (44%) were males. Out of all participants, 162 (54%) were aged above 14 years, while around 138 (46%) were aged below 14 years. Regarding education, 109 (36.3%) participants were in high school, 103 (34.3%) in middle school, and 88 (29.3%) attended higher secondary school. The majority, 242 (80.7%) belonged to nuclear families, and around 248 (82.7%) resided in owned houses. Out of the 300 study participants, 246 (82%) were found to be playing video games [Table/Fig-1].

S. No.	Variables	Frequency (N=300)	Percentage (%)
1.	Gender		
	Male	132	44
	Female	168	56
2.	Age		
	≤14 years	138	46
	>14 years	162	54
3.	Type of family		
	Nuclear	242	80.7
	Joint	58	19.4
4.	Type of housing		
	Owned	248	82.7
	Rented	52	17.3
5.	Level of schooling		
	Middle school	103	34.3
	High school	109	36.3
	Higher secondary	88	29.3
6.	Play video games		
	Yes	246	82
	No	54	18

[Table/Fig-1]: Socio-demographic variables of the study participants.

The prevalence of video game addiction, noting that 31.7% of the 246 (82.7%) participants who played video games were found to have video game addiction based on the GASA scale is presented in [Table/Fig-2].



[Table/Fig-2]: Prevalence of video game addiction (GASA scale).

The association between video game addiction and the gaming patterns of the participants is illustrated in [Table/Fig-3]. Among those with video game addiction, 33.3% played for over four hours daily, showing a statistically significant association ($p < 0.05$) with an odds ratio of 2.5 (95% CI: 1.3-4.6). Additionally, 74.4% of those addicted to video games preferred online gaming, showing a significant association ($p < 0.05$) with an odds ratio of 2.9 (95% CI: 1.6-5.2). Personal Computer (PC) and console gaming were also associated with video game addiction, with odds ratios of 2.57 and 1.833, respectively, showing statistical significance ($p < 0.05$).

S. No.	Variables	Video game addiction		Total (N=246)	Chi-square	Unadjusted odd's ratio (95% CI)	p-value
		Present n (%) n=78 (31.7%)	Absent n (%) n=168 (68.3%)				
1.	Age at which started playing video games?						
	<5 years	10 (12.8%)	16 (9.5%)	26 (10.6%)	1.729	1.687 (0.445-6.395)	0.441
	6-9 years	24 (30.8%)	44 (26.2%)	68 (27.6%)		1.473 (0.536-4.046)	0.453
	10-13 years	24 (30.8%)	54 (32.1%)	78 (31.7%)		1.200 (0.444-3.244)	0.719
14-17 years	20 (25.6%)	54 (32.1%)	74 (30.1%)	1		1	
2.	Average time spent on gaming per day						
	>4 hours	26 (33.3%)	28 (16.7%)	54 (22%)	8.637	2.500 (1.343-4.654)	0.003*
<4 hours	52 (66.7%)	140 (83.3%)	192 (78%)	1			
3.	Preferred mode of gaming						
	Online	58 (74.4%)	84 (50%)	142 (57.7%)	12.952	2.900 (1.605-5.239)	0.001*
Offline	20 (25.6%)	84 (50%)	104 (42.3%)	1			
4.	Gaming with						
	Friends and family	52 (66.7%)	98 (58.3%)	150 (61%)	1.555	1.429 (0.814-2.506)	0.212
Alone	26 (33.3%)	70 (41.7%)	96 (39%)	1			
5.	Gaming platform used#						
	Mobile	70 (89.7%)	156 (92.9%)	226 (91.9%)	0.691	0.673 (0.263-1.720)	0.673
	Consoles	26 (33.3%)	36 (21.4%)	62 (25.2%)	4.005	1.833 (1.008-3.333)	0.045*
	PC	28 (35.9%)	30 (17.9%)	58 (23.6%)	9.621	2.576 (1.402-4.732)	0.002*

[Table/Fig-3]: Association between video game addiction and gaming pattern of the study participants.

* p-value <0.05 -Statistically significant at 95% Confidence Interval; OR: Odd's ratio; χ^2 : Chi-square; #Multiple response

Variables showing a statistically significant association with video game addiction in bivariate analysis were further analysed using binary logistic regression to account for confounders. Gaming for more than four hours per day had an adjusted odds ratio of 2.46 (95% CI: 1.2-4.8), and online gaming had an adjusted odds ratio of 2.75 (95% CI: 1.4-5.2), both showing a significant association with video game addiction ($p < 0.05$) [Table/Fig-4].

Variables	p-value	Adjusted odds ratio	95% CI
Gaming >4 hours per day	0.009*	2.466	1.2-4.8
Online gaming	0.002*	2.750	1.4-5.2
PC gaming	0.237	1.641	0.7-3.7
Console gaming	0.830	0.915	0.4-2.5

[Table/Fig-4]: Binomial logistic regression between video game addiction and gaming pattern.

"Enter method" was used for binomial logistic regression; Dependant variables: video game addiction; All variables with $p < 0.05$ in bivariate analysis were included as independent variables for logistic regression analysis; * Statistically significant at 95% Confidence Interval, OR: Odd's ratio; AOR: Adjusted odd's ratio

The association between video game addiction and various physical, psychological, and social health factors are depicted in [Table/Fig-5]. Notably, 41% of those with video game addiction experienced eye strain, headache, and neck pain, showing a statistically significant association ($p < 0.05$) with an odds ratio of 2.55 (95% CI: 1.4-4.5). Furthermore, individuals with video game addiction were 2.60 times more likely to verbally abuse others while gaming, 5.74 times more likely to suffer from sleep disturbances, and 4.14 times more likely to have decreased physical activity.

Other variables also showed a statistically significant association ($p < 0.05$) with video game addiction, including anger and irritation when interrupted during gaming, reduced interest in other activities, skipping meals to play games, feeling sad and depressed after losing games continuously, restlessness when unable to play games, and skipping school to play games, with odds ratios of 5.12, 4.22, 3.79, 2.65, 6.0, and 7.45, respectively.

Variables with a statistical association with video game addiction were further analysed using regression analysis. Significant

variables included verbally abusing others while gaming with an adjusted odds ratio of 4.89 (95% CI: 1.7-18.5), sleep disturbances due to gaming with an adjusted odds ratio of 6.163 (95% CI: 1.19-19.2), anger and irritation when interrupted during gaming with an adjusted odds ratio of 8.09 (95% CI: 1.8-18.5), physical inactivity due to gaming with an adjusted odds ratio of 4.68 (95% CI: 1.4-15.3), and skipping school to play games with an adjusted odds ratio of 3.786 (95% CI: 2.2-16.8) [Table/Fig-6].

The prevalence of video game addiction was found to be 10.6% among school children [10]. A study by Goswami V and Singh DR in India reported a similar prevalence rate, with around 24.50% of adolescents being addicted to video games [7]. The consistent prevalence rates across these studies indicate a significant proportion of adolescent school children affected by this issue. These rates are notably high, considering the potential consequences of gaming addiction on various aspects of adolescents' lives, including their physical and mental health, academic performance, and social relationships.

DISCUSSION

Video games have been around for a long time and have evolved remarkably with technological advancements. Though video game addiction has been included in the latest ICD-11 classification, it is imperative for authors to understand the adverse effects of playing video games across various age groups, with a focus on adolescents. The present study conducted among adolescent school children revealed interesting findings, which are explained in the discussion below, compared with studies done in India and elsewhere.

S. No.	Variables	Video game addiction		Total (N = 246)	Chi-square	Unadjusted odd's ratio (95% CI)	p-value
		Present n (%) n = 78 (31.7%)	Absent n (%) n = 168 (68.3%)				
1.	Eye strain, headaches, or neck pain due to playing video games.						
	Yes	32 (41%)	36 (21.4%)	68 (27.6%)	10.228	2.551 (1.425 - 4.567)	0.001*
	No	46 (59%)	132 (78.6%)	178 (72.4%)		1	
2.	Verbally abused others while gaming						
	Yes	22 (28.2%)	22 (13.1%)	44 (17.9%)	8.282	2.607 (1.339 - 5.077)	0.004*
	No	56 (71.8%)	146 (86.9%)	202 (82.1%)		1	
3.	Sleep disturbances due to gaming						
	Yes	40 (51.3%)	26 (15.5%)	66 (26.8%)	34.788	5.749 (3.124 - 10.579)	0.001*
	No	38 (48.7%)	142 (84.5%)	180 (73.2%)		1	
4.	Angry and irritated when interrupted during gaming sessions						
	Yes	48 (61.5%)	40 (23.8%)	88 (35.8%)	33.003	5.120 (2.872 - 9.127)	0.001*
	No	30 (38.5%)	128 (76.2%)	158 (64.2%)		1	
5.	Gaming reduced your interest in performing other activities						
	Yes	34 (43.6%)	26 (15.5%)	60 (24.4%)	22.830	4.220 (2.287 - 7.786)	0.006*
	No	44 (26.4%)	142 (84.5%)	186 (75.6%)		1	
6.	Skipped meals to play games						
	Yes	20 (25.6%)	14 (8.3%)	34 (13.8%)	13.397	3.793 (1.798 - 8.004)	0.002*
	No	58 (74.4%)	154 (91.7%)	212 (86.2%)		1	
7.	Physical inactivity due to gaming						
	Yes	30 (38.5%)	22 (13.1%)	52 (21.1%)	20.561	4.148 (2.188 - 7.862)	0.004*
	No	48 (61.5%)	146 (86.9%)	194 (78.9%)		1	
8.	Feeling sad and depressed while continuously losing games						
	Yes	30 (38.5%)	32 (19%)	62 (25.2%)	10.650	2.656 (1.462 - 4.825)	0.001*
	No	48 (61.5%)	136 (81%)	184 (74.8%)		1	
9.	Feeling restless when unable to play video games						
	Yes	18 (23.1%)	8 (4.8%)	26 (10.6%)	18.904	6.000 (2.479 - 14.525)	0.002*
	No	60 (76.9%)	160 (95.2%)	220 (89.4%)		1	
10.	Skipped school to play games						
	Yes	12 (15.4%)	4 (2.4%)	16 (6.5%)	14.812	7.455 (2.320 - 23.848)	0.004*
	No	66 (84.6%)	164 (97.6%)	230 (93.5%)		1	

[Table/Fig-5]: Association between video game addiction and physical, psychological and social health factors.

*p-value <0.05; Statistically significant at 95% Confidence Interval; OR: Odd's ratio; χ^2 : Chi-square

Variables	p-value	Adjusted odds ratio	95% CI
Eye strain, headache, and neck pain due to gaming	0.355	1.551	0.6-3.9
Verbally abused others while gaming	0.002*	4.891	1.7-18.5
Sleep disturbances	0.033*	6.163	1.19-19.2
Anger and irritation when interrupted during gaming	0.005*	8.099	1.87-18.52
Reduced interest to perform other activities,	0.291	0.507	0.1-1.7
Skipped meals to play games	0.037	0.234	0.60-0.91
Physical inactivity due to gaming	0.039*	4.682	1.4-15.3
Sad and depressed while continuously losing games	0.140	0.307	0.6-1.4
Restless when unable to play games	0.883	1.106	0.2-4.2
Skipped school to play games	0.045*	3.786	2.2-16.8

[Table/Fig-6]: Binomial logistic regression analysis between video game addiction and physical, psychological, and social health factors.

"Enter method" was used for binomial logistic regression; Dependent variables: video game addiction; All variables with p<0.05 in bivariate analysis were included as independent variables for logistic regression analysis; * Statistically significant at 95% Confidence Interval; OR: Odd's ratio; AOR: Adjusted odd's ratio

In the present study, the prevalence of video game addiction among adolescent school children was found to be 31.7%. In a study done by Singh YM et al., the prevalence of gaming addiction was

found to be 10.6% among school children [10]. Similar results were found in a study done by Goswami V and Singh DR in India, where around 24.50% of adolescents were addicted to video games [7]. The consistent prevalence rates of gaming addiction across these studies indicate that a substantial proportion of adolescent school children are affected by this issue. These prevalence rates are notably high, especially when considering the potential consequences of gaming addiction on various aspects of adolescents' lives, including their physical and mental health, academic performance, and social relationships.

In the present study, video game addiction was associated with gaming for more than 4 hours a day. In a study done by Marmet S et al., among young adults in Switzerland, it was found that binge gaming for five or more consecutive hours was associated with GD [11]. Similar findings were observed in a study done by Gorman TE et al., which revealed that excessive video gaming, higher impulsivity scores, and lower social competence scores led to gaming addiction among students [12]. Increased gaming time may result in immersion in the game's virtual environment, leading to decreased interest in performing other activities and mental fatigue.

Increased screentime due to excessive gaming also leads to sleep disturbances and poor sleep quality. In a study done by Zaman M et al., in Pakistan, participants with gaming addiction had significantly lower subjective sleep quality, more sleep disturbances, shorter

sleep duration, and more daytime sleepiness than those without gaming addiction [13]. Study done by Lam LT among young people revealed that excessive gaming was linked to sleep problems [14]. Extended gaming sessions can additionally reduce the amount of available sleep time, leading to disruptions in sleep patterns and insomnia. These findings are in concordance with the present study, in which sleep disturbance was associated with gaming addiction among the study participants. In the long run, these factors may have an impact on an individual's mental health. Taking regular breaks when playing games may lessen the harmful effects of gaming and make it easier to maintain a healthy lifestyle. Conversely, neglecting these risk factors can negatively affect one's quality of life and result in impaired functioning.

The present study highlighted that study participants who had video game addiction showed aggressive behaviour when interrupted during gaming sessions and tended to verbally abuse others while gaming. This finding is consistent with research done by Yao M et al., in China, which demonstrated an association between exposure to video games and heightened aggression in individuals [15]. Several other studies have also demonstrated that gaming can lead to the development of aggressive behaviour associated with anger and impulsivity [16-19]. In addition, increased levels of pathological gaming, regardless of the content type, predicted an increase in physical aggression in real life among adolescents [20,21]. Aggressive behaviour during gaming not only affects the individual but can also impact those around them, including family members and online gaming peers. Recognising and addressing this behaviour is crucial to prevent potential harm and strained relationships. Verbal abuse, whether directed at other players in online games or individuals in the immediate environment, has serious consequences for both the abuser and the recipient. It can lead to conflicts, social isolation, and exacerbation of mental health issues [22-24]. Effective interventions are needed to address this behaviour and promote healthier interactions.

In the present study, video game addiction was associated with physical inactivity. In a study done by Güllü M et al., it was found that digital game addiction has a positive relationship with physical inactivity and obesity [25]. This association shows that individuals excessively engaged in video games might be neglecting physical activities and spending extended periods in sedentary behaviours, both of which are well-established risk factors for obesity. It is essential to motivate adolescents to participate in physical activities as a means to decrease their levels of digital game addiction.

The present study revealed that students skipped school to indulge in gaming, and this behaviour was linked to gaming addiction. A study done by Saunders JB et al., among secondary school students in Hong Kong showed that students with gaming addiction experienced mood disorders, refusal to attend school, and engage in school activities, extreme anger and aggression, and various other health consequences [26]. School absenteeism resulting from gaming significantly influences academic performance. Comparable results were identified in research conducted by Brunborg GS et al., and Sun RQ and Ye JH indicating that gaming addiction was linked to decreased academic achievement [27,28]. Adolescence is a crucial phase in a person's life that shapes their personality. The findings from the study highlight the fact that playing video games can lead to anger issues, sleep disturbances, verbal abuse, school absenteeism, and physical inactivity. All these factors can affect their personal and academic life. These findings will help authors provide behavioural change communication to parents regarding the hazards of video game usage among their children.

Limitation(s)

Since video game addiction is a new phenomenon occurring in the rapidly urbanising world, longitudinal studies are needed to better understand the causal association between video game addiction

and the various risk factors. The present study, being cross-sectional in design, has its limitations as only prevalence and associated risk factors could be computed. The incidence of video game addiction could be assessed only by cohort studies. The study was conducted in four private schools; including government schools would have provided a better understanding of video game addiction among children from lower socioeconomic backgrounds.

CONCLUSION(S)

The findings of the study shed light on the fact that 31.7% of adolescent school children had video game addiction. Independent factors such as gaming for four or more hours per day, online gaming, sleep disturbances, verbal abuse, anger and irritation, and school absenteeism were identified as potential risk factors of video game addiction. In addressing video game addiction among adolescents, a multifaceted approach involving schools, healthcare providers, parents, and policymakers is essential. It requires a collective responsibility to safeguard the well-being of the youth and guide them towards a balanced and healthy lifestyle.

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