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Crime & Delinquency published online 4 March 2010
DOI: 10.1177/0011128710362201

Article

Crime & Delinquency
XX(X) 1–21

DOI: 10.1177/0011128710362201
http://cad.sagepub.com

Violent Video Games, Catharsis Seeking, Bullying, and Delinquency: A Multivariate Analysis of Effects

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Abstract

The effects of violent video game exposure on youth aggression remain an issue of significant controversy and debate. It is not yet clear whether violent video games uniquely contribute to long-term youth aggression or whether any relationship is better explained through third variables such as aggressive personality or family environment. The current study examines the influence of violent video game exposure on delinquency and bullying behavior in 1,254 seventh- and eighth-grade students. Variables such as parental involvement, trait aggression, stress, participation in extracurricular activities, and family/peer support were also considered. Results indicated that delinquent and bullying behavior were predicted by the child's trait aggression and stress level. Violent video game exposure was not found to be predictive of delinquency or bullying, nor was level of parental involvement. These results question the commonly held belief that violent video games are related to youth delinquency and bullying.

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Keywords

aggression, violence, mass media, computer games, child development

The release of *Grand Theft Auto IV* (*GTA*) in 2008 precipitated waves of commentary from politicians, journalists, and scholars (e.g., Bushman, 2008; O'Brien, 2008; Parents Television Council, 2008) who feared potential negative effects on youth. Given the considerable history of controversy regarding violent video games in general, and the *GTA* series in particular, these statements reflect society's concerns about hypothesized deleterious effects of interactive media on youth. The consequence of these concerns has been at least 10 state laws in the United States intended to curb youth access to violent games. In the United States, all such laws have been blocked or overturned by courts, although similar efforts in other countries have been more successful.

The American Psychological Association (2005) has joined this chorus of concern, suggesting that violent video game exposure may be related to increased aggression among players. Other scholars (Grimes, Anderson, & Bergen, 2008) have countered that media violence researchers themselves have fanned a moral panic, asserting personal beliefs in the guise of scientific facts, in the absence of high-quality scientific evidence. In some cases, speculations about the use and effects of violent video games have later proved incorrect. For instance, the 2007 murders on the campus of Virginia Tech sparked comments that the perpetrator, Seung-Hui Cho, must have been influenced by violent game content. However, the official investigation found no evidence that he had ever played violent video games (Virginia Tech Review Panel, 2007). Further research is needed to determine whether interactive violent content has the potential to promote aggressive attitudes or behaviors in children and which children might be most vulnerable to such influence.

Research on Violent Video Game Effects

The degree to which current research on violent video games is sufficient to conclude that such games promote long-term aggression remains intensely debated. Some scholars (e.g., Anderson, 2004; Bushman & Anderson, 2002) have concluded that sufficient research evidence has amassed to assert proof of a causal link between violent video games and aggression. Other scholars have raised concerns about the quality, methodology, and conclusions of this body of research (Ferguson, 2007a; Grimes et al., 2008; Kuntsche, 2004; Olson, 2004; Pinker, 2002; Sternheimer, 2007). A number of concerns about video game violence studies have been raised. These include the following:

Many aggression measures used demonstrate poor validity. Put simply, many measures used in video game studies claiming to represent "aggression" in fact do not correlate well with actual real-life aggressive acts or violent behaviors (Ferguson & Rueda, 2009; Ferguson, Smith, Miller-Stratton, Fritz, & Heinrich, 2008; Ritter & Eslea, 2005; Tedeschi & Quigley, 2000).

The "third variable" effect. This concern is that other variables, such as gender, family violence, genetics, and so forth, may account for any small relationship between violent video game exposure and aggression (Ferguson, 2007b; Freedman, 1996; Savage, 2008). Univariate statistics may be overinterpreted at the expense of multivariate statistics. For example, Gentile, Lynch, Linder, and Walsh (2004) overinterpret bivariate correlations between violent video games and aggression and fail to note that controlling for gender alone removes most of the overlapping variance. As boys are both more aggressive and play more violent video games than do girls, any bivariate correlation may simply be masking an underlying gender effect. In support of this concern, Ferguson, Rueda, et al. (2008) in a multivariate analysis found that trait aggression and family violence were predictive of violent criminal acts, whereas violent game exposure was not.

Citation bias. Numerous scholars have noted that media-effects scholars ignore work, even from their own results, that contradicts their hypotheses (Freedman, 2002; Gauntlett, 1995; Moeller, 2005; Savage, 2008).

Publication bias. Studies of video game violence appear to be deeply influenced by publication bias (Ferguson, 2007a, 2007b; Ferguson & Kilburn, 2009). Studies with statistically significant effects, no matter how small in practical effect, are more likely to be published than those with null results.

Small effect sizes. Estimates on the size of effect for violent video games on aggressive behavior range from (using $r^2 \times 100$) effectively 0% to 4% (Anderson, 2004; Ferguson, 2007a, 2007b; Sherry, 2007). Many scholars have argued that these effects, even if assumed to have been produced by methodologically perfect research, are too small to be meaningful (Ferguson, 2002; Freedman, 2002; Gauntlett, 1995; Olson, 2004; Savage, 2008; Sherry, 2007).

Unstandardized use of aggression measures. As noted in Ferguson (2007a) and Ferguson and Kilburn (2009), one significant concern is that some measures of aggression have been used in unstandardized ways. Sometimes even the same authors use aggression measures differently between studies. Ferguson found that measures used in such unstandardized ways resulted in higher effect sizes, possibly as authors were free to choose outcomes that supported their hypotheses and ignore outcomes that did not.

These issues point to ongoing difficulties in assessing the effects of violent media, including video games, on violent delinquency. Too often, researchers use surveys and laboratory paradigms of aggression that are of questionable validity,

seldom involving measures that generalize well to person-on-person violence. For instance, although perhaps several hundred studies exist regarding the impact of violent media on behavior (Freedman, 2002), recent reviews have found that most of these examine aggression only weakly and that valid studies of youth delinquency remain rare (Ferguson & Kilburn, 2009; Mitrofan, Paul, & Spencer, 2009; Savage & Yancey, 2008). Part of the concern is the ethical limitations inherent in studying youth violence, particularly in laboratory settings. Researchers cannot incite youth to engage in dangerous or illegal violent behavior in the lab. As Ritter and Eslea (2005) note, efforts to get around this with milder ethical measures, such as mildly aversive "noise blast" generators, having participants taste hot sauce, and so forth, have largely failed. Indeed, such tools do not predict violent behaviors (Ferguson & Rueda, 2009).

Correlational studies also run the risk of overinterpretation. Given that both video game playing and aggression are more frequent in males than females (Olson et al., 2007), bivariate correlations in particular may merely reflect underlying gender differences (i.e., as males both play more video games and are more aggressive, a bivariate correlation between video games and aggression is to be expected, as with any two male-dominated activities). Correlations between media violence and aggression tend to be small (Freedman, 2002) and to disappear in some studies when other variables are controlled (Ferguson, Rueda, et al., 2008; Ferguson, San Miguel, & Hartley, 2009). Assessing youth violence in correlational studies, although better perhaps than in experimental studies, remains imperfect as well. Arrest records may not capture all or even most violent acts, whereas self-reported acts are subject to social desirability bias. These factors considered together argue that media researchers should exercise greater caution in making causal attributions.

Overall, results of violent video game research have been mixed. An examination of specific studies finds that some provide evidence for an association between violent game exposure and some measure of increased aggression (e.g., Anderson & Murphy, 2003; Bartholow & Anderson, 2002; Bartholow, Bushman, & Sestir, 2006). There are also recent studies that do not support such a link (e.g., Colwell & Kato, 2003; Ferguson et al., 2009; Ferguson, Rueda, et al., 2008; Unsworth, Devilly, & Ward, 2007; Williams & Skoric, 2005).

Video Games and Youth Aggression

Statistics on youth violence illustrate a related concern. In Figure 1, we present overlapping data regarding video games sales and youth violence rates in the United States. Data were compiled from a Federal Interagency Forum on Child and Family Statistics (2008) report on youth health, including violent crime

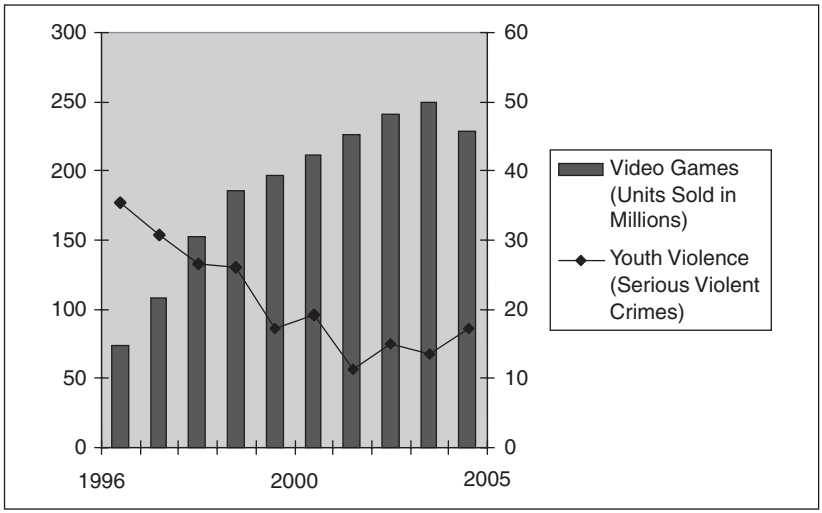

Figure 1. Youth violence and video game sales data.

arrests, as well as Entertainment Software Association (2007) data on video game sales. As the availability of electronic games (most of which contain some violence) increased, violent crime rates among youth declined. Indeed, the correlation between these two data is $r = -.95$, a very strong relationship. There is a similar trend with adult violent crime.

One must be very careful not to read too much into this relationship; it is extremely unlikely that video games are responsible for this decline in violent crimes among youth. Rather, other phenomena are responsible for the decrease in youth violence, including the end of a crime spike fueled by crack cocaine and handguns (Blumstein, 2006). Nonetheless, these data present an obstacle to the belief that exposure to violent video games increases violent behavior in the general population of youth, given that the majority of young males play such games (Olson et al., 2007).

The Current Study

This study attempts to address gaps in the literature on video game violence and youth aggression in several ways.

1. It is conducted on a large, reasonably representative sample of youth in the United States.

2. It focuses directly on behaviors of legal and social interest rather than abstract measures of aggression with limited validity (Ritter & Eslea, 2005; Tedeschi & Quigley, 1996). Delinquent behaviors broadly and bullying behaviors specifically are examined as outcomes.
3. It is multivariate in nature. Previous research has suggested that small but statistically significant bivariate correlations may be observed between media violence exposure and aggression. These correlations may disappear once other variables such as trait aggression and family environment are controlled (Ferguson, Rueda, et al., 2008; Kuntsche, 2004). For policy purposes, it is critical to understand whether violent video games uniquely contribute to youth aggression or whether other factors may account for most or all of the variance in this relationship.

Our research tests two main sets of hypotheses:

1. Any relationship between video game playing and delinquency will be moderated by other relevant third variables: potential risk and protective factors such as trait aggression, family environment, stress, participation in extracurricular activities, and perceived support from peers and family.
2. Any relationship between video game playing and bullying behavior will be moderated by other relevant variables such as the above.

It should be carefully noted that the current research design is correlational in nature. Causal inferences should not be drawn from correlational findings.

Method

Participants

Seventh- and eighth-grade students at two middle schools in the mid-Atlantic region of the United States were included in the current study. All students were invited to participate, aside from those with significant English-language difficulties or cognitive impairment (see Kutner & Olson, 2008, for full description). A total of 1,254 students completed the survey, virtually all eligible students in attendance at school on that day. Regarding gender, 584 (47%) of the students identified themselves as male and 653 (53%) as female. Of the students, 664 (53%) were from a comparatively affluent suburban-located school, and 590 (47%) were from a school located in a lower socioeconomic status urban environment.

The ethnic makeup of students in the suburban school was 90% White, 4% Black, 4% Asian, 1% Hispanic, and 1% Other. The ethnic makeup of students in the urban school was 50% White, 43% Black, 2% Asian, 5% Hispanic, and less than 1% Other. Mean age of the students was 12.9 ($SD = 0.76$).

Predictor Measures

Trait aggression. The Attitudes Toward Conflict scale (ATC; Dahlberg, Toal, & Behrens, 1998) consists of eight Likert items related to potential aggressive responses to various hypothetical situations. Items on the ATC are similar to those on adult trait aggression measures, such as the Aggression Questionnaire (Buss & Warren, 2000). Sample items include "It's OK for me to hit someone to get them to do what I want" and "I try to talk out a problem instead of fighting." Because trait aggression, as a variable, appears to be stable over time and across the life span, it has come to be regarded as an important control variable in media violence studies (Anderson & Dill, 2000; Ferguson, Rueda, et al., 2008). Coefficient α for the current sample for the ATC was .76.

Parental involvement. To measure parents' involvement with their children, sharing media consumption with children, and making media consumption decisions for them, a nine-item Likert scale was created for this study. Examples of questions included in this scale are "My parents play electronic games with me," "My parents spend time with me," "My parents are home when I am home," and "My parents tell me I can't play a particular electronic game." Coefficient α for the current sample was .68.

Support from others. We compiled a 16-item Likert-scale measure of perceived support from peers and family. This measure was based on two existing measures (Lerner et al., 2005; Philips & Springer, 1992) of peer support and family support. Overall coefficient α for the resultant scale was .87.

Stress. The Stressful Urban Life Events scale (SULE; Attar, Guerra, & Tolan, 1994), a 19-item yes/no scale, was used to measure total stress that children in the current sample had experienced during the past year. The SULE addressed stressors such as getting suspended from school, getting poor grades on one's report card, or experiencing the death of a family member. Coefficient α for the total stress scale was .67 for the current sample.

Extracurricular activity involvement. A measure of nongaming activities including participation in sports, reading, school-related clubs, nonschool clubs, religious activities, and music/art/drama activities was developed from a previous activities scale (Lerner et al., 2005). Six items inquired about level of participation in each of these activities during an average week. Responses were summed for an overall level of participation in nongaming activities. (As the questions

address activity level across multiple domains, high consistency was not expected and not assessed.)

Video game violence exposure. Several past research studies (Anderson & Dill, 2000; Ferguson, Rueda, et al., 2008) have measured violent video game exposure by asking respondents to subjectively rate the amount of violence in video games that they had played. This approach has some merits but runs the risk of having participants use widely divergent criteria for assigning the same label. In the current study, we took a slightly different tack, using existing Entertainment Software Ratings Board (ESRB) video game ratings as an estimate of violence exposure. Respondents were asked to write the names of five video games that they had "played a lot" in the past 6 months. ESRB ratings were then obtained for each game and ordinally coded (a maximal score of 5 for "Mature," 4 for "Teen," etc.). This ordinal coding system was designed to correspond to the levels of the ESRB rating system (although at the time of data collection, the E10+ rating was not yet being used).

Many factors go into an ESRB rating, including language, sexual content, and use of (or reference to) drugs or gambling. However, among those factors that determine the age-based rating, violence appears to take priority. (Of the 30 "content descriptors" that accompany ratings, 10 concern violence.) Descriptors of listed games were reviewed to ensure that high ratings had not been obtained primarily for sexual content; this was not the case for any of the games. The ratings were summed across the five games listed, then multiplied by the number of hours per week that the child reported playing video games. As with all attempts to assess game content exposure, this is only an estimate; however, it removes some of the subjectivity inherent in previous methods.

Outcome Measures

Delinquency. A six-item Likert scale of general delinquency was compiled from several existing delinquency scales (Brener et al., 2002; Elliot, Huizinga, & Ageton, 1985; Leffert et al., 1998). Questions addressed physical aggression (been in a physical fight, hit or beat up someone) as well as more general delinquency (stole something from a store; got into trouble with the police; damaged property just for fun, such as breaking windows, scratching a car, or putting paint on walls; skipped classes or school without an excuse). Participants were asked to report how often these behaviors occurred within the previous 12 months. Coefficient α for the resultant scale was .75 for the current sample.

Bullying. The Revised Olweus Bully/Victim Questionnaire (Olweus, 1996) was used to assess bullying behaviors. The bullying perpetration scale consisted of nine items in which participants were asked to rate how often they had engaged

in bullying behaviors during the past months. Items inquire about physical aggression, verbal aggression, threats, and social exclusion. A coefficient α of .86 was obtained for the current sample.

Aggression when angry. A three-item Likert scale was developed to measure aggressive reactions to angry feelings. Respondents were asked how often they "yell or curse," "break or damage something," or "slam doors or punch walls" when they feel angry. This scale obtained a coefficient α of .75 with the current sample.

Catharsis seeking. To assess beliefs related to video games' utility as a release for aggression and frustration, a four-item Likert scale was created. As part of a larger series of questions on motivations for electronic game play, respondents were asked whether they used such games to "help me relax," "help me feel less lonely," "help me get my anger out," and "help me forget my problems." Internal reliability of the resultant scale was .80 for the current sample.

Procedure

Study protocols and materials were approved by the Partners Healthcare System human research committee and were designed to comply with American Psychological Association standards for the ethical treatment of human participants. Parents were notified about the study through two avenues: school newsletters and notices sent home with students, which included contact information for the study principal investigator. An "opt out" procedure was used for parental consent. A youth assent to participation, including information about the study and the voluntary nature of participation, was read aloud to students from a standardized script on the day of participation. Identifying information was removed from the surveys and discarded prior to data analysis. Teachers were not involved in data collection or present during the distribution and collection of the surveys. All data were compiled into SPSS data software. Primary data analysis used for the testing of the study hypotheses were hierarchical multiple regressions. All students were included in all analyses to maximize generalizability.

Results

Data Collection Sites

To verify the similarity of the two data collection sites, bivariate correlations between school (suburban or urban) and predictor and outcome variables were conducted. To be conservative in assessing any potential a priori differences between schools, Bonferroni correction was not applied to these analyses. No

significant differences between the two schools were found, which suggests that data collection site was not a moderator variable.

Again, we note that the results discussed below are correlational in nature and not intended to support causal inferences.

Video Game Consumption Habits: Who Plays?

Video game playing and exposure to violence in video games were both common in the current sample. Only 98 participants (7.8%) reported no frequently played games during the previous 6 months. A further 140 children (11.2%) reported playing exclusively E-rated nonviolent games. Thus, 1,016 children in the sample (81.0%) had at least some recent exposure to violence in video games. Regarding use of M-rated games, 48.8% named at least one such game among those they had recently played. Preference for violent video games (as measured by exposure) was not related to age ($r = .01$).

Assessing results by gender, 67.9% of boys and 29.2% of girls reported playing at least one M-rated title in the previous 6 months. Boys ($M = 44.5$, $SD = 33.3$) had much greater exposure to violent games than did girls ($M = 17.8$, $SD = 18.3$) overall, Levene's $p < .001$, $t(868.31) = 17.05$; $p < .001$; $r = .50$, $.46 < r < .54$. Gender thus overlaps 25% with the variance in violent video game exposure. This finding highlights the importance of avoiding the interpretation of bivariate correlations between video game violence exposure and aggression, as these may reflect only well-documented gender differences in aggression.

The variance in boys' exposure to violent video games suggests important underlying variables affecting whether specific boys (or girls) select violent video games to play. To further examine factors related to violent video game play, we ran a hierarchical multiple regression with gender entered first, parental involvement and family/peer support entered second, and stress, trait aggression, and catharsis seeking entered on the third step. Violent video game preference, as indicated by violent game exposure, was the outcome variable. Five regressions overall were run as part of the present study, and a Bonferroni correction of $p < .01$ was used for statistical significance.

Results of this regression are presented in Table 1. Results indicated a predictive relationship $R = .54$ ($R^2 = .29$) that was statistically significant, $F(6, 798) = 54.17$, $p < .001$, for the overall model. Only gender ($\beta = -.38$, partial $r = -.39$, $-.44 < r < -.34$), catharsis seeking ($\beta = .23$, partial $r = .26$, $.21 < r < .31$), and trait aggression ($\beta = .15$, partial $r = .14$, $.09 < r < .19$) were uniquely predictive of violent video game preference. Collinearity diagnostics demonstrated the absence of multicollinearity effects, with the lowest tolerance value of .71 and highest variance inflation factor (VIF) of 1.46. Thus, preference for violent video games

Table 1. Violent Game Preference Regression: β Weights and Significance of Entered Variables

Variable	b	β	*t* test	Significance
Constant	35.97		4.02	.001*
Gender	−22.49	−.38	−12.02	.001*
Parental involvement	−0.23	−.03	−1.00	.32
Family/peer support	0.06	.02	0.54	.59
Stress	−0.32	−.03	−0.96	.34
Trait aggression	0.98	.15	4.09	.001*
Catharsis seeking	2.10	.24	7.70	.001*

*$p < .01$.

appears to be determined largely by male gender and aggressive personality traits as well as the belief that violent games will reduce frustration. Other external variables were not related to video game preference. Interestingly, parental involvement did not influence video game preference.

The Influence of Violent Games on Outcomes From a Multivariate Perspective

Hierarchical multiple regressions were used to analyze the impact of violent video game exposure on outcome variables from a multivariate perspective. In all models, gender was entered on the first step; parental involvement, stress, and family/peer support entered on the second step; extracurricular activity level and trait aggression entered on the third step; and violent video games entered on the final step.

The first outcome variable examined was delinquent behaviors (including physical aggression). Results are presented in Table 2. Results indicated a predictive relationship $R = .65$ ($R^2 = .43$) that was statistically significant, $F(7, 807) = 86.11$, $p < .001$, for the overall model. Only trait aggression ($\beta = .39$, partial $r = .38$, $.33 < r < .43$), family/peer support ($\beta = -.10$, partial $r = -.11$, $-.16 < r < -.06$), and stress ($\beta = .34$, partial $r = .38$, $.33 < r < .43$) were uniquely predictive of delinquent behavior. Although activity level approached significance ($\beta = .07$, partial $r = .08$, $.03 < r < .13$), the resultant effect size was less than $r = .10$ and thus of trivial importance. Video game violence exposure was not predictive of delinquency, and the effect size observed was less than $r = .10$. Collinearity diagnostics demonstrated the absence of multicollinearity effects, with the lowest tolerance value of .65 and highest VIF of 1.54.

Table 2. Delinquency Regression: β Weights and Significance of Entered Variables

Variable	b	β	*t* test	Significance
Constant	–3.00		–3.21	.001*
Gender	–0.03	–.01	–0.15	.88
Parental involvement	–0.01	–.01	–0.34	.73
Stress	0.40	.34	11.57	.001*
Family/peer support	–0.03	–.10	–3.14	.01*
Trait aggression	0.30	.39	11.83	.001*
Extracurricular activity level	0.06	.07	2.40	.02
VGV	0.01	.05	1.49	.14

Note: VGV = video game violence exposure.
*$p < .01$.

Table 3. Bullying Regression: β Weights and Significance of Entered Variables

Variable	b	β	*t* test	Significance
Constant	–2.47		–2.14	.03
Gender	–0.12	–.02	–0.46	.64
Parental involvement	0.06	.07	2.05	.04
Stress	0.33	.26	7.78	.001*
Family/peer support	–0.03	–.09	–2.38	.02
Trait aggression	0.22	.27	7.06	.001*
Extracurricular activity level	0.01	.01	0.33	.74
VGV	–0.01	–.01	–0.40	.69

Note: VGV = video game violence exposure.
*$p < .01$.

The second outcome variable examined was bullying behaviors. Results are presented in Table 3. These indicated a predictive relationship $R = .48$ ($R^2 = .23$) that was statistically significant, $F(7, 808) = 33.87$, $p < .001$, for the overall model. Only trait aggression (β = .27, partial $r = .24$, $.19 < r < .29$) and stress (β = .26, partial $r = .26$, $.21 < r < .31$) were uniquely predictive of bullying behavior. Video game violence exposure was not predictive of bullying, and the effect size observed was less than $r = .10$. Collinearity diagnostics demonstrated the absence of multicollinearity effects, with the lowest tolerance value of .67 and highest VIF of 1.52.

The third outcome variable examined was anger. Results are presented in Table 4. These indicated a predictive relationship $R = .58$ ($R^2 = .34$) that was statistically significant, $F(7, 813) = 58.58$, $p < .001$, for the overall model. Trait aggression (β = .25, partial $r = .24$, $.19 < r < .29$), family/peer support

Table 4. Anger Regression: β Weights and Significance of Entered Variables

Variable	b	β	*t* test	Significance
Constant	3.55		3.66	.001*
Gender	0.64	.10	2.93	.01*
Parental involvement	0.00	.00	0.01	.99
Stress	0.34	.30	9.45	.001*
Family/peer support	–0.07	–.20	–6.00	.001*
Trait aggression	0.19	.25	7.12	.001*
Extracurricular activity level	0.00	.01	0.18	.86
VGV	0.01	.11	3.32	.001*

Note: VGV = video game violence exposure.
*$p < .01$.

(β = –.20, partial $r = –.21, –.26 < r < –.16$), stress (β = .30, partial $r = .31, .26 < r < .36$), violent video game exposure (β = .11, partial $r = .12, .07 < r < .17$), and gender (β = .10, partial $r = .10, .05 < r < .16$) were all uniquely predictive of anger. Collinearity diagnostics demonstrated the absence of multicollinearity effects, with the lowest tolerance value of .66 and highest VIF of 1.52.

Discussion

Study results are discussed in relation to the study hypotheses. Our conclusions are based on correlational data, not designed to support causal inferences. Therefore, our discussion focuses on predictive risk relationships. Our first hypothesis was that the influence of video game violence effects on delinquency and physical aggression would become null once other relevant variables were controlled. This hypothesis was supported. Only trait aggression and the amount of stress that children had experienced in their lives recently were predictive of delinquent behaviors. Although family and peer support was also statistically significant, the resultant effect size was so small (partial $r = –.11$) that we are cautious about interpreting this variable.

The second hypothesis of this study was that the influence of video game violence effects on bullying behaviors would become null once other relevant variables were controlled. This hypothesis was supported. As with delinquent behaviors, trait aggression and stress best predicted bullying behaviors.

A combination of trait aggression and environmental stress was consistently related to delinquent and bullying behaviors. Last, aggressive individuals were

slightly more likely to prefer violent video games, although this preference had no direct effect on their delinquent or bullying behaviors.

On the other hand, parent involvement and family/peer support were poor predictors of delinquent and bullying behaviors. A greater influence for family variables, in particular, was expected. Previous studies have found significant family environment effects for aggression and violence (Caspi et al., 2002; Ferguson, Rueda, et al., 2008). It may be that it is *family violence* in particular that is predictive of aggressive behaviors. Other family environment variables may have little to no influence on aggression. Unlike past studies (Caspi et al., 2002; Ferguson, Rueda, et al., 2008), our study did not examine family violence. Questioning minors about family violence raises ethical concerns, particularly for clinical researchers who may have a duty to inform law enforcement whenever child abuse is reported. Also, young adolescents' self-report data on family violence may not be valid. Nonetheless, this is a limitation of the current study. We suggest that future research look more deeply into the potential moderating effects of family violence exposure in media violence research. Similarly, our study did not take genetic effects into account. If feasible, it would be valuable to control for genetic effects in later studies, particularly given the enormous influence of genetics on aggressive and violent behavior (Ferguson, 2010; Rhee & Waldman, 2002).

Another potential weakness of this study lies in measurement of violent content exposure, which presents difficulties to all researchers in this field. Neither asking participants to rate the amount of violence in games that they play (Anderson & Dill, 2000; Ferguson, Rueda, et al., 2008) nor repurposing the existing ESRB rating system, as we have done, is a satisfactory or sufficient system. Future attempts to validate media violence exposure measures, including ones that consider potential effects of the *context* of media violence, would be welcome. Finally, as with most survey research, the issue of self-selection bias is always a concern. Future designs might incorporate techniques such as propensity score matching to examine and control for potential self-selection bias effects.

General Conclusions

Results of the present study do not support the common social belief that violent video game exposure constitutes a significant public health risk for the general population of minors. These analyses found little evidence for the assertion that playing violent video games is a useful predictor of youth delinquency or bullying behaviors.

We offer several suggestions in the hope that these may help guide future policy-relevant research on violent video games:

1. Use more consistent standards for the interpretation of effect sizes, the meaningful interpretation of null results (rather than merely invoking Type II error without considering the meaningfulness of effect size), and consistent standards for identifying the validity of social science measures.

We are concerned that interpretation of effect sizes remains, too often, inconsistent, as do specious arguments for the validity of psychological measures, particularly aggression measures (Ritter & Eslea, 2005; Tedeschi & Quigley, 1996). We suggest, for instance, that aggression measures ought to demonstrate validity coefficients of at least $r = .4$ with meaningful real-world outcomes such as violent crime, physically aggressive behaviors toward other persons, bullying, domestic violence, and so forth (Ferguson & Rueda, 2009). Validity coefficients of .4 are reasonable (Anastasi & Urbina, 1996), although many aggression measures currently used in research fail to reach this standard.

2. Focus on multivariate analyses of video game violence effects.

Bivariate correlations, in particular, may be so corrupted by other third variables such as gender and trait aggression as to be nearly uninterpretable. Meta-analytic studies of video games should avoid bivariate correlations; they are likely to be distorted by gender effects, trait aggression, and other variables, thereby rendering meta-analytic results meaningless. Researchers might also cast a wider net, going beyond social learning to consider other theoretical approaches (including the role of genetics) and to incorporate variables from multiple disciplines that research suggests play a role in aggressive and violent behavior.

3. Distinguish normal/adaptive aggression from pathological aggression (Hawley & Vaughn, 2003; P. Smith, 2007).

Most video game studies, particularly experimental studies, have failed to make such distinctions. Given that the results from such studies are often generalized to hostile aggressive acts and violence—not only by politicians and the public but also occasionally by scientists—future measures should establish clinical cutoffs that identify scores indicative of pathological aggression. Merely demonstrating small increases within normal aggressive limits is not sufficient to generalize to serious aggressive behaviors and violence. Such an improvement in methodology would be valuable in providing greater understanding of the practical significance of research on aggressive behavior, including that of video game violence effects.

Examining the influence of video game and other media violence on youth violence is a serious and worthy undertaking. However, as noted, considerable methodological limitations have rendered it difficult to come to clear conclusions about video game violence effects. To move this field of research forward, we argue that future studies should be held to stronger standards of evidence. Indeed, Sherry (2007) made a similar appeal: "Further, why do some researchers (e.g. Gentile & Anderson, 2003) continue to argue that video games are dangerous despite evidence to the contrary?" (p. 244).Toward this end, clearer standards for the interpretation of practical significance warrant discussion. Several scholars have noted that over-interpretation of results with weak effect sizes runs the risk of producing misinformation; low effect size results tend to be unreliable, inconsistent across studies, and particularly prone to Type 1 error and publication bias effects (Ferguson, 2009; Smith & Ebrahim, 2001). For instance, Ferguson (2009) argues that effect sizes below $r = .20$ are particularly problematic, while noting that even higher effect sizes need to be carefully examined in relation to measurement and design features of the particular study in question. As noted above, we argue that increased use of multivariate analyses, improved measurement of youth violence, and the establishment of effect size guidelines for practical significance will be instrumental in shaping this research field in years to come. Given that research on video game violence is so often discussed in the context of serious violent offenses, we wish to highlight the recommendation that social scientists take greater care when both measuring youth violence accurately and avoiding sweeping generalizations to real-world acts of violence. Indeed, some scholars have been tempted to posit links between media violence and school shootings (Anderson, 2004; Anderson & Dill, 2000) and even the 9/11 terrorist attacks (Bushman & Anderson, 2002), despite using research tools that do not generalize to such phenomena.

We suggest that it is time for social scientists to step back from a focus on video game violence effects and put the research on video games and other media violence into a broader scientific context. In doing so, we may gain substantial insights that also have practical utility in countering youth violence.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support for the research and/or authorship of this article: This research was supported by Grant No. 2003-JN-FX-0078 awarded by the Office of Juvenile Justice and Delinquency Prevention, Office of Justice Programs, U.S. Department of Justice.

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