Impersonal Agencies of Communication:
Comparing the Effects of Video Games and Other Risk Factors on Violence

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DeCamp, Whitney. (2015). Impersonal Agencies of Communication: Comparing the Effects of Video Games and Other Risk Factors on Violence. *Psychology of Popular Media Culture, 4*, 296-304. doi: 10.1037/ppm0000037

The data used in this research were collected by the University of Delaware Center for Drug and Alcohol Studies as part of a study supported by the Delaware Health Fund and by the Division of Substance Abuse and Mental Health, Delaware Health and Social Services. The views and conclusions expressed in this manuscript are those of the authors and do not necessarily represent those of the University of Delaware or the sponsoring agencies. In addition, this research was aided through a generous award by the College of Arts and Sciences at Western Michigan University. The author wishes to thank both University of Delaware and Western Michigan University for their support.

Abstract

In the debated topic of violent video games and violent behavior, empirical evidence has been mixed. Some studies support the assertion that there is a causal or correlational link between gaming and violence, while others do not find such support. Recent advances have demonstrated that adequately controlling for background characteristics that might result in a selection bias decrease the effect sizes. However, it remains unclear how strong of an effect video game playing has in comparison to other risk factors. The present study uses data from over 6,000 eighth grade students to examine the effects of playing violent games. Using propensity score matching (PSM) and logistic regression models, results are estimated to show the relative effects from gaming and other social risk factors. Results indicate that PSM decreases the already modest effect from gaming, often to non-significance. In comparison to other risk factors in the models, the effects are also relatively weak.

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There is growing evidence supporting an empirical link between violent video game playing and violent behavior. This evidence, however, is often correlational in nature, and the presence of a correlation does not necessarily equate to that of a causal link. When the issue of selling violent video games to minors came before the Supreme Court of the United States, the opinion of the court reflected this concern: "These studies… do not prove that violent video games cause minors to act aggressively… [instead] they show at best some correlation between exposure to violent entertainment and minuscule real-world effects…" (Brown v. Entertainment Merchants Association, 2011, p. 12-13).

Regardless of the Supreme Court's ruling the debate over whether violent games have an effect on behavior and whether children should be protected from exposure to violent media continues. Alternative efforts to enact laws targeting violent media continue in the wake of the decision, such as an additional sales tax on violent games (Orland, 2013). The constitutionality of such laws aside, the question remains as to whether there is a causal effect and what the nature and size of this effect is. Although many empirical analyses have been conducted, the results are inconsistent and there are various criticisms of the methods used. A meta-analysis of published and un-published studies indicates that there may be a publication bias also present, with significant results supporting a link between games and violence more likely to be published than disconfirming studies (Ferguson & Kilburn, 2009).

The present study contributes to this debate by using propensity score matching (PSM) to overcome some of the limitations of prior research. Moreover, these results present a comparison of the effects of violent video gaming to the effects of other social risk and protective factors, such as parental monitoring, parental attachment, and exposure to violence at home or in school. The combined use of PSM and a focus on contrasting risk factors build on previous research to further explore the relationship between games and violence.

Violent Games and Violent Behavior

It has been argued for generations that exposure to violent media could influence an individual's behavior. This includes historical examples, such as cinema (Cressy, 1938), comic books (Wertham, 1953), and music (Arnett, 1991). Counterarguments against these claims can

also be found throughout the past century. Sutherland argued in his social learning theory of crime that "impersonal agencies of communication, such as movies and newspapers, play a relatively unimportant part in the genesis of criminal behavior" (Sutherland & Cressey, 1960/2007, p. 224). Adding to this debate, video games offer players the ability to assume the role of an individual and have control over this character. This interactive process has been argued to have a potentially stronger influence on consumers through the closer identification with the protagonist (Dill & Dill, 1998).

Experimental studies of violent gaming have used random assignment in order to isolate the type of game as a causal factor in behavior. Though quite strong in methodology, often these designs are short-term and cannot measure real-world violence by the participants. Instead, these studies rely on non-violent outcomes, such as blasting noise at others (Bartholow, Sestir, & Davis, 2005) or feeling less distressed when viewing violence (Carnagey, Anderson, & Bushman, 2007). Although causality is adequately proven through the use of random assignment in these studies, the applicability to violent behavior is not certain. In addition, not all experimental studies find a significant effect (e.g. Adachi & Willoughby, 2011; Ballard, Visser, & Jocoy, 2012; Ferguson et al., 2008; Valadez & Ferguson, 2012).

There have also been a variety of non-experimental designs to study this relationship, often involving data gathered through cross-sectional or longitudinal surveys. Some of these studies have shown a positive statistical association between violent gaming and violent behavior (Anderson et al., 2008; Moller & Krahe, 2009; Olson et al., 2009), while others have not (Durkin & Barber, 2002; Ferguson, 2011; Ferguson et al., 2008; Ferguson, San Miguel, Garza, & Jerabeck, 2012; Ferguson, San Miguel, & Hartley, 2009; Wallenius & Punamäki, 2008). The reasons for these conflicting findings are not always clear, though some studies have found that introducing sufficient controls into models can reduce the effects significantly (Adachi & Willoughby, 2011; Przybylski, Rigby, & Ryan, 2010).

A final category of research studies is that of quasi-experimental designs, which are sometimes preferable because they provide a balance between the causality-oriented experiments and the real-life behavior focused non-experimental survey designs. In the sole published quasi-experimental study of violent video games (Gunter & Daly, 2012), the researchers used a cross-sectional survey of eighth grade students with a large sample size and used PSM to find pairs of students who were similarly matched on 154 control variables based on the effect of the variables on playing violent video games. By comparing the results of the unmatched and matched samples, the study illustrates how the effect of playing violent video games on violent behavior is reduced, often to non-significance, when controlling for background characteristics.

Although the use of PSM in the study (Gunter & Daly, 2012) strengthens the argument that previously found correlations do not necessarily correspond to causal relationships, this research is not without limitations. One critical consideration absent from this prior study is a direct comparison between the effect of video game exposure and the effects of other competing risk and protective causes of violence. Through combining the use of PSM with that of multiple regression to simultaneously examine multiple predictors, the present study builds upon this previous work by estimating the effect size from video game exposure relative to other predictors of violence.

Risk Factors of Violence

Exposure to violent media has long been debated as a risk factor of violent behavior. In contrast, criminological theory and research have identified numerous social risk and protective

factors[1] that are more firmly established as having a connection to violence. The social environment around a person is shown to have an impact on individuals in several ways. The behavior of family and friends, for example, is theorized in social learning theories of crime to have a stronger impact on children than would the behavior of strangers or those presented in the media, with people imitating the behavior of those closest to them (Sutherland & Cressey, 1960/2007; Burgess & Akers, 1966).

Another theoretical cause of violence is impulsivity. Gottfredson and Hirschi (1990 argue that self-control is a central factor in the propensity towards crime or deviance. Moreover, they argue that self-control is a direct product of parental monitoring, and that adolescents and adults with low self-control are the product of ineffective child rearing. This also connects with the concept of parental attachment as an inhibitor of crime (Hirschi, 1969). Although not necessarily the same as the more punitive-oriented concept of monitoring, both are desirable parental features and have been empirically linked to crime and violence as protective social factors (e.g., Agnew, 1991; Pratt & Cullen, 2000).

The Present Study

This research question addressed by this study is: What is the relative effect size of video game exposure on violent behavior in comparison to other social risk and protective factors? Specifically, this research estimates effects using PSM to address spuriousness through matched samples. Within these matched samples, the effect of playing violent video games is used in logistic regression models predicting violent/pre-violence behaviors. The effects of video game exposure are compared with those of other variables in order to estimate how strong the effect from video game exposure is in comparison to established risk and protective factors of violence.

Methods

The data used come from the same source as the previous study using PSM (Gunter & Daly, 2012). Specifically, the data come from the 2008 Delaware School Survey, which surveyed a census of eighth grade classrooms in all public and public-charter schools in the state of Delaware in 2008. Some randomly selected classrooms were assigned a different survey, but otherwise the survey was a full census of eighth grade classrooms. There were 6,567 questionnaires returned from students, with less than one percent of students present during administration of the survey declining to participate or refused parental consent (which is passively obtained).

Variables

Dependent Variables. Violence and pre-violent behaviors were measured with three indicators. Each is a dichotomous past-year measure of the students' responses to the question of whether they: "hit someone with the intention of hurting them," "take some kind of weapon to school or to a school event," and "carry a gun when you're not in school."

Criterion Variable. The main variable of interest used for this study is a dichotomous indicator of whether the student reported having played "'M' or 'Mature'" rated video games in

1 In the interest of brevity, this text cannot provide a full review of criminological theory. Instead, these theoretical concepts are selected because they can be represented in the analyses with empirical data. The survey used, unfortunately, was not designed with criminological theory testing in mind, and so the selection is limited.

the past year.[2] Students who did not answer this question (about four percent) are excluded from analyses.

Other Independent Variables. A variety of additional predictors are used in the models.[3] To measure the nature of the social environment in which the child finds himself or herself, which may model ideal behavior for the child, two measures were used. For the home environment, students were asked how often they "see or hear violence between people in [their] home."[4] For the school environment, five indicators were combined using factor extraction ($\alpha = .71$). The indicators used included: "I feel safe in my school;" "students in this school are well-behaved in public (classes, assemblies, cafeterias);" "students are bullied by other students when teachers are not around (in halls, outside school, bathrooms, cafeteria, etc.);" "the misbehavior of some students in this school keeps teachers from teaching the students who want to learn;" and "student violence is a problem at this school."

To measure impulsivity/self-control, a known correlate of violent and other risk behaviors, the Zuckerman (1979) sensation seeking scale is used as a proxy measure. The indicators include: "I sometimes do crazy things just for fun," "I like wild parties," "I like to be around people who party a lot," "I like to try new things even if they scare me or I know it's something I shouldn't do," "I get a real kick out of doing things that are a little dangerous," and "I like to have new or exciting experiences even if they are illegal." The available responses formed a five-point Likert scale ($\alpha = .89$).

Two constructs are used for parental influences. To assess parental monitoring, the indicators "my parents know where I am when I am not in school" and "my parents know what I am doing when I am not in school" were used ($\alpha = .76$). For parental attachment, three indicators were used ($\alpha = .74$): "when I do a good job at home or at school, my parents tell me about it; "how often do you talk to either of your parents about how things are going at school?;" and "how often do you talk to either of your parents about your education and career plans?"[5]

Controls. In addition to the above social factors, several control variables are also be used. Race/ethnicity are included through multiple dummy variables, including non-Hispanic white (the reference category), non-Hispanic black, Hispanic, and other/multiple. In addition, a dichotomous self-reported measure of receiving free or reduced-price lunches at school, which is a good indicator of poverty, is used as a rough proxy measure for social class. Because separate models are estimated for males and females, a control for gender is inapplicable. In addition to

2 This measure is not a perfect measure for violent video games, as video games may be rated M for other reasons and some T-rated games are also violent. Despite this, using the M-rating can be used as a proximate measure of exposure to violent media because of the strong connection between the M rating and violence. Unfortunately, this measure ignores other important aspects, such as the type of game, the motives of the protagonist, length and frequency of play, etc. This is an unfortunate limitation with the data. Ideally, future research would expand measurement to include a full battery of indicators.

3 Unless otherwise noted, the response categories for these questions were: never, not often, some of the time, often, and most of the time. For "how often" questions, the categories were: never, before but not in the past year, a few times in past year, once or twice a month, once or twice a week, and almost every day.

4 This single indicator was transformed into a z-score for purposes of having its metric be equal to that of the other continuous variables, which are already standardized through factor extraction. Because standardized betas are presented, this effectively has no impact on the results displayed.

5 Descriptive statistics for variables: Violent Video Games, 56%; Hit Someone, 34%; Take a Weapon to School, 4%; Carry a Gun, 7%; Black, 26%; Hispanic, 12%; Asian, 3%; Other Race, 10%; Free/Reduced-Price Lunch, 36%. Remaining variables (See/Hear Violence at Home, Fearful School Environment, Sensation Seeking, Parental Monitoring, and Parental Attachment) all have a mean of zero and standard deviation of one.

the controls included in these models, numerous additional controls were used in creating the propensity scores, so additional controls in the multiple regressions are likely superfluous.

Analytic Strategy

All analyses and calculations are performed and reported separately for males and females. This is important given the nature of gender and violent media; whereas 79 percent of males in the sample had played an M-rated game, only 33 percent of the females reported the same. Additionally, failing to control for sex, which estimating separate models fully accomplishes, can result in inflated effect sizes (see Ferguson & Kilburn, 2009). Most importantly, prior findings suggest sex-specific effects are present (Gunter & Daly, 2012).

PSM is used here in the same manner as the previous study (Gunter & Daly, 2012) that used these data. As in that case, a logistic regression, in which playing violent video games was regressed on 154 predictors,[6] was used to estimate a propensity towards gaming. Using a random sort and caliper matching via the SAS Greedy 5 → 1 Digit Matching Macro (Parsons, 2001), participants who did game and participants who did not were matched based on virtually identical propensities. This results in two sets of cases, with the latter set acting as counterfactuals to the first, thus retroactively creating a quasi-experimental design.

To address missing data, imputation was used for predictor variables. Cases with missing data for playing violent video game and for sex were deleted listwise. Missing data for the dependent variables measuring violent behavior were handled by simply excluding the cases from their respective models. This deletion results in a remaining sample of 6,122 cases (2,945 males and 3,177 females). Because playing violent games is not evenly split and because some participants might not have a similar participant with whom to be matched, there is necessarily a reduction in the sample size for the matched dataset. In the matched data, there were 591 pairs (n = 1,182) out of a theoretical maximum of 606 for males (based on the number of males who reported having not played a violent game) and 949 pairs (n = 1,898) out of a maximum of 1062 (based on the number who reported having played a violent game) for females.

Substantive analyses were conducted separately for each of the three dependent variables. Because they are each dichotomous, logistic regression was used.[7] For each dependent variable, three models were estimated. First, a model was estimated using only playing violent video games. Second, an alternative model using all other independent variables was estimated. The final model combined the earlier models to include both playing violent games and social influences in the same model.

Results

Hitting

The results for models predicting hitting someone with the intension of hurting them are presented in Table 1.[8] Immediately it is clear that playing violent video games does not have a

6 These analyses use the same 154 variables to generate propensity scores as did the previous study using PSM with these data (for the full list, see: Gunter & Daly, 2012).

7 Because multiple IVs are being used, the t-tests that are often used with PSM samples are inadequate for this design. Additionally, the t-tests that would be generated from these data would be identical to those published in a previous study (see: Gunter & Daly, 2012)

8 Standardized betas are presented rather than the more commonly used odds ratios. Because the emphasis of the research question is placed on effect size, standardized betas are more useful in that they can be compared within models. Odds ratios are affected by the distribution of each predictor, and cannot be easily compared to each other.

significant impact on the probability of hitting someone within these matched samples. The coefficient of determination for Model 1 for males indicates that gaming impacts less than one percent of the probability for hitting someone and the effect is not significant. The next model provides an alternative set of predictors based on various social risk and protective factors, which has quote greater predictive power, with about 24 percent of the variation explained. The significant factors in the model include seeing or hearing violence in your own home (β = .268) and sensation seeking (β = .349). With regard to the former, this would seem to indicate that it is exposure to violence in real life, rather than via entertainment, that has a meaningful impact. Model 3 combined the previous two, and offers no meaningfully different results. Adding playing violent video games to the model neither altered the significance of other predictors, nor notably contributed to the explanatory power (β = .066).

The results for females differ somewhat from those of males. In the first model, playing violent video games is a significant predictor of hitting someone (β = .093). However, the actual strength of that effect is rather low, with less than one percent of the variance explained. The second model finds seeing or hearing violence at home (β = .226) and sensation seeking (β = . 360) to be significant predictors as well. Unlike the male models, however, these effects are complimented with additional positive effects from certain racial/ethnic categories and a negative effect from parental monitoring (β = -.094). In comparison to the coefficient of determination of . 009 in the first model, this model achieves a .250. Adding violent gaming back into the model does not have a significant effect (β = .057), with only a minimal change to the explained variance.

Weapon Carrying

Estimations for models predicting carrying a weapon to school are presented in Table 2. The male models indicate a low impact from playing violent video games (β = ..026), with an explained variance contribution so low that it is rounded to zero. Other variables do indicate some predictive power, however, with sensation seeking students more likely to take a weapon to school (β = .348) and students with closely monitoring parents less likely to do so (β = -.257). The female models indicate slightly more of a contribution from gaming in the models. Violent game playing begins as significant in Model 1 (β = .188), but loses significance in Model 3 (β = . 158) once the other risk and protective factors are added. In contrast to gaming's minimal contribution explaining about one percent of the variance, seeing or hearing violence, sensation seeking, and parental attachment have stronger effects on weapon carrying (β = .163, .251, -.383 respectively).

Gun Carrying

The results for gun carrying are presented in Table 3 and are quite similar to the others. For males, violent gaming has a virtually zero impact with or without controls (β = .021), while home violence and sensation seeking continue to show strong effects (β = .129 & .431). Among females, the same can be said for violent gaming with this outcome (β = .083). The significant predictors, however, are parental monitoring and attachment, and both are associated with a lower risk of carrying a gun (β = -.191 & -.234).

Table 1: Logistic Regressions Predicting Hitting Someone in Past Year (Standardized Betas)

	Males			Females		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Violent Video Games	0.071	---	0.066	0.093**	---	0.057
See/Hear Violence at Home	---	0.268**	0.269**	---	0.226**	0.223**
Negative School Environment	---	0.061	0.063	---	0.058	0.055
Sensation Seeking	---	0.349**	0.346**	---	0.360**	0.359**
Parental Monitoring	---	-0.052	-0.053	---	-0.094**	-0.096**
Parental Attachment	---	-0.074	-0.076	---	-0.052	-0.054
Black	---	0.085	0.091*	---	0.184**	0.183**
Hispanic	---	-0.084	-0.085	---	0.086**	0.085**
Asian	---	-0.061	-0.058	---	-0.015	-0.014
Other Race	---	-0.026	-0.020	---	0.064*	0.062
Free/Reduced-Price Lunch	---	0.036	0.034	---	-0.018	-0.017
Nagelkerke R^2	.005	.238	.241	.009	.250	.252

* $p < .05$
** $p < .01$

Table 2: Logistic Regressions Predicting Taking a Weapon to School in Past Year (Standardized Betas)

	Males			Females		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Violent Video Games	0.026	---	0.040	0.188*	---	0.158
See/Hear Violence at Home	---	0.123	0.124	---	0.174*	0.163*
Negative School Environment	---	0.154	0.155	---	0.023	0.013
Sensation Seeking	---	0.348**	0.346**	---	0.254*	0.251*
Parental Monitoring	---	-0.257**	-0.261**	---	-0.076	-0.085
Parental Attachment	---	-0.067	-0.067	---	-0.380**	-0.383**
Black	---	-0.009	-0.007	---	0.108	0.102
Hispanic	---	-0.029	-0.028	---	0.093	0.091
Asian	---	0.021	0.025	---	-0.004	-0.013
Other Race	---	0.035	0.037	---	0.071	0.059
Free/Reduced-Price Lunch	---	0.143	0.141	---	0.117	0.116
Nagelkerke R^2	.000	.215	.215	.013	.200	.208

* $p < .05$
** $p < .01$

Table 3: Logistic Regressions Predicting Carrying a Gun in Past Year (Standardized Betas)

	Males			Females		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Violent Video Games	0.048	---	0.021	0.108	---	0.083
See/Hear Violence at Home	---	0.128*	0.129*	---	0.158	0.149
Negative School Environment	---	0.054	0.054	---	0.024	0.018
Sensation Seeking	---	0.432**	0.431**	---	-0.052	-0.050
Parental Monitoring	---	-0.030	-0.030	---	-0.188*	-0.191*
Parental Attachment	---	-0.094	-0.094	---	-0.233*	-0.234*
Black	---	-0.041	-0.039	---	-0.056	-0.058
Hispanic	---	0.084	0.084	---	0.114	0.112
Asian	---	-0.165	-0.163	---	-0.005	-0.008
Other Race	---	0.078	0.079	---	-0.001	-0.004
Free/Reduced-Price Lunch	---	0.065	0.064	---	0.120	0.122
Nagelkerke R^2	.001	.179	.179	.004	.108	.110

* $p < .05$
** $p < .01$

Discussion

For over a decade, the association between violent video games and violent behavior has been studied in a variety of methods. Laboratory-style experiments have in some studies found some statistical associations with short-term aggressiveness, but not violence *per se*. Survey-based research has found mixed results and some of the research neglects to address the selection bias in which children choose to play violent games. This study sought to advance this line of research through the use of PSM to overcome the selection bias and multivariate regressions to place the size of the effect into greater context.

The findings of this study add to the body of research indicating that the effects of video games on behavior may be overstated based on purely correlational research. After using PSM to control for the selection bias in who chooses to play violent video games and using additional predictors in the models, violent gaming was not predictive of any tested violent behavior.

In terms of what does seem to matter in predicting violent behavior, other social factors account for the vast majority of the predictive power of the models. Though not significant in all models, seeing or hearing violence at home, having a sensation seeking personality, experiencing less parental monitoring, and having lower levels of parental attachment are all relatively strong predictors of violent behavior and weapon carrying. In comparison to playing violent video games, the standardized effects from these variables (in models when they were significant) ranged from only marginally stronger as a predictor to having an effect size over twenty times as strong. Thus, these analyses not only fail to find significant effects from video games on violence, they also identify several variables that are magnitudes stronger than gaming in predicting violence.

Though the support for a connection between playing violent video games and being violent is already weak in this study, caution is urged before accepting even the weak support as conclusive. First, these data are not longitudinal, so they cannot be presumed to prove time-order. Noteworthy, however, is that time-order is irrelevant for non-significant relationships because the lack of a correlation already fails to establish causality, so the non-significant relationships are not affected by this weakness. Second, even though a large dataset was used as a control for the selection bias, it is not possible to entirely reject the idea that some selection bias may remain. Third, because the data used were limited to the eighth grade, it remains possible that an effect will manifest later in life. Future research should explore this possibility, which may be challenging given that playing violent games become more commonplace, especially for males, during the later teenage years. Another limitation of the present study was the inability in the data to determine the amount of time spent playing violent video games. As with most theorized causes of behavior, exposure measured as dichotomous is inherently less meaningful than a more nuanced spectrum of exposure. Ideally, the content of the games (e.g., minor violence verses extreme violence, intensions of the protagonist, realism of graphics, etc.) and the amount of time spent playing them would also be considered.

Future research in this area would also do well to continue closely examining the association between gaming and violence. Though this study was able to address, partially, the topic of spuriousness, time-order, for example, remains untouched. Though there are longitudinal studies in this area (e.g., Anderson et al., 2008; Moller & Krahe, 2009), there have not been any longitudinal studies to make use of PSM or other advanced methods of addressing spuriousness and selection bias. Thus, research that combines approaches to examining these necessary elements of causality would be a significant stride forward. In terms of the application of these

results to policy, it is clear that the conclusions here do not support the notion that there is an established causal link between gaming and violence. Therefore, the implication is such that, if a supposed empirical link is indeed the basis for such policy, changes to legal code or retail practices would be ill-advised at this point in time and efforts to decrease violence might be more effective if directed toward other risk and protective factors.

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