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Sex Differences in the Association Between Gaming and Serious Violence Among Predominantly African American Youth

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Abstract

Video gaming, a remarkably popular hobby in the United States, has been consistently identified as a correlate of aggressive behavior, and this association is not limited to violent video gaming. Prior studies of sex differences in the association between video gaming and aggression have not controlled for other well-known violence correlates (e.g., substance use, community violence exposure, violence attitudes) or focused primarily on high-risk youth. In this study, we used data from an emergency department in Flint, Michigan (N = 409, 59.9% female, 93.4% African American) to identify sex differences in the association between video gaming and serious peer violence. Youth aged 14 to 20 years were recruited from October 2011 to March 2015, and self-administered computerized surveys including measures of demographics, violence perpetration, gaming frequency, substance use, community violence exposure, and violence attitudes. The primary outcome was an indicator of any serious violence perpetration (e.g., choking, burning, weapon violence) in the past 2 months. Using logistic regression, we estimated the association between gaming and serious violence perpetration, and how it varied by sex, while controlling for demographics, substance use, community violence exposure, and violence attitudes. Approximately 36.6% of males and 27.3% of females reported past 2-month serious violence. On adjusted analysis, hours spent gaming was associated with violence among females (odds ratio

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[OR] = 1.40, 95% confidence interval [CI] = [1.16, 1.78]), but not males (OR = 1.03, 95% CI = [0.89, 1.19]); in the model including both males and females, the interaction between hours gaming and sex was significant ($p < .01$). Our findings suggest video gaming is a stronger marker of severe violence perpetration in females than males among at-risk youth. Violence interventions among females may be improved by including content related to video gaming and identifying other prosocial activities for youth as an alternative to video gaming. Additional research is required to clarify the causal process underlying the identified associations, and to determine what aspects of video gaming are risk-enhancing.

Keywords

youth violence; video gaming; alcohol; drugs

Introduction

Video gaming is a regular activity in 63% of U.S. households (Entertainment Software Association, 2016) and was identified by the Institute of Medicine as a violence prevention priority (National Research Council, 2013). The association between video game use and aggression is multifaceted. Specifically, empirical research suggests a clear and reproducible association between violent video gaming and aggression (Anderson et al., 2010). This association is often conceptualized as arising through violence desensitization (Carnagey, Anderson, & Bushman, 2007), attitudinal shifts in favor of violent behavior (Simpson Beck, Boys, Rose, & Beck, 2012), or aggressive individuals choosing violent video games (Slater, Henry, Swaim, & Anderson, 2003). Other evidence indicates that excessive gaming frequency, not specific to violent games only, is linked to increased aggression (Kim, Namkoong, Ku, & Kim, 2008; Lemmens, Valkenburg, & Peter, 2011), suggesting that the association between video gaming and aggression may also arise from the clustering of nonnormative behaviors. Individual-level cognitive and emotional traits are theorized to modify susceptibility to media effects on violence (Valkenburg & Peter, 2013), and some empirical evidence supports that supposition; for example, there is a higher association between video game violence exposure and aggression among individuals with higher levels of trait aggression (Ferguson et al., 2008). In the current study, we focus on the moderating role of sex on the relationship between video gaming frequency and severe aggression.

Existing literature on sex differences in the association between gaming and aggression has produced mixed results. Some researchers have found that violent video gaming is more strongly associated with aggressive behavior among males (Anderson & Dill, 2000; Bartholow & Anderson, 2002). Others found that problematic gaming, defined in terms of addictive characteristics of game use, is more strongly associated with aggression—and other negative health factors—in females, concluding that gaming was more normative among males (Desai, Krishnan-Sarin, Cavallo, & Potenza, 2010). A meta-analysis of the aggression and video game violence exposure concluded that there was no evidence of moderation by gender (Anderson et al., 2010), but the authors noted trends of a larger association among females in experimental and longitudinal studies, and a larger association among males in cross-sectional studies, further underscoring the inconsistent results.

There are two primary gaps in the current literature on sex differences in the association between gaming and aggression that we seek to address. First, there are several known risk factors for violence among youth, such as substance use (Goldstick et al., 2015; Nordfjaem, 2017), community violence exposure (Goldstick et al., 2017), and violence attitudes (Carter et al., 2015); yet, none of the aforementioned studies control for those factors when estimating sex differences in the gaming/aggression association. Different distributions of those factors among the different study populations may explain the inconsistent results observed. Second, we know of no literature on sex differences in the gaming/violence relationship that focuses on predominantly African American populations and/or populations at high risk for violence. Given that homicide is the leading cause of death among African American youth (Centers for Disease Control and Prevention, 2015), this is a notable literature gap.

In this study, we used data from an urban emergency department (ED) to study sex differences in the association between video gaming frequency and severe peer violence among youth aged 14 to 20 years, controlling for violence risk factors including substance use, community violence exposure, and violence attitudes. By using an ED-based sample, we were able to recruit youth from an underresourced community (Pines et al., 2011), many of whom did not attend school, and are thus harder-to-reach. In this way, we were able to study a high-risk, and predominantly African American, sample. We also explored whether our results were specific to a given video game genre preference (violent vs. nonviolent genres).

Methods

Study Protocol

We examined baseline (i.e., pre-intervention or, in the case of controls, prior to receiving the control condition) measurements from a community-based youth violence prevention study. Participants (ages 14–20) were recruited at a Level 1 ED in Flint, Michigan, between October 2011 and March 2015, 2:30–10:00 p.m. daily, with occasional midday shifts (8:30 a.m.–4:00 p.m.; 11:30 a.m.–7:00 p.m.). Eligibility was based on residence in one of two Flint neighborhoods. Exclusion criteria included presentation for sexual assault, suicidal ideation/attempt, and medical/cognitive conditions precluding consent. Individuals below age 18 required parental consent (with youth assent) to participate. Consenting participants self-administered computerized questionnaires (~25 min), receiving US$20 compensation. Individuals were assessed at baseline and at 2 months post intervention. Greater details on the study design can be found in a prior paper describing the study outcomes (Carter et al., 2016). Protocols were approved by institutional review boards (IRBs) at the University of Michigan and Hurley Medical Center.

Measurements

The outcome was severe non-partner physical violence perpetration over the past 2 months, and was assessed using the modified Conflict Tactics Scale (CTS; Straus, Hamby, Boney-McCoy, & Sugarman, 1996). Violence was considered severe if it included behaviors listed on the severe end of the CTS, which included hitting with something that could hurt,

choking, slamming against the wall, beating up, burning, kicking, and weapon violence. Individuals were coded "Yes" for the outcome if they reported any of the aforementioned violent behaviors.

Explanatory variables included validated measures of alcohol use severity, cannabis use frequency, proviolence attitudes, community violence exposure, sociodemographic characteristics (age, sex, public assistance, race, parental cohabitation), and reason for ED visit (violent vs. nonviolent injury). Alcohol use was measured using the Alcohol Use Disorders Identification Test–Consumption (AUDIT-C) summary score (range: 0–12; Chung et al., 2000), and cannabis use frequency was measured by the NIDA-Modified Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST) frequency question (range: 0–6; Humeniuk et al., 2008). Each was modified to assess the same past 2-month window used for violence perpetration. Proviolence attitudes (range: 0–5) were measured using the average of four 5-point items from the Youth Empowerment Survey (Caldwell, Rafferty, Reischl, De Loney, & Brooks, 2010), and community violence exposure (range: 0–4) was measured by the average of five 4-point items from the Things I Have Seen and Heard survey (Richters & Saltzman, 1990). For additional measurement details, see Carter et al. (2016).

The primary predictor of interest is video gaming frequency, measured as hours per day, rounded up, and capped at 10. While this measure is limited in its ability to ascertain both violent video gaming frequency, we did also measure individuals' preferred video game genre. Specifically, youth reporting >0 hours per day of video game use were asked "What type of video games do you play the most?" and had five response options: action games, fighting games, shooter games, sports games, and role-playing games, with parenthetical examples of each. Using this measure, we were able to ascertain a preference for violent video games based on selecting fighting, shooter, or action games as their preferred genre. To clarify our choice to place "action games" among the violent category, we note that the parenthetical examples given to the participant for action games were Assassin's Creed, Grand Theft Auto, and Splinter Cell—all games that include graphic violence.

Data Analysis

We descriptively compared individuals who did, versus did not, have past 2-month severe violence perpetration, on each explanatory variable. We used logistic regression to estimate adjusted odds ratios (AORs) relating gaming frequency with the odds of past 2-month severe violence perpetration. Models were fit to each sex separately, followed by a joint model to test whether the effect of gaming on violence perpetration varied by sex. Models were adjusted for demographics (age, race, public assistance, living with parents), ED visit reason (violent or nonviolent injury), alcohol and marijuana use, proviolence attitudes, and community violence exposure.

Sensitivity Analysis

To determine, to the greatest extent possible, whether our results were specific to violent video gaming, we conducted sensitivity analysis based on self-reported video game genre preference. We refitted the logistic regression model described above while excluding (a)

those who reported a preference for violent video games and (b) those who reported a preference for nonviolent (sports, role-playing) games. Note that individuals reporting 0 hours of gaming per day did report a genre preference, and thus were included in both analyses.

Results

Descriptive Analysis

At baseline, the study sample (n = 409) was 59.9% female and 93.4% African American; 79.0% received public assistance, 75.3% lived with their parents, and 8.8% were seeking ED care for a violent injury; for greater detail, see the main study outcomes paper (Carter et al., 2016). Gaming frequency was significantly higher (p < .001) among males (M = 2.5 hr/day, SD = 2.8) than females (M = 0.8 hr/day, SD = 1.8). Of the n = 193 (47.2%) reporting any video gaming, a majority of males (69/118 = 58.5%) and females (52/75 = 69.3%) reported action, fighting, or shooter games as their favorite genre. Approximately 31.0% of respondents (n = 127) reported past 2-month severe physical violence perpetration, including 36.6% of males and 27.3% of females; the increased rate of severe violence perpetration among males was not statistically significant (p = .06). Table 1 shows unadjusted comparisons of those with versus without severe violence perpetration. Those reporting past 2-month severe violence were younger, more likely to have presented for violent injury, and scored higher on measures of proviolence attitudes, community violence exposure, alcohol use severity, and cannabis use frequency. Gaming frequency was higher among females who had severe violence than those who did not, but we did not find a difference in gaming frequency between males who did versus did not have severe violence.

Adjusted Analysis

Table 2 displays logistic regression models, stratified by sex, and with both sexes combined, adjusted for all other factors listed in the table. Gaming was a risk factor for violence perpetration in females (p < .01), with each additional hour corresponding to an estimated 40% increase in violence risk. We found no association between gaming frequency and violence among males.

In the combined model, we found a gaming-by-sex interaction (p < .01); the AOR relating gaming with violence perpetration was approximately 38% larger among females. Among both sexes, proviolence attitudes and community violence were risk factors for violence perpetration. Violent injury at baseline was a risk factor for males, but not females, while increasing age was associated with less violence perpetration in both males and females. Alcohol use was associated with more violence in all models, but was only significant in the combined model. Model fit was good in all cases, with an area under the receiver operating characteristic (ROC) curve of at least 0.8 in all models.

Sensitivity Analysis

Our sensitivity analyses sought to determine whether video game genre preference affected our results. When removing 72 respondents (23 female, 49 male) reporting video gaming but no preference for violent games, gaming frequency remained a risk factor in the adjusted

model for violence among females (AOR = 1.30, 95% confidence interval [CI] = [1.04, 1.67]), but not males (AOR = 0.97, 95% CI = [0.79, 1.17]); in the combined model, the gender/gaming interaction was significant (p = .047). When removing the 121 (52 female, 69 male) individuals reporting a preference for violent video games, we found qualitatively similar results. Gaming frequency was not a risk factor in the adjusted model among males (AOR = 1.07, 95% CI = [0.87, 1.31]), but was among females (AOR = 1.88, 95% CI = [1.23, 3.36]); in the combined model, the sex/gaming interaction remained significant (p = .040).

Discussion

Among high-risk, predominantly African American, youth from an underresourced community, sex differences were evident in the association between severe violence perpetration and video gaming frequency. After controlling for demographics, substance use, community violence exposure, and violence attitudes, video gaming frequency was a significantly larger risk factor for violence among female youth than male youth. In particular, increased video gaming frequency corresponded to substantial excess risk of severe violence perpetration (40% increased odds per hour of gaming) in females, but not males; the gender difference was significant. Those results were robust to the video game genre preference, with the same findings present when restricted to those preferred violent video game genres, and to those who preferred non-violent video game genres. Our findings are consistent with prior work indicating that video gaming was a stronger correlate of health behaviors in females than males (Desai et al., 2010). We extend prior work by focusing on a clinical sample of high-risk youth living in an urban, low-resource environment, and by establishing that this sex-specific association between gaming and violence stands after controlling for traditional violence risk factors, such as substance use, proviolence attitudes, and community violence exposure. The contrast of our findings with a preponderance of other studies of gender as a moderator of the gaming/violence link (Anderson et al., 2010) underscores potentially important substantive differences in our study population with regard to gaming and severe violence.

One interesting feature of our findings was that the observed associations between video gaming frequency and severe aggression were not specific to those with a preference for violent genres (action, shooter, fighting) of video games. Specifically, significant gender differences in the association between video gaming frequency and severe aggression were found (with large positive effects for females, and null effects for females), both when restricted to those who preferred violent genres of games, and when restricted to those who did not. Those results indicate that video gaming, without specificity to those with a preference for violent genres of video games, is a robust correlate of severe violence perpetration among females in this population. If video game genre preference can be taken as a proxy for the types of games individuals played during their reported hours per day, this may suggest that video game violence exposure was not what drives the observed associations between gaming frequency and severe violence. These findings may suggest that exposure to video game violence does not specifically correspond to excess risk of violence among high-risk youth, such as those living in environments with increased violence exposure, although future studies with direct measurement of video game violence exposure are required in similar populations to reevaluate that hypothesis. Study limitations

include self-reported cross-sectional data, our video gaming frequency measure, and geographic generalizability. Although our measurements are based on self-report, the use of validated measures, private computerized administration, and assurance of confidentiality lessens concerns about their veracity. Although causal conclusions are limited by a cross-sectional design, our results add valuable information for future research via a novel study population; future studies in similar populations are therefore advised to evaluate the direction of the identified associations. Our video gaming measures were limited in their ability to rigorously assess violent video gaming exposure. Yet, given that our sensitivity analyses restricting the genre preference (e.g., violent genres versus nonviolent genres) of those reporting video game use produced similar results, we remain confident that our measure did not substantially bias our results. Nevertheless, future studies in similar populations with more comprehensive video gaming measures would be useful. Relatedly, given that this is a low-resource study population, it would be useful to know to what extent lack of video game availability explained low video gaming frequency. Finally, our study occurred at a single ED in a disadvantaged community, although Flint is comparable with other mid-sized cities (e.g., Oakland, California; Camden, New Jersey) in terms of demographics and crime rates. Thus, the results may generalize to other similar urban contexts.

Our results suggest that video gaming is a stronger marker of severe violence (e.g., burning, choking, and weapon violence) perpetration in females than males among at-risk youth aged 14 to 20 years, even after controlling for known correlates of violence—such as substance use, proviolence attitudes, and community violence exposure—which has potential utility for intervention design. Youth violence interventions among females may be improved by including content related to video gaming, perhaps by focusing on identifying other prosocial activities as an alternative to video gaming, such as organized sports activities, church/extra-curricular activities, and other forms of community engagement. This would be consistent with multibehavioral interventions that have been effective (Walton et al., 2010) by focusing on multiple aspects of a behavioral cluster (in this case video gaming and violent behavior). Additional research is required to clarify the causal direction of the identified associations, and on the design of violence interventions that harness the findings observed here. In addition, future research with more comprehensive questioning on video gaming habits, content, and preferences is needed to more carefully parse what aspects of video gaming are risk-enhancing and what factors might help mitigate the association between video gaming and violence.

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Table 1

Unadjusted Comparisons Between Those With (n = 127) and Without (n = 282) Severe Violence Perpetration.

	Severe Violence (n = 127)	No Severe Violence (n = 282)	p
Age ***	16.92 (2.04)	18.00 (1.81)	<.001
Male	60 (47.2%)	104 (36.9%)	.061
African American	119 (93.7%)	263 (93.2%)	.999
Public assistance	100 (80.0%)[a]	223 (79.4%)[b]	.927
Live with parent	106 (83.5%)	202 (71.6%)	.015
Violent injury ***	23 (18.1%)	13 (4.6%)	<.001
Proviolence attitudes ***	3.26 (0.73)	2.93 (0.68)	<.001
Community violence ***	1.31 (0.71)	0.94 (0.63)	<.001
Alcohol use severity ***	1.12 (2.43)	0.46 (1.33)	.005
Cannabis use frequency **	1.46 (2.01)	1.04 (1.95)	.049
Gaming (hours) **	2.13 (2.96)	1.21 (2.04)	.002
Gaming (female) **	1.66 (2.80)	0.51 (1.13)	.002
Gaming (male)	2.67 (3.06)	2.40 (2.62)	.578

Note. Quantitative measures are represented as ns with % out of the total in parentheses; continuous measures display means with standard deviations in parentheses. Cannabis use frequency was measured by Alcohol Smoking and Substance Involvement Screening Test. Alcohol use was measured using the AUDIT-C. Alcohol and cannabis use were modified to past 2-month to match the time window for the violence perpetration outcome. AUDIT-C = Alcohol Use Disorders Identification Test–Consumption.

[a] Two cases excluded due to missing values.

[b] One case excluded due to missing values.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 2

Logistic Regression Analysis of Severe Violence Perpetration Stratified by Sex and With Both Sexes Combined.

	Male (n = 162) OR (95% CI)	Female (n = 244) OR (95% CI)	With Interaction (N = 406) OR (95% CI)
Age	0.76 [0.61, 0.95]*	0.69 [0.56, 0.84]***	0.73 [0.62, 0.84]***
Female (Ref. = male)	NA	NA	0.77 [0.40, 1.50]
Violent injury (Ref. = no)	7.51 [2.22, 18.17]***	1.84 [0.41, 8.84]	4.16 [1.86, 9.73]***
African American (Ref. = White/ Other)	0.39 [0.08, 1.83]	1.16 [0.28, 6.59]	0.72 [0.27, 2.06]
Living with parents (Ref. = no)	2.38 [0.99, 10.94]	0.84 [0.35, 2.07]	1.40 [0.71, 2.84]
Public assistance (Ref. = no)	0.99 [0.43, 2.43]	1.08 [0.43, 2.91]	0.95 [0.52, 1.79]
Violence attitudes mean	1.65 [1.01, 3.21]*	1.68 [1.04, 2.76]*	1.69 [1.18, 2.44]**
AUDIT-C sum (alcohol use severity)	1.20 [0.98, 1.54]	1.12 [0.90, 1.40]	1.16 [1.00, 1.34]*
Cannabis use frequency (ASSIST)	2.72 [0.78, 1.13]	1.10 [0.89, 1.35]	1.00 [0.88, 1.15]
Community violence	2.46 [1.40, 4.51]**	2.52 [1.44, 4.56]**	2.41 [1.62, 3.62]***
Gaming (hours)	1.03 [0.89, 1.19]	1.40 [1.16, 1.78]**	1.02 [0.89, 1.17]
Gaming × Female	NA	NA	1.38 [1.10, 1.80]**
Area under ROC curve	0.81	0.80	0.80

Note. We excluded three participants due to missing values on the public assistance question. All variance inflation factors were <1.9 in all models. OR = odds ratio; CI = confidence interval; AUDIT-C = Alcohol Use Disorders Identification Test–Consumption; ASSIST = Alcohol, Smoking, and Substance Involvement Screening Test; ROC = receiver operating characteristic.

* $p < .05$.

** $p < .01$.

*** $p < .001$.