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Excessive Video-Game Playing and Associated Health-Risk Behaviors among US Youth: Results from the 2019 YRBS

Claudia (Chunyun) Wang[1], Hongtao Li[2]*

1 Pingdingshan University, Pingdingshan, Henan, 467000, P.R. China

2 Smart Whole Health, LLC. Terre Haute, IN 47803 U.S.A

***Corresponding author:**
Hongtao Li

chunyunw@gmail.com

Tel: 8618638336695

School of Physical Education, Pingdingshan University, South Weilai Rd, Pingdingshan City New District, Pingdingshan, Henan Province, 467000, P.R. China

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Abstract

Objective: To examine associations between excessive video-game playing (≥ 3 hours on an average school day not for school work) and a multitude of health-risk behaviors in U.S. adolescents and if the associations vary by age, gender, and race/ethnicities.

Methods: Data from the 2019 Youth Risk Behavior Survey (YRBS) (n=13,677) was analyzed. Associations between video-game playing and health-risk behaviors were examined using logistic regression models controlling for demographic confounders.

Results: Excessive video-game playing was reported by 46.1% of the students. Compared to those who did not report excessively video-game playing, excessive video-game players were more likely to involve in a physical fight (adjusted odds ratio [AOR]: 1.2; 95% CI: 1.1-1.4), be bullied (AOR: 1.7; 95% CI: 1.5-1.9), attempt suicide (AOR: 1.6; 95% CI: 1.4-1.9), use marijuana (AOR: 1.2; 95% CI: 1.1-1.4), drink soda/pop (AOR: 1.5; 95% CI: 1.4-1.7), are not physical active (AOR: 1.5; 95% CI: 1.3-1.7), watch television (AOR: 2.0; 95% CI: 1.7-2.2), and have insufficient sleep (AOR: 1.4; 95% CI: 1.3-1.6), controlling for age, gender, and race/ethnicities.

Conclusion: Excessive video-game playing was associated with many health-risk behaviors among youth in the U.S. Greater awareness of the impact of video-game playing on health is vital. Further studies should explore effective interventions to reduce excessive video-game playing. School nurses are suggested to have knowledge about the aforementioned risk factors and provide assessment, consultation, and education to help reduce Excessive video-game playing.

Keywords: Videogame playing; Health-risk behaviors; Youth

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Introduction

Elevated video-game playing has become a popular activity as well as a significant public health issue in the Western society, especially among youth within the past 10 years. [1-4] for example, Australian teens reported daily average electronic media use of around 5 hours [5]. Another study showed that more than 30% of European youth played computer games for at least 2 hours per weekday [6]. According to a recent report from the Centers for Disease Control (CDC), more than 40% of U.S. adolescents spent more than 3 hours per day on electronic game playing or computer use that is not for school work in 2019, [7] which has drastically exceeded the 2-hour recommended daily maximum [8].

Although the original purpose of video-game playing is just to have fun or relax, many researchers have expressed a variety of opinions on the benefits and detriments of video game playing among adolescents. Some studies conclude that video game playing is associated with positive well-being, such as improving moods, reducing stress, and providing a sense of freedom [9-12], while many others indicate that excessive video-game playing may result in negative health outcomes, including obesity [13], insufficient sleep [14], poor academic performance [15], substance abuse, [16] and psychological distress [7, 17-20].

The association between video-game playing and aggression has also been under much debate among popular media outlets and within the scientific community [21-23]. Some researchers believe that excessive video game playing is an important factor leading to aggressive and violent behaviors among children and adolescents [15, 24-26], Others argue that the effects of video games on aggression is minimal [27]. The mixed findings can be attributed to different amounts of time immersed in play,

the contents of the games (e.g., violent vs. non-violent), video gamers' personality traits, and the link to pre-existing health conditions of video gamers [11, 28].

According to Jessor's conceptual framework about adolescents' risk-taking behaviors, adolescent behaviors (risk and protective behaviors) usually occur together [29]. In addition, the causes and consequences of risk-taking behaviors in adolescents are related rather than separated. Because of the co-occurrence of behaviors among adolescents, there should be associations of excessive video-game playing with a multitude of risk behaviors. However, most previous studies only focused on one or two of the health-risk behaviors, such as aggression or internet addiction. Therefore, they do not provide a comprehensive understanding of the associations between excessive video-game playing and many other health-related risk behaviors. Furthermore, small samples in previous studies may have led to weak effect size. Cultural differences among participants in non-U.S. studies (e.g., Australia, Canada, and European countries) might have limited the generalizations of results for the U.S. population [11, 25, 27, 28, 30, 31].

To better understand the association between video-game playing and co-occurring health-risk behaviors among US adolescents, a large scale study with a nationally representative sample is needed [32]. Thus, the purposes of this study are to examine: 1) the associations between excessive video-game playing and a multitude of health-related risk behaviors, and 2) whether the associations vary by age, gender, or race/ethnicity among U.S. youth using data from the national Youth Risk Behavior Survey (YRBS).

Methods

Study Design and Participants

Data used in this study came from the 2019 national YRBS. YRBS is a biennial, self-reported survey conducted by the CDC since 1991 in order to monitor risk behaviors among US high school students. A 3-stage cluster sample design was used to produce a nationally representative sample of public and private high school students in the United States. The 2019 school response rate was 75.1%, student response rate was 80.3%; and overall response rate was 60.3%.

A weighting factor was applied to each student record to adjust for nonresponse and different probabilities of selection, including those resulting from oversampling of black and Hispanic students. The study population included students (n=13,177) who responded to the video-game playing question (500 with missing data on the question omitted). Survey procedures were designed to ensure anonymity and voluntary participation. Additional detailed information about the 2019 survey could be found from the YRBS reports [33].

Measures

Excessive video-game playing is defined as playing video-games or computer games or using a computer for something that is not for school work for more than three hours per day on an average school day according to the CDC's 2019 YRBS user guide. 33 Students were asked, "On an average school day, how many hours do you play video or computer games or use a computer for something that is not schoolwork? (Include activities such as Nintendo, Game Boy, PlayStation, Xbox, computer games, and the Internet.)." Response options were "Do not play video games," "Less than 1 hour per day," "1 hour per day," "2 hours per day," "3 hours per day," "4 hours per day," "5 or more hours per day." Responses were dichotomized into < 3 hours and ≥ 3 hours (excessive video game playing) [33].

Health Risk Behaviors

Based on previous studies and the availability of the health-risk behaviors measured by the YRBS, the following 13 health-risk behaviors were examined: 1) Did not go to school because felt unsafe at school or on the way to or from school ≥ 1 during the past 30 days, 2) In a physical fight ≥ 1 time during the 12 months before the survey, 3) Being bullied either on school properties or through electronic devices, 4) Felt so sad or hopeless almost every day for 2 weeks or more in a row that they stopped doing some usual activities, 5) Seriously considered attempting suicide during the 12 months before the survey, 6) Smoked cigarettes ≥ 1 (i.e., current cigarette use) during the 30 days before the survey, 7) Had at least one drink of alcohol on ≥ 1 day (i.e., current alcohol use) during the 30 days before the survey, 8) Used marijuana ≥ 1 time (i.e., current marijuana use), 9) Had four or more sexual partners in life, 10) Drank soda or pop (not including diet soda or diet pop) at least one time/day during the 7 days before the survey, 11) Did not participate in at least 60 min of physical activity on ≥ 5 of 7 days before the survey, 12) Watched television ≥ 3 hours per day on an average school day, and 13) Slept less than 8 hours on an average school night. All the behavioral variables were coded dichotomously using cut-points consistent with national guidelines, health objectives, and surveillance categories [8, 34, 35].

Statistical Analysis

Descriptive analyses were performed to describe the weighted percentages and 95% confidence intervals (CI) of characteristics of the study population. The association between each of the 13 health-related risk behaviors with excessive video-game playing was examined using logistic regression, controlling for age, gender, and race/ethnicity. We further tested if the associations vary by demographic characteristics by adding interaction terms (including video-game playing × age, video-game playing × gender, and video-game playing × race/ethnicity) to the logistic regression models above.

Data management and statistical analyses were performed using SAS 9.4 version (SAS Institute Inc., Cary, NC). All analyses and estimates were adjusted for complex sample design using PROC SURVEY procedure in considering its multistage, stratification, and cluster design to represent the US population. Statistical significance of adjusted odd ratios was determined at P = 0.05.

Results

Appropriately half (49.4%, weighted and hereafter) of the total sample (N=13,677) was females. The majority of students were non-Hispanic white (49.6%), and more than 60% of the students

were older than 16 years old. Around 46.1% of students reported that they spent more than 3 hours on playing video or computer games or using a computer for something that is not school work. The prevalence of health-risk behaviors among study participants is indicated in (**Table 1**).

Excessive video-game playing was associated with 9 of 13 health-related risk behaviors examined, indicating that students who reported excessive video-game playing may have higher odds of engaging in the risk behaviors than students who did not. However, no significant associations were found between excessive video-game playing and the involvement in a physical fight, current cigarette use, and current alcohol use (**Table 2**).

The association between excessive video-game playing and health-risk behaviors varied by gender for 1 of the 13 associations.

Table 1. Demographic, video-game playing, and health-risk characteristics of study sample (n=13,677) Youth Risk Behavior Survey, United States, 2019.

Characteristics	%	95% CI
Gender		
Female	49.37	(47.86-50.87)
Male	50.63	(49.13-52.14)
Age (years)		
≤ 16	37.15	(35.53-38.78)
≥ 17	62.85	(61.22-64.47)
Race/ethnicity		
White (non-Hispanic)	49.6	(44.68-54.52)
Black or African American (non-Hispanic)	11.82	(9.72-13.92)
Hispanic	8.89	(6.91-10.87)
Other	29.69	(25.74-33.65)
Video game playing not for school work on a school day		
1	17.65	(16.37-18.94)
< 2	10.36	(9.18-10.93)
3	10.12	(9.35-10.89)
4	15.75	(14.74-16.77)
5	15.41	(14.40-16.41)
6	10.07	(9.32-10.82)
≥ 7	20.64	(18.82-22.46)
Excessive video game playing (≥ 3 h/day)	46.12	(44.37-47.87)
Health-risk behaviors		
Did not go to school ≥ 1day	8.72	(7.45-9.98)
In a physical fight ≥ 1 time	21.86	(20.24-23.48)
Being school and/or cyber bullied	25.03	(23.55-26.50)
Felt sad or hopeless	36.71	(35.13-38.29)
Seriously considered attempting suicide	18.75	(17.55-19.96)
Current cigarette use	5.96	(4.87-7.05)
Current alcohol use	3.11	(2.50-3.72)
Current marijuana use	21.75	(19.84-23.66)
Multiple sexual partners	23.23	(19.66-26.79)
Drank soda or pop ≥ 1 time/day	31.66	(29.64-33.69)
Did not participate in 60 min of physical activity on ≥5 of 7 days	55.9	(53.68-58.11)
Watched television≥ 3 h/day	19.8	(18.30-21.30)
Insufficient sleep (< 8 h on an average school night)	77.9	(76.32-79.47)

CI: Confidence interval

The association of participating in 60 min of physical activity on ≥5 of 7 days with excessive video-game playing was slightly different between girls (AOR=1.4; 95% CI, 1.1-1.6) and boys (AOR=1.7; 95% CI, 1.5-1.9). The associations between excessive video-game playing or internet surfing and health-risk behaviors did not vary by age (i.e., ≤ 16 ys or > 16 ys) and race (i.e., White, Black, Hispanic, and Other).

Discussion

Our results showed that excessive video-game playing was associated with 9 of 13 health-risk behaviors based on the 2019 national YRBS. Only a few of the associations (1 of 13) varied by gender, which indicates that excessive video-game playing is correlated with many health-risk behaviors across all age, gender, and race/ethnicities among youth in the U.S. The findings support Jessor's conceptual frame-work that health-related risk behaviors among adolescents normally occur together 29 and are consistent with many previous studies [3, 14, 15, 18, 36].

The possible explanation is that the excessive time involved in video-game playing may have resulted in more sedentary behaviors, which has replaced the opportunity for active healthy lifestyle activities. Thus, health-risk behaviors, such as having insufficient sleep, drinking soda, using marijuana, or bullying through electronic media occur [37-40].

An unexpected finding is that no statistically significant association between video-game playing and drinking or smoking was found from our study, although some previous studies have suggested that video-game players are more likely to indulge in substance abuse [41, 42]. This may be because video-game playing is much more socially acceptable and easier to access among youth in our modern society compared to smoking cigarettes and drinking alcohol. Therefore, the new era of video-game playing could have replaced old-fashioned substances abuse due to its stronger addictive properties [25,43, 44].

Although this study has the apparent strength of analysis of a nationally representative sample and thus provides useful information on video-game playing and related health-risk factors, it also has limitations. First, the causality between excessive video-game playing and health-risk behaviors cannot be generated due to the cross-sectional study design. Second, the information used in this study is based on self-reporting which may have resulted in response bias, especially if students provided socially desirable answers [45]. Third, the video-game content (e.g., violent vs. non-violent) and types (e.g., active vs. sedentary) were not differentiated in our study, and therefore, the associations might have been underestimated.

Given that video-game playing is becoming an important activity among youth and emerging research has demonstrated its potential positive and negative influences on health and behaviors, further research should move beyond a pure "good-bad" dichotomy and provide a more nuanced understanding about these phenomena. Longitudinal studies or research addressing the contents of the games, video gamers' personality traits, and the directionality of causal relationship (including bidirectional or circular effects) between video-game playing and health-risk behaviors is warranted.

Table 2. Prevalence and adjusted likelihood of selected health-risk behaviors by excessive (or not excessive) video-game playing on an average school day -- Youth Risk Behavior Survey, United States, 2019.

Health-risk behavior		Playing video game			Playing video game			Adjusted	95% CI	P
		< 3 h/day [N=7136]			≥ 3 h/day [N=6108]			OR		
		%		95%CI	%	95%CI				
Did not go to school ≥ 1day	8.26		(6.70-9.81)		9.13		(7.75-10.5)	1.11	(0.91-1.34)	0.29
In a physical fight ≥ 1 time	19.63		(17.59-21.67)		23.69		(21.75-25.63)	1.22	(1.05-1.42)	0.01
Being school and/or cyber bullied	23.13		(21.24-25.02)		27		(25.14-28.86)	1.26	(1.11-1.44)	<0.0001
Felt sad or hopeless	31.94		(29.86-34.02)		42.68		(40.63-44.73)	1.66	(1.47-1.88)	<0.001
Seriously considered attempting suicide	15.58		(14.00-17.16)		22.57		(20.91-24.23)	1.62	(1.39-1.89)	<0.0001
Current cigarette use	6.09		(4.91-7.28)		5.79		(4.31-7.27)	0.96	(0.73-1.25)	0.75
Current alcohol use	3.21		(2.19-4.24)		3.08		(2.10-4.06)	0.92	(0.55-1.55)	0.75
Current marijuana use	20.14		(17.70-22.58)		23.64		(21.56-25.72)	1.23	(1.06-1.44)	<0.01
Multiple sexual partners	8.95		(7.30-10.59)		8.09		(6.96-9.22)	0.92	(0.76-1.12)	0.42
Drank soda or pop ≥ 1 time/day	36.05		(33.70-38.40)		26.54		(24.40-28.68)	1.54	(1.38-1.72)	<0.0001
Did not participate in 60 min of physical	51.57		(48.73-54.41)		60.99		(58.58-63.41)	1.52	(1.34-1.74)	<0.0001
Activity on ≥5 of 7 days										
Watched television≥ 3 h/day	14.95		(13.56-16.35)		25.48		(23.34-27.61)	1.95	(1.73-2.22)	<0.001
Slept < 8 h on an average school night	75.14		(73.00-77.28)		81.15		(79.15-82.80)	1.44	(1.26-1.64)	<0.001

CI: Confidence interval; OR: Odds ratio

Conclusions

More than 40% of the U.S. youth reported excessive video-game playing that is not for school work on an average school day. Our study highlights the significant associations between excessive video-game playing and a multitude of health-risk behaviors across all age, gender, and race/ethnicities among youth in the U.S. Greater awareness of the impact of video-game playing on health is vital. Further studies should also explore effective interventions to reduce excessive video-game playing or internet surfing.

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