

Associations between Electronic Media Use and Involvement in Violence, Alcohol and Drug Use among United States High School Students

Maxine M. Denniston, MSPH*

* Centers for Disease Control and Prevention, Atlanta, GA

Monica H. Swahn, PhD, MPH†

† Georgia State University, Institute of Public Health, Atlanta, GA

Marci Feldman Hertz, MS*

Lisa M. Romero, DrPh*

Supervising Section Editor: Abigail Hankin, MD, MPH

Submission History: Submitted January 21, 2011; Revision received March 1, 2011; Accepted March 3, 2011

Reprints available through open access at http://scholarship.org/uc/uciem_westjem.

Objective: We identified associations between time spent watching television and time spent playing video or computer games or using computers and involvement in interpersonal violence, alcohol and drug use in a nationally representative sample of United States high school students.

Methods: We analyzed data from the 2007 national Youth Risk Behavior Survey. Exposure variables were time spent watching television and time spent playing computer or video games or using computers (hereafter denoted as “computer/video game use”) on an average school day; outcome variables included multiple measures assessing involvement in violence and alcohol or drug use. Chi-square tests were used to identify statistically significant associations between each exposure variable and each of the outcome variables. We used logistic regression to obtain crude odds ratios for outcome variables with a significant chi-square p-value and to obtain adjusted odds ratios controlling for sex, race, and grade in school.

Results: Overall, 35.4% (95% CI=33.1%-37.7%) of students reported frequent television (TV) use and 24.9% (95% CI=22.9%-27.0%) reported frequent computer/video game use. A number of risk behaviors, including involvement in physical fights and initiation of alcohol use before age 13, were significantly associated with frequent TV use or frequent computer/video game use, even after controlling for sex, race/ethnicity and grade.

Conclusion: Findings highlight the need for additional research to better understand the mechanisms by which electronic media exposure and health-risk behaviors are associated and for the development of strategies that seek to understand how the content and context (e.g., watching with peers, having computer in common area) of media use influence risk behaviors among youth. [West J Emerg Med. 2011;12(3):310-315.]

INTRODUCTION

Media use is highly prevalent among young people; eight to 18-year-olds spend an average of 7.4 hours per day using media, including 1.5 hours per day using a computer outside of school work, and 80% of teens have some type of gaming console.¹⁻² The viewing or use of violent or aggressive television (TV) programs or computer and video games is associated with adverse health outcomes including interpersonal violence.³ The link between exposure to

violent media and involvement in violent behavior has been extensively researched across different youth population groups.⁴⁻⁷ Research also links frequent media use and other risk behaviors and outcomes such as obesity, earlier sexual activity, earlier alcohol and drug use, and heavier use of a range of substances.^{8-10,12-17} Most previous studies, however, have focused on a specific health-risk behavior, making it difficult to determine the range of possible health outcomes across studies and populations that may be associated with

Table 1. Percentage of United States high school students who reported violence, alcohol or drug use by time spent watching television and time spent playing video or computer games or using a computer for something that was not school work on an average school day--Youth Risk Behavior Survey, 2007.

Risk Behavior	Watched TV ≥ 3 hours/day			Used Computers ≥ 3 hours/day			Watched TV > 3 hours/day & Used Computers ≥ 3 hours/day		
	Yes (%)	No (%)	χ^2 p-value	Yes (%)	No (%)	χ^2 p-value	Yes (%)	No (%)	χ^2 p-value
Violence-related behaviors									
Carried a weapon ^a	19.5	17.1	ns	21.0	17.0	< .001	23.4	17.1	.002
Carried a gun ^a	6.0	4.5	ns	6.3	4.7	.006	7.6	4.7	< .001
Carried a weapon on school property ^a	6.0	5.6	ns	7.3	5.3	.001	8.2	5.4	.002
In a physical fight ^b	39.0	33.2	< .001	39.4	33.9	< .001	42.8	34.1	< .001
In a physical fight on school property ^b	14.3	11.1	< .001	15.1	11.3	< .001	17.4	11.4	< .001
Experienced dating violence ^c	10.7	9.3	ns	10.7	9.6	ns	11.6	9.5	ns
Ever physically forced to have sexual intercourse ^d	8.2	7.5	ns	8.0	7.6	ns	9.6	7.4	ns
Alcohol Use Behaviors									
Lifetime alcohol use	75.2	75.0	ns	76.2	74.6	ns	75.4	75.0	ns
Drank alcohol before age 13	27.1	22.1	< .001	28.2	22.4	< .001	30.3	22.8	< .001
Current alcohol use ^a	41.4	46.6	.011	44.8	44.8	ns	43.0	45.1	ns
Drank alcohol on school property ^a	4.7	3.8	ns	5.5	3.7	.007	6.9	3.7	.002
Episodic heavy drinking ^e	22.4	28.0	< .001	25.4	26.3	ns	22.7	26.6	.006
Bought alcohol in a store ^f	5.3	4.9	ns	4.7	5.2	ns	4.8	5.1	ns
Other Drug Use Behaviors									
Lifetime marijuana use	38.4	38.0	ns	38.5	37.9	ns	39.9	37.8	ns
Tried marijuana before age 13	9.8	7.4	.003	9.7	7.7	ns	11.5	7.8	.007
Current marijuana use ^a	20.0	19.5	ns	21.5	19.1	ns	23.4	19.2	.005
Used marijuana on school property ^a	5.5	3.9	.001	6.8	3.7	< .001	8.8	3.8	< .001
Lifetime cocaine use	7.1	7.2	ns	7.8	6.9	ns	8.3	7.0	ns
Current cocaine use ^a	3.8	2.9	ns	4.8	2.8	.002	6.0	2.9	.003
Lifetime inhalant use ^g	14.5	12.8	ns	16.5	12.4	< .001	16.8	12.9	.005
Lifetime heroin use	3.0	1.8	.006	3.6	1.8	< .001	5.1	1.8	< .001
Lifetime methamphetamine use	4.6	4.2	ns	5.6	3.9	ns	6.2	4.1	ns
Lifetime ecstasy use	6.1	5.6	ns	7.0	5.4	ns	7.8	5.5	ns
Lifetime hallucinogenic drug use	7.1	8.1	ns	8.2	7.6	ns	9.0	7.6	ns
Lifetime illegal steroid use	4.6	3.5	ns	5.0	3.5	ns	6.6	3.5	.004
Lifetime illegal injection-drug use	2.4	1.7	ns	3.2	1.6	.002	4.2	1.6	.005

ns, not significant;

^a During the 30 days before the survey; ^b During the 12 months before the survey; ^c Hit, slapped, or physically hurt on purpose by their boyfriend or girlfriend during the 12 month before the survey; ^d When they did not want to; ^e Had five or more drinks of alcohol in a row within a couple of hours on at least one day during the 30 days before the survey; ^f Among students who currently drank alcohol during the 30 days before the survey; ^g Sniffed glue, breathed the contents of aerosol spray cans, or inhaled any paints or sprays to get high one or more times in their life.

frequent media use. In response to this limitation, the current study uses the 2007 Youth Risk Behavior Survey (YRBS) to examine specific associations between TV-viewing, video or computer game playing or computer use, and violence, alcohol and other drug use at the population level.

METHODS

The YRBS is a biennial national survey of United States high school students administered by the Centers for Disease Control and Prevention (CDC) to assess priority health-risk behaviors.¹⁸ The 2007 YRBS used a three-stage cluster-

Table 2. Crude (COR) and adjusted odds ratios (AOR) for association between risk behaviors and time spent watching television and time spent playing video or computer games or using a computer among U.S. high school students, Youth Risk Behavior Survey (YRBS), 2007

Risk Behavior	Time Spent Watching Television on an Average School Day							
	Simple Logistic Regression Results					Multivariate Logistic Regression Results		
	Watched Television \geq 3 hours/day					Watched Television \geq 3 hours/day		
	Yes (%)	No (%)	COR	95% CI	p-value	AOR	95% CI	p-value
In a physical fight ^b	39.0	33.2	1.28	1.16, 1.42	< .001	ns	ns	ns
In a physical fight on school property ^b	14.3	11.1	1.34	1.16, 1.55	< .001	ns	ns	ns
Drank alcohol before age 13	27.1	22.1	1.31	1.14, 1.50	< .001	1.18	1.03, 1.35	.017
Current alcohol use ^a	41.4	46.6	0.81	0.70, 0.95	.009	ns	ns	ns
Episodic heavy drinking ^c	22.4	28.0	0.74	0.66, 0.84	< .001	ns	ns	ns
Tried marijuana before age 13	9.8	7.4	1.37	1.11, 1.69	.004	1.23	1.01, 1.52	ns
Used marijuana on school property ^a	5.5	3.9	1.43	1.15, 1.78	.002	1.36	1.11, 1.66	.004
Lifetime heroin use	3.0	1.8	1.66	1.20, 2.30	.003	1.62	1.12, 2.34	.012
	Time Spent Playing Video or Computer Games or Using a Computer							
	Used Computers \geq 3 hrs/day					Used Computers \geq 3 hrs/day		
	Yes (%)	No (%)	COR	95% CI	p-value	AOR	95% CI	p-value
Carried a weapon ^a	21.0	17.0	1.30	1.14, 1.48	< .001	ns	ns	ns
Carried a gun ^a	6.3	4.7	1.36	1.11, 1.66	.003	ns	ns	ns
Carried a weapon on school property ^a	7.3	5.3	1.40	1.17, 1.68	< .001	ns	ns	ns
In a physical fight ^b	39.4	33.9	1.27	1.14, 1.41	< .001	ns	ns	ns
In a physical fight on school property ^b	15.1	11.3	1.40	1.18, 1.65	< .001	1.24	1.04, 1.47	.017
Drank alcohol before age 13	28.2	22.4	1.36	1.18, 1.56	< .001	1.26	1.11, 1.44	.001
Drank alcohol on school property ^a	5.5	3.7	1.52	1.15, 2.00	.004	1.44	1.09, 1.91	.012
Used marijuana on school property ^a	6.8	3.7	1.89	1.51, 2.36	< .001	1.79	1.43, 2.23	< .001
Current cocaine use ^a	4.8	2.8	1.79	1.33, 2.41	< .001	1.78	1.32, 2.40	< .001
Lifetime inhalant use ^d	16.5	12.4	1.40	1.22, 1.60	< .001	1.42	1.24, 1.63	< .001
Lifetime heroin use	3.6	1.8	2.00	1.45, 2.76	< .001	1.83	1.26, 2.66	.002
Lifetime illegal injection-drug use	3.2	1.6	2.08	1.27, 3.39	.004	1.90	1.16, 3.10	.012

ns, not significant;

^a During the 30 days before the survey.; ^b During the 12 months before the survey.; ^c Hit, slapped, or physically hurt on purpose by their boyfriend or girlfriend during the 12 month before the survey.; ^d Sniffed glue, breathed the contents of aerosol spray cans, or inhaled any paints or sprays to get high one or more times in their life.

sample design to obtain a representative sample of students in grades nine through 12 who attended public and private schools in the 50 states and the District of Columbia. We obtained parental permission following local procedures and participation was voluntary. Students anonymously completed the self-administered questionnaire during a regular class period. An institutional review board at the CDC has approved the national YRBS.

Measures

Exposure variables were time spent watching TV and playing computer or video games or using computers (hereafter denoted as “computer/video game use”) on an average school day. We assessed time spent watching TV with the question “On an average school day, how many hours do you watch TV?” Time spent using computers/video games

was assessed with the question “On an average school day, how many hours do you play video or computer games or use a computer for something that is not school work? (Include activities such as Nintendo, Game Boy, PlayStation, Xbox, computer games and the Internet.)” Outcome variables were 26 risk behaviors related to violence and alcohol and other drug use. Exact wording of the questions can be found in Section 6 of the 2007 Data User’s Manual (<http://www.cdc.gov/HealthyYouth/yrbs/data/history.htm>).

Statistical Analysis

We dichotomized responses to exposure variables to less than three hours/day and greater than or equal to three hours/day to reflect frequent TV use and frequent computer/video game use. We selected this cut-off based on the American Academy of Pediatrics recommendation to “Limit children’s

total media time (with entertainment media) to no more than one to two hours of quality programming per day” (<http://aappolicy.aappublications.org/cgi/reprint/pediatrics;107/2/423.pdf>). Responses to outcome variables were dichotomized to reflect any report of the risk behavior.

Analyses performed in SUDAAN accounted for stratification of counties by racial concentration and urban/rural status, and clustering of schools within counties at the first stage of sampling, and for unequal probabilities of selection.¹⁹ We used chi-square tests to identify statistically significant associations between the exposure variables and each outcome variable. Logistic regression was used to obtain crude odds ratios for outcome variables with a significant chi-square p-value and adjusted odds ratios controlling for sex, race, and grade in school. Because we performed a number of statistical tests, results were considered significant when $p < 0.02$.

We also used logistic regression models to determine the contribution of both TV and computer/video game use for any significant outcome associated with either form of media use. Finally, a model was used to determine whether the association between computer/video game use and fighting at school was independent of alcohol and other drug behaviors.

RESULTS

The school response rate was 81%, the student response rate was 84%, and the overall response rate was 68%. The final analysis data set included 14,041 students from 157 schools.

Overall, 35.4% (95% CI=33.1%-37.7%) of students reported frequent TV use and 24.9% (95% CI=22.9%-27.0%) reported frequent computer/video game use. Moreover, 12.8% (95% CI=11.6%-14.2%) reported frequent TV and computer/video game use. Those who reported frequent TV use and those who reported frequent TV and computer/video game use were significantly younger and more likely to be male, black non-Hispanic or Hispanic, and in ninth or tenth grade than those who did not. Students who reported frequent computer/video game use were significantly younger and more likely to be male, of race other than White non-Hispanic, and in ninth or tenth grade than those who did not.

The prevalence of risk behaviors by TV and computer/video game use is shown in Table 1. The prevalence differed significantly for eight risk behaviors by TV use and for 12 risk behaviors by computer/video game use. For all but two of these – current alcohol drinking and episodic heavy drinking – risk-behavior prevalence was higher among those who reported frequent TV use or frequent computer/video game use than among those who did not. The prevalence for 16 risk behaviors was significantly higher among those who reported both frequent TV and computer/video game use than among those who did not.

We show crude odds ratios for risk behaviors with a significant chi-square p-value by TV use, and the adjusted

odds ratios controlling for sex, race/ethnicity, and grade in Table 2. Three risk behaviors were still significantly associated with frequent TV use after controlling for sex, race/ethnicity and grade, including initiation of alcohol use before age 13. Crude odds ratios for risk behaviors with a significant chi-square p-value by computer/video game use, and the adjusted odds ratios controlling for sex, race/ethnicity, and grade are also shown in Table 2. Eight risk behaviors were still significantly associated with frequent computer/video game use after controlling for sex, race/ethnicity and grade, including initiation of alcohol use before age 13.

The same risk behaviors associated separately with frequent TV or computer/video game use also were associated with reporting both frequent TV and computer/video game use. In addition, involvement in a physical fight, carrying a weapon on school property, current marijuana use and lifetime illegal steroid use were significantly associated with reporting frequent TV and computer/video game use after controlling for sex, race/ethnicity and grade (data not shown).

When we added computer/video game use to the models for each of the three risk behaviors associated with TV use, computer/video game use was significantly associated with each behavior while TV use was no longer independently associated. Similarly, when TV use was added to the model for each of the eight risk behaviors associated with computer/video game use, TV use was not found to be significantly associated with any of the behaviors while computer/video game use remained significantly associated with each risk behavior. When the seven alcohol and drug use risk behaviors significantly associated with computer/video game use were added separately to the model for fighting at school that already included computer/video game use, each of the seven risk behaviors was significantly associated with fighting at school while computer/video use was no longer independently associated (data not shown).

DISCUSSION

Frequent TV use, frequent computer/video game use and frequent use of both TV and computers/video games were significantly associated with several of the risk behaviors examined. Of particular interest are the associations between video and computer use and involvement in physical fights, which is a topic extensively researched previously.⁴⁻⁷ These associations have generated a long-standing debate about the content and ratings of video and computer games and the ages for which some games may be appropriately introduced and used by youth. Additionally, our findings support earlier research by demonstrating that initiation of alcohol before age 13 is associated with TV-viewing as well as media and computer use. These findings are very important since early initiation of alcohol has significant short- and long-term health implications.²⁰⁻³⁰ Taken as a whole, these findings confirm, with a nationally representative sample, what other researchers have found in smaller studies and with specific populations,

and provide a more comprehensive epidemiologic description of these associations.⁴⁻⁷

Several limitations to this study should be considered when interpreting the findings. First, the YRBS data do not contain detailed information on the exposure or outcome variables, such as which TV programs were watched or the content or ratings of any computer or video games played. Second, the survey is cross-sectional and cannot be used to infer causality. Third, the findings pertain to students attending school and may not generalize to those who are not in school. Finally, these analyses examined the basic associations between different forms of electronic media and risk behaviors and did not assess the influence of other possible confounders.

The high prevalence of media use among high school students and the association between high media use and health-risk behaviors emphasizes the need for parents, schools and healthcare providers to monitor youth screen time. The American Academy of Pediatrics, for example, has reported that office counseling is effective and suggests that pediatricians and other healthcare providers ask about the number of hours per day a child or adolescent is watching in order to advocate for safer media environments for children (<http://aappolicy.aappublications.org/cgi/content/abstract/pediatrics;124/5/1495>). Similarly, the American Psychological Association has suggested that parental involvement and monitoring is part of the solution and also introduced policy-related legislation in 2010 (the Healthy Media for Youth Act) to increase research in the area of media use and to emphasize the need for new strategies to reduce inappropriate media use (<http://www.apa.org/about/gr/issues/women/healthy-media-week.aspx>). While the field of youth media use is getting increased attention, our findings provide empirical evidence that even brief and broad measures of frequent TV and computer/video game use are associated with health-risk behaviors, especially involvement in physical fights and early initiation of alcohol use. The findings highlight the need for research on media exposure and health-risk behaviors as well as measures that seek to understand how the content and context (e.g., watching with peers, having computer in common area) of media use influence risk behaviors among youth.

Address for Correspondence: Maxine M. Denniston Centers for Disease Control and Prevention 1600 Clifton Road NE, MailStop G-37 Atlanta, GA 30333 E-mail: mmd1@cdc.gov

Conflicts of Interest: By the WestJEM article submission agreement, all authors are required to disclose all affiliations, funding sources, and financial or management relationships that could be perceived as potential sources of bias. The authors disclosed none.

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

REFERENCES

1. Rideout VJ, Foehr UG, Roberts DF. GENERATION M2 Media in the Lives of 8- to 18-Year-Olds. January 2010. Available at: <http://www.kff.org/entmedia/upload/8010.pdf>.
2. Lenhart A, Purcell K, Smith A, et al. Social media and mobile internet use among teens and young adults. 2010. Pew Internet and American Life Project. <http://www.pewinternet.org/Reports/2010/Social-Media-and-Young-Adults.aspx>
3. Bushman BJ, Huesmann R. Short-term and long-term effects of violent media on aggression in children and adults. *Arch Pediatr Adolesc Med.* 2006; 160:348-52
4. Boxer P, Huesmann LR, Bushman BJ, et al. The role of violent media preference in cumulative developmental risk for violence and general aggression. *J Youth Adolesc.* 2009; 38:417-28.
5. Ybarra ML, Diener-West M, Markow D, et al. Linkages between internet and other media violence with seriously violent behavior by youth. *Pediatrics.* 2008; 122:929-37.
6. Gentile DA, Lynch PJ, Linder JR, et al. The effects of violent video game habits on adolescent hostility, aggressive behaviors, and school performance. *J Adolesc.* 2004; 27:5-22.
7. Roberts DF, Christenson PG, Gentile DA. The effects of violent music on children and adolescents. In: Gentile DA. *Media violence and children: a complete guide for parents and professionals*. Westport, CT: Greenwood Publishing Group, 2003.
8. Barnett TA, O'Loughlin J, Sabiston CM, et al. Teens and screens: the influence of screen time on adiposity in adolescents. *Am J Epidemiol.* 2010; 172:255-62.
9. Laurson KR, Eisenmann JC, Welk GJ, et al. Combined influence of physical activity and screen time recommendations on childhood overweight. *J Pediatr.* 2008; 153:209-14.
10. Shields M. Overweight and obesity among children and youth. *Health Rep.* 2006; 17(3):27-42.
11. Villani S. Impact of media on children and adolescents: a 10-year review of the research. *J Am Acad Child Adolesc Psych.* 2001; 40(4):392-401.
12. Anderson P, de Bruijn A, Angus K, et al. Impact of alcohol advertising and media exposure on adolescent alcohol use: a systematic review of longitudinal studies. *Alcohol Alcohol.* 2009; 44:229-43.
13. Hanewinkel R, Sargent JD. Longitudinal study of exposure to entertainment media and alcohol use among German adolescents. *Pediatrics.* 2009; 123:989-95.
14. Jackson C, Brown JD, L'Engle KL. R-rated movies, bedroom televisions, and initiation of smoking by white and black adolescents. *Arch Pediatr Adolesc Med.* 2007; 161:260-68.

15. Gutschoven K, Van den Bulck J. Television viewing and age at smoking initiation: does a relationship exist between higher levels of television viewing and earlier onset of smoking? *Nicotine Tob Res.* 2005; 7:381-5.
16. Gidwani PP, Sobol A, DeJong W, et al. Television viewing and initiation of smoking among youth. *Pediatrics.* 2007; 110:505-8.
17. Robinson TN, Chen HL, Killen JD. Television and music video exposure and risk of adolescent alcohol use. *Pediatrics.* 1998; 102:E54.
18. Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance – United States, 2007. Surveillance Summaries, June 6, 2008. *MMWR.* 2008; 57(No. SS-4).
19. Research Triangle Institute. *SUDAAN Language Manual, Release 9.0.* Research Triangle Park, NC: Research Triangle Institute, 2004.
20. Hingson RW, Heeren T, Winter MR. Age at drinking onset and alcohol dependence: age at onset, duration, and severity. *Arch Pediatr Adolesc Med.* 2006;160:739–46.
21. Ellickson PL, Tucker JS, Klein DJ. Ten-year prospective study of public health problems associated with early drinking. *Pediatrics.* 2003;111:949–55.
22. Hingson RW, Heeren T, Jamanka A, et al. Age of drinking onset and unintentional injury involvement after drinking. *JAMA.* 2000; 284, 1527–33.
23. Hingson R, Heeren T, Zakocs R, et al. Age of first intoxication, heavy drinking, driving after drinking and risk of unintentional injury among U.S. college students. *J Stud Alcohol.* 2003;64:23–31.
24. Hingson R, Heeren T, Winter MR, et al. Early age of first drunkenness as a factor in college students' unplanned and unprotected sex attributable to drinking. *Pediatrics.* 2003;111:34–41.
25. Cho H, Hallfors DD, Iritani BJ. Early initiation of substance use and subsequent risk factors related to suicide among urban high school students. *Addict Behav.* 2007;32(8): 1628–39.
26. Swahn MH, Bossarte RM, Sullivent EE. Age of alcohol use initiation, suicidal behavior, and peer and dating violence victimization and perpetration among high-risk seventh-grade adolescents. *Pediatrics.* 2008;121(2):297–305.
27. Swahn MH, Bossarte RM. Gender, early alcohol use, and suicide ideation and attempts: Findings from the 2005 Youth Risk Behavior Survey. *J Adolesc Health.* 2007;41(2):175–81.
28. Swahn MH, Bossarte RM, Ashby J, et al. Early alcohol use and suicide attempts among middle and high school students: Findings from the 2006 Georgia Student Health Survey. *Addict Behav.* 2010;35(5):452-8.
29. Hingson R, Heeren T, Zakocs R. Age of drinking onset and involvement in physical fights after drinking. *Pediatrics.* 2001;108:872–77.
30. Bonnie RJ, O'Connell ME. *Reducing Underage Drinking: A Collective Responsibility.* 2004. Washington, DC: National Academies Press.