The Hitman Study

Violent Video Game Exposure Effects on Aggressive Behavior, Hostile Feelings, and Depression

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Abstract. This article explores commonly discussed theories of violent video game effects: the social learning, mood management, and catharsis hypotheses. An experimental study was carried out to examine violent video game effects. In this study, 103 young adults were given a frustration task and then randomized to play no game, a nonviolent game, a violent game with good versus evil theme (i.e., playing as a good character taking on evil), or a violent game in which they played as a "bad guy." Results indicated that randomized video game play had no effect on aggressive behavior; real-life violent video game-playing history, however, was predictive of decreased hostile feelings and decreased depression following the frustration task. Results do not support a link between violent video games and aggressive behavior, but do suggest that violent games reduce depression and hostile feelings in players through mood management.

Keywords: computer games, aggression, aggressive behavior, mass media, coping behavior, stress, resilience (psychological), leisure time, depression, emotional states

Whether violent video games cause aggression or violent crime has been a source of contention in public and academic circles. In 2005 the American Psychological Association (APA) released a resolution on violence in video games suggesting a link between violent video games and aggression may surpass that for television (American Psychological Association, 2005). However, some scholars have also questioned this link (e.g., Ferguson, 2007a; Olson, 2004; Sherry, 2007; Unsworth, Devilly, & Ward, 2007; Williams & Skoric, 2005). This debate and confusion was evident after the Virginia Tech Shootings in the United States where pundits including Jack Thompson and Philip McGraw (Dr. Phil) quickly blamed video game violence. Ultimately the Virginia Tech Review Panel (2007) found that Seung-Hui Cho, the shooter, did not play violent video games at all.

Two Opposing Theories of Violent Video Game Effects

Social Learning Theory

Social learning theories of aggression (Anderson & Bushman, 2002; Huesmann, 1986; Patterson, DeBarysche, & Ramsey, 1989) have dominated most of the discussion of video game violence. For instance, the General Aggression Model (GAM; Anderson & Bushman, 2002) suggests that exposure to violent media fosters the development of cognitive "scripts" related to aggression. This model focuses primarily on external forces including media that foster the development of aggressive scripts. An unspoken assumption of the GAM, however, is that the human mind is incapable of distinguishing between fictional/fantasy and real life and selecting which stimuli are most useful to model.

Debate exists about whether the literature supports social learning theories of video game violence exposure (e.g., Carnagey & Anderson, 2004; Sherry, 2007). Although some studies provide evidence for violent game exposure leading to increased aggression (e.g., Anderson & Murphy, 2003; Bartholow & Anderson, 2002; Bartholow, Bushman, & Sestir, 2006) there are also a number of studies which do not support this link (e.g., Colwell & Kato, 2003; Ferguson, et al., 2008; Unsworth et al., 2007; Williams & Skoric, 2005).

Early meta-analyses (Anderson, 2004; Anderson & Bushman, 2001) found small but significant effects for video game violence on aggressive behavior (r = .14 for aggression toward other people). This was interpreted as highly supportive of the social learning model. However, these authors have been criticized in US courts for failing to cite articles that contradicted the authors' views (e.g., ESA, VSDA, & IRMA v. Blagojevich, Madigan & Devine, 2005). Sherry (2001) found similar effects (r = .15 for aggression in general, although not specified as aggression toward another person). Sherry, however, found concerns in the weak effect size for the social learning perspective. He also noted that this effect size was lower than that seen for television violence, which questioned the APA's task force assertion that video games may lead to stronger effects than television (APA, 2005). In an update Sherry (2007) was more critical of the social learning perspective, suggesting

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that this model is not well supported by the available data. Ferguson (2007a) found that publication bias and the use of unstandardized and poorly validated measures of aggression greatly inflated the effect sizes seen in video game research. As corrected effect size estimate confidence intervals crossed the zero point into negative effects, Ferguson concluded that the theorized social learning relationship between violent video games and aggression could not be supported by the current literature.

The Catharsis Hypothesis

The catharsis hypothesis posits that aggression is a biological drive which requires release (Lorenz, 1963). Aggression may be primed by external provocations (such as competing for mates) but the ultimate cause is biological and evolutionary adaptation (Ellis & Walsh, 1997). Organisms may displace aggression from one source to another. For instance, a human may release aggression by engaging in aggressive sports rather than harming another person.

Although some early studies appeared to support the catharsis hypothesis (e.g., Feshbach, 1961) these were not followed by further confirmations. Geen and Quanty (1977) in their review concluded that the research evidence did not support catharsis.

Several recent researchers have challenged this in regard to video games. Sherry (2007) found that the effect size for studies examining violent video game playing and aggression decreases with longer video game exposures. Although Sherry does not unequivocally support the catharsis hypothesis, he does suggest that it should be better evaluated.

Olson, Kutner, and Warner (2008), in a qualitative study of young boys, found that respondents reported feeling calmer, less aggressive, and less angry after playing violent video games. Tentatively, the authors suggest that the catharsis hypothesis may bear reexamining in relation to violent video games.

It is worth noting that most studies of violent video game effects do not directly study catharsis. The most proper way of studying catharsis would begin by irritating or frustrating participants and then randomizing them to violent or nonviolent games to study which calmed participants. Most studies of violent video games take the opposite tact, namely taking "calm" participants and randomizing them to video game conditions to see which increase aggression. This approach is not adequate for testing catharsis.

It remains possible that the catharsis hypothesis may be technically wrong, yet video games may function as a leisure activity which promotes coping with stress (Iwasaki, MacTavish, & MacKay, 2005; Lazarus, 1999). Previous research has suggested that leisure activities can reduce stress (Iwasaki, Mannell, Smale, & Butcher, 2002; Trenberth, Dewe, & Walkey, 1999) and that these findings may extend to the use of video games (Ryan, Rigby, & Przybylski, 2006). If violent video games are employed as a stress coping technique by some individuals we would expect stress-related sequelae including hostile feelings and depression to be reduced in game players.

Video Games and Mood Management

Mood-management theory suggests that media consumers will choose specific media that best suit their current mood state with the goal of reducing depressed mood (Zillman, 1988). In particular, media which distracts individuals from a depressed mood is more likely to be selected (Dillman-Carpentier et al., 2008). Although media selection can be quite idiosyncratic, previous research suggests that negatively valenced media, that is media with dark themes or violent content, may be sought out by individuals with depressed mood (Chen, Zhou, & Bryant, 2007; Nabi, Finnerty, Domschke, & Hull, 2006; Strizhakova and Krcmar, 2007). Dillman-Carpentier et al. (2008) suggest that depressed adolescents may seek out media which is exciting including media with violent content, and that such media may improve depressed mood.

In regard to the mechanism for a positive effect for violent games on depression, Nabi et al. (2006) suggest that individuals with depressed mood and regret will seek out media that will best allow them to come to terms with their emotions. Violent games in particular may offer an avenue for exploring feelings of disappointment, loss of power and control, and helplessness, by offering circumstances over which the individual can virtually assert control and power, and accomplish tangible and immediate goals in the game world. Although both violent and nonviolent games may provide outlets along these lines, violent games may particularly provide opportunities for coping with frustration and hostile feelings aroused through stressful or depressing life events via the assertion of power and dominance over virtual settings and situations. Feelings of helplessness and lack of goal directness have long been implicated in the etiology of depression (Healy & Williams, 1988). Similarly hostile feelings have been linked with depressive conditions (Barefoot, Williams, Siegler, & Schroll, 1995; Keltikangas-Jarvinen & Heironen, 2003). Hostile feelings may represent one particular component of depression that is particularly susceptible to amelioration through mood management using violent video games. As such violent video games may provide mood management for coping with stress and depression as some previous research has suggested (Colwell, 2007; Olson et al., 2008).

The present study examined causal effects of video game playing on aggressive behavior, hostile feelings, and depression. Unlike most previous studies of violent video game effects, participants were first exposed to a frustration task to irritate them. This approach allowed for testing social learning and catharsis models of aggression as well as the mood-management approach. The social learning theory would be best supported if playing violent games (either random assignment in the laboratory or real-life playing history), compared to nonviolent games or no game at all, increases aggressive behavior. The catharsis hypothesis would be supported if playing violent games reduces aggressive behavior. The mood-management approach would be supported if exposure to violent video games is associated with reductions in hostile feelings or depressed feelings. There will be two main approaches to examining the hypotheses of the current study.

1) The main experimental analyses. In the main analyses the effects of randomized exposure to violent or nonviolent or no-game conditions were examined in relation to aggressive behavior, hostile feelings, and depression.
2) Follow-up analyses. In the follow-up or nonexperimental analyses, previous real-life violent video game exposure was examined via hierarchical regressions for relationships with aggressive behavior, hostile feelings, and depression.

These two sets of analyses explored the short-term laboratory effects, as well as longer-term real-life effects of violent video game exposure. Both sets of analyses controlled for the potential effects of gender and trait aggression, as these variables have been demonstrated to have a relationship with aggression in previous studies (Anderson & Dill, 2000; Ferguson et al., 2008).

Method

Participants

Participants consisted of 103 young adults recruited from a Hispanic-serving public university in the South of the United States. Of these students 62 (60.2%) were men and 41 (39.8%) were women. Regarding ethnicity, 98 (95.1%) were Hispanic, 3 (2.9%) were (non-Hispanic) Caucasian, and 2 (1.9%) declined to answer. The ethnic distribution of the sample was similar to that of the student body of the university. The mean age of the sample was 23.6 (SD = 5.82). Average education level was equivalent to a college sophomore in the United States (2nd year of postsecondary education). Data were collected over a 1-year period in 2007.

Materials

Frustration Task

A computerized version of the paced auditory serial addition task (PASAT; Gronwall, 1977) was used to induce frustration in all participants. The PASAT involves adding an accelerating sequence of simple numbers, each number to the number before it. However the "answer" to each set of numbers tends to create an interference effect as many participants intuitively wish to add new numbers to the previous "answer," not the previous number. The sequence of digits gradually accelerates making the task more and more difficult. Originally designed as a neuropsychological measure of cognitive processing speed, reviews of the PASAT have found that it is extremely irritating, frustrating, and anxiety provoking (Tombaugh, 2006). This was confirmed on debriefing with our current sample who universally found the PASAT to be unpleasant and frustrating.

Video Games

In the current study four separate conditions were used in order to test for a range of violence levels. The most violent game exemplar was *Hitman: Blood Money* (for which this article is named) which has received an M (Mature) rating from the Entertainment Software Ratings Board (ESRB) due to extreme violent content. Hitman allows players to carry out killings for hire. As such, the player is essentially a "bad guy." The second game exemplar with violent content selected was *Call of Duty 2* in which the player plays as an Allied soldier in World War II combating Nazi soldiers. In this case players play as a "good guy" and the game violence is framed as morally acceptable. This game was rated T (Teen) for violent content.

Two nonviolent conditions were included as well. The game *Madden: 2007* was chosen as a nonviolent game exemplar and consists of developing football plays for a football team of the player's choice. The game includes no violent content and is rated E (Everyone) by the ESRB. Inclusion of a sports game with no fighting or destruction is consistent with definitions of nonviolent games used by other researchers (Funk & Buchman, 1995). Given that the intention of sports-related behaviors such as tackling is to follow the rules of the game and not to injure others, rule-based sports-related actions such as tackling or blocking are not typically considered violence (Thompson & Haninger, 2001). This allowed us to include a game with action, yet which was nonviolent.

The last condition was a no-game control condition used to examine how each of the three games compared to a time lapse "cooldown" period. Participants in this condition were never told they would play a commercial video game but instead were given a cover story that a computer malfunction was going to delay their participation in the reaction time test (discussed shortly) by about 45 min (identical to the amount of time other participants played a game). Participants in this condition participated in the PASAT task, as the other participants, but instead of subsequently playing a video game were given the cover story and then allowed a 45-min "cooldown" period in which they were not given a directed activity, effectively making this condition a "behavior as usual" condition. Participants did remain in the same laboratory room as did participants who played video games, although the video game console was not in sight. This condition allows for the three video game conditions to be compared to time-related "cool down" from the initial frustration of the PASAT task. A "fun task" was specifically not given as we wished to examine the difference between video game playing and unmitigated frustration.

All three of the video games were released at approximately the same time and all three got positive reviews from gaming sites and proved to be popular games. At the time that the study was conducted all of the games were "new release." All games were played on an XBOX 360 game console to enhance the ecological validity of the study in comparison with those that used older consoles or computers such as the Mac, which is an atypical gaming platform.

Demographic Sheet

On a single page, participants indicated their age, gender, self-described ethnicity, and education level.

Aggressive Behavior

This experiment used a modified version of the Taylor Competitive Reaction Time Test (TCRTT) that is procedurally identical to those used in other studies of media violence (e.g., Anderson & Dill, 2000; Ferguson et al., 2008). The TCRTT provides an opportunity for the participant to play a "reaction time game" against a fictional opponent. Participants were told that their opponent was in an adjoining room, with computers connected via Ethernet. Participants are asked to set the level of a noise blast that will serve as punishment for their competitor in a reaction time game. This noise blast can vary both in terms of intensity (loudness) and duration. For each of the 25 trials, participants are told that if they win, their opponent will hear the noise blast they have set, and if they lose, they will hear a noise blast that their opponent has set for them. The pattern of wins and losses is actually preset in the computer, as there is no human opponent. White noise levels range between 0 and 95 decibels.

Ferguson et al. (2008) reported potential validity problems with the duration measure and recommended a standardized assessment procedure focused on the mean of all intensity trials. That standardized assessment procedure is used here. The internal consistency coefficient alpha of the 25 trials on the TCRTT was used to examine the reliability of this laboratory measure of aggression. The reliability of intensity scores was found to be ($\alpha = .94$) for the current sample.

Video Game Habits

A measure of video game-playing habits (VGH) adapted from that described in Anderson and Dill (2000) was used to measure the VGH. Participants were asked to report the top five video games that they most regularly played, noting how often they played these games and how violent the story of the game was using Likert-scale items. Composite scores were obtained across the games the participants played by multiplying the frequency score by the violence score, then summing across all five games. This allowed for a general measure of video game-playing habits in participants. In our sample, the measure of exposure to violent video game obtained an alpha coefficient of .84 across the top five games. It should be noted that this is not a perfect measure of violence exposure. However, due to the wide range of games available for play, as well as the rapid production of new games, objective ratings of violent content in games quickly become outdated and require significant expense to produce. Further, it is unlikely that such ratings themselves would be objective, as they would reflect experimenter beliefs as to what constitutes violence.

Trait Aggression

To measure trait aggressiveness, participants completed the Aggression Questionnaire-Short Form (AQ) (Buss & Warren, 2000). The shortened version of AQ consists of the summed score of the first 15 items of the original 34-item version and was designed to measure the degree to which respondents endorse statements about their levels of aggression. Items are responded to using a 5-point Likert scale. The AQ has been demonstrated to have good predictive validity (Felsten & Hill, 1999) and convergent validity with other measures of trait aggression (Garcia-Leon et al., 2002). Within the current sample, the AQ obtained an alpha coefficient of .85.

Hostile Feelings

The State Hostility Scale (SH; Anderson, Deuser, & DeNeve, 1995) is a 35-item Likert-type scale in which respondents are asked to report on their current mood. Respondents are asked to rate a series of adjectives whether these describe them from "strongly disagree" to "strongly agree." Items included on this scale tend to reflect an irritated, angry emotional state. In our sample this measure demonstrated an internal consistency of .92 at pretest and .95 at posttest. It is worth noting that an affective measure of hostile feelings should not be assumed to correlate with physically aggressive behavior. However, many social learning theories of media effects (e.g., Anderson & Dill, 2000) include hostile feelings as part of their models and test for effects on aggression. Thus, this measure was used to examine potential mood-management or modeling effects related to hostile feelings.

Depression Severity

The Beck Depression Inventory-II (BDI) was utilized to assess for symptoms of depression. This measure is 21-item assessment of the severity of depression to be used in people of ages 13 and over (Beck, 1996). Scores on each item range from 0 to 3. In our sample this measure demonstrated an internal consistency of .86 at pretest and .87 at posttest. This measure was included to examine potential mood-management effects for dealing with stress promoted by violent video game play.

Follow-up Survey

A follow-up survey was given to participants after they had completed all tasks. This survey asked participants about their perceptions of the video games they had played and whether they found the games to be fun, exciting, and/or frustrating; how competent they felt playing the game; whether they had played the game before; and whether they would choose to play the game of their own free will in their personal lives. Participants were asked to rate each of these factors on a 5-point Likert scale. Four of these items

(frustrating, exciting, competent, and play of free will) were highly correlated with each other ($\alpha = .77$) and were used to make a measure of game experience. Previous research (Anderson & Dill, 2000) has noted that violent video games are often perceived more positively than nonviolent video games. In the present study, the measure of game experience was found not to differ between the three game conditions, $F(2, 74) = 0.35$, $p > .05$; $r = .07$, $-.16 \leq r \leq .29$, giving us confidence that the current design has avoided this potential pitfall.

Procedure

Figure 1 presents the procedure sequence in detail. All procedures were IRB approved and designed according to APA ethical standards. Participants signed up for a 2-hour individual appointment time. Only one participant was run through the procedure at a time. Participants were given a cover story for the study: that the study was designed to examine reaction time performance. They were informed that the study would conclude with them playing a reaction time test against a human opponent seated in a nearby room with computers communicating through the local Ethernet. After informed consent, participants were given the surveys and then administered the PASAT task. Following the PASAT task, participants were asked to rate their hostile feelings and depression (pretest). Following this, participants were randomly assigned to one of the four video game conditions (i.e., Hitman: Blood Money, Call of Duty 2, Madden 07, or no game). All participants were allowed to play the game for a 45-min interval (again with the exception of the no-game condition). After this interval, the game was stopped, and the TCRTT begun.

After the TRCTT task was completed, participants were asked to fill out the follow-up questionnaire as well as the postevaluation for depression and hostile feelings. Finally, all participants were thoroughly debriefed, informed of the deception in the TCRTT and the hypotheses of the study, thoroughly queried for suspicion and impact of the PASAT, and invited to ask any questions. All participants in the study denied suspiciousness regarding the deceptive nature of the study and all participants regarded the PASAT as unpleasant and frustrating. We commonly heard that the experiment would have been "fun" or "interesting" if not for the PASAT task which, of course, was what we hoped for.

All analyses were conducted using SPSS software.

Results

Participants in the current study were generally familiar with video games. Among women, 73.2% had at least some experience with video games over the past year. Only 10% had never played a violent game at any point in the past. However only 27% of women were current regular players, playing at least once a week. Among men, 84% had some experience with video games over the past year and only 8% had never played a violent game. Regarding regular video game play, 71% of men reported playing video games at least once a week.

Table 1 presents groups equivalence data for the randomized game-playing groups. One-way ANOVAs were used to assure randomly assigned video game-playing group equivalence between the four groups in relation to age, real-life video game violence exposure, and trait aggression. Chi-squared analyses were used to assure group equivalence for gender and ethnicity. In all cases no differences were found between groups, giving confidence that random assignment was successful in producing equivalent groups.

To test the impact of video game group on aggressive behavior an ANCOVA was employed with video game group as the independent variable with gender and trait aggression scores used as covariates. Results indicated no differences between randomly assigned groups $F(3, 93) = 0.28$, $p > .05$; $r = .05$, $-.15 \leq r \leq .24$. As indicated in Table 1, violent content in video games had no impact on aggressive behavior. Although results were not significant the no-game control was the most aggressive group, lending credence to the conclusion that video games do not foster aggression. The use of effect size confidence intervals alleviates much of the risk of either Type I or Type II errors. Nonetheless, to further rule out the possibility that the ANCOVA may have missed "true" differences, we ran a more powerful t test on the two groups with the greatest mean difference (Madden 07 and the no-game control). Results confirmed the absence of significant differences $t(49) = -1.02$, $p > .05$; $r = .14$, $-.14 \leq r \leq .40$.

To test the impact of video game-playing group on hostile feelings (SH) a mixed ANCOVA design was used. Differences from pretest to posttest scores on the hostile feelings measure (i.e., time) were used as the within-subject independent variable. Group assignment was the between-subjects independent variable. Gender and trait aggression scores were used as covariates. A significant interaction between time and group would have supported game-playing condition having an effect on hostile feelings. However, in this case the interaction effect between time and group was not significant $F(3, 92) = 0.01$, $p > .05$; $r = .01$, $-.18 \leq r \leq .20$.

To test the impact of video game-playing group on depression (BDI) a mixed ANCOVA design was used. Differences in pretest and posttest scores on the depression measure (i.e., time) and group assignment were independent variables. Gender and trait aggression scores were used as covariates. An interaction effect between time and group would have been supportive of game-playing condition having an effect on depression. In this case the interaction effect between time and group was not significant $F(3, 89) = 0.43$, $p > .05$; $r = .07$, $-.13 \leq r \leq .26$. Trait aggression, as a covariate, was significantly related to depression scores $F(1, 89) = 35.56$, $p < .001$; $r = .53$, $.38 \leq r \leq .66$ and there was a trait aggression by time interaction $F(1, 89) = 5.41$, $p < .05$; $r = .24$, $.05 \leq r \leq .41$ suggesting that more aggressive individuals tended to remain more depressed.

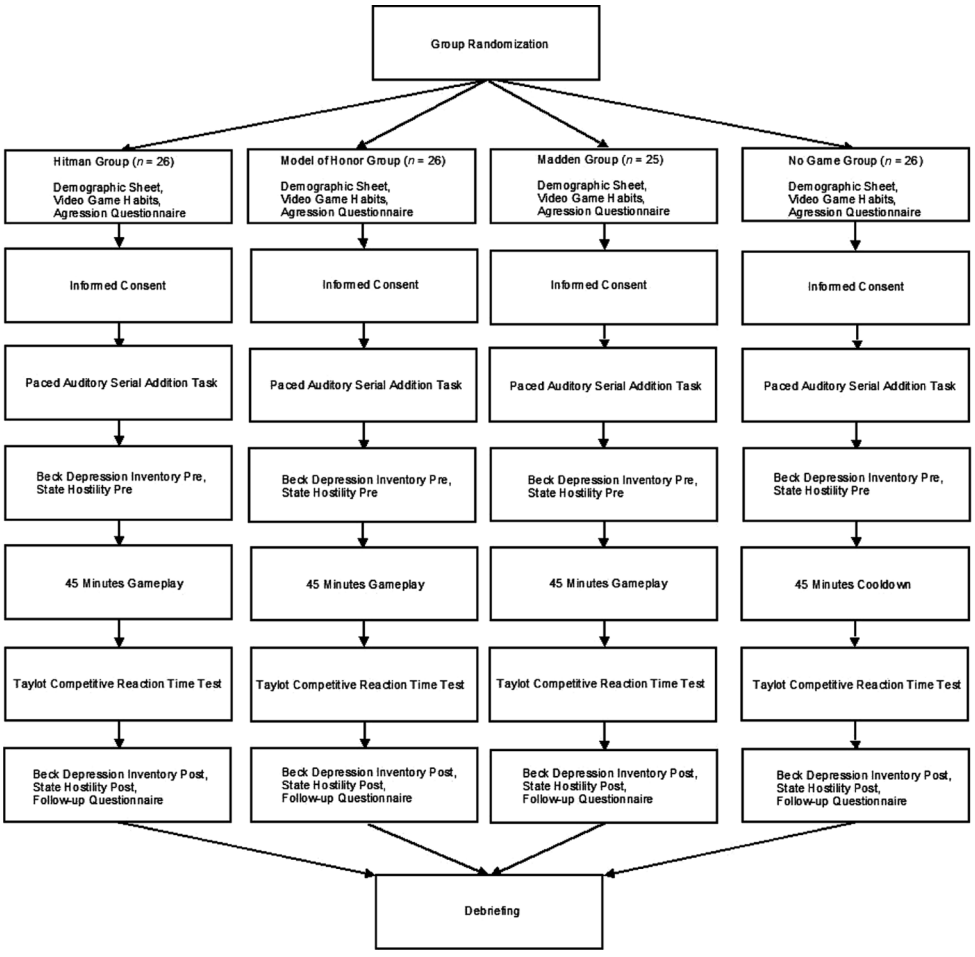

Figure 1. Graphical representation of experimental procedure.

Table 1. Group equivalency means for randomized video game groups

Condition	Age	Violent game exposure	Trait aggression	Aggressive behavior (TCRTT)	*N*
Hitman (antisocial violent)	25.2 (8.1)	25.3 (26.5)	27.8 (7.9)	6.03 (1.95)	26
Call of duty 2 (prosocial violent)	23.2 (4.5)	17.3 (15.8)	28.9 (11.0)	6.02 (2.05)	26
Madden 07 (nonviolent)	22.8 (4.6)	25.2 (22.2)	24.6 (8.3)	5.89 (2.03)	25
No-game control	23.1 (5.2)	18.5 (16.7)	31.4 (9.6)	6.52 (2.24)	26

Note. Standard deviations are in parentheses. All group differences were not statistically significant. TCRTT = Modified Taylor Competitive Reaction Time Test.

Follow-up Analyses

It is possible that exposure to video games in real life may have an influence on aggression, hostile feelings, and depression outcomes. As such we augmented the randomized design with a quasi-experimental design with real-life violent video game exposure (VGH) as the main independent variable. Note that the following results are correlational in nature and should not be taken to infer causality as they do not benefit from random assignment. Table 2 presents the bivariate correlations between the variables used in these analyses. A Bonferroni correction of $p = .0018$ for significance was used for Type I error correction due to multiple comparisons.

To test the effects of real-life exposure to violent video games using the video game habits questionnaire on aggressive behavior in the laboratory environment a hierarchical multiple regression was used. Violent video game exposure (VGH) was entered on the first step to give this variable of interest maximal predictive potential. Trait aggression was entered on the second step, followed by gender. The resultant model $R = .18$ ($R^2 = .03$) was not significant $F(3, 95) = 1.09$, $p > .05$.

To test the effects of real-life exposure to violent video games using the video game habits questionnaire on hostile feelings (SH) following a stressful activity (PASAT) a hierarchical multiple regression was used. These results are presented in Table 3. SH pretest scores were added on the first

Table 2. Bivaraiate correlations between multiple regression variables

Variable	1	2	3	4	5	6	7	8
(1) Video game violence	1.00	.27	−.44*	.14	−.10	−.21	.12	−.04
(2) Trait aggression		1.00	−.08	.15	.20	.17	.57*	.41*
(3) Gender			1.00	−.09	.05	−.01	.03	.01
(4) Aggressive behavior (TCRTT)				1.00	.04	−.01	.08	.07
(5) Hostility pre					1.00	.61*	.18	.10
(6) Hostility post						1.00	.11	.19
(7) Beck depression inventory pre							1.00	.74*
(8) Beck depression inventory post								1.00

Note. TCRTT = Modified Taylor Competitive Reaction Time Test.
*$p \leq .0018$.

step to control for individual variations in hostile feelings. Violent video game exposure (VGH) was entered on the second step to give this variable of interest maximal predictive potential. Trait aggression was entered on the third step, followed by gender. SH posttest scores were the outcome variable. The resultant model $R = .66$ ($R^2 = .43$) was statistically significant $F(4, 95) = 17.63$, $p < .001$. Results indicated that, not surprisingly, hostile feelings pretest scores were the best predictor of hostile feelings posttest scores ($\beta = .57$; $t = 7.13$, partial $r = .59$, $.45 \leq r \leq .70$). Of much greater interest however, video game violence exposure was a significant predictor of reduced hostile feelings scores ($\beta = -.25$; $t = -2.77$, partial $r = -.28$, $-.45 \leq r \leq -.09$) indicating that individuals more experienced with violent video games were better able to calm themselves following a stressful experience. Collinearity diagnostics demonstrated the absence of multicollinearity effects with the lowest tolerance value of .74 and highest VIF of 1.36.

To test the effects of real-life exposure to violent video games using the video game habits questionnaire on depression (BDI) following a stressful activity (PASAT) a hierarchical multiple regression was used. These results are presented in Table 4. BDI pretest scores were added on the first step to control for individual variations in depression. Violent video game exposure (VGH) was entered on the second step to give this variable of interest maximal predictive potential. Trait aggression was entered on the third step, followed by gender. BDI posttest scores were the outcome variable. The resultant model $R = .75$ ($R^2 = .56$) was statistically significant $F(4, 90) = 28.95$, $p < .001$. Results indicated that, not surprisingly, depression pretest scores were the best predictor of depression posttest scores ($\beta = .74$; $t = 8.61$, partial $r = .67$, $.55 \leq r \leq .76$). Of much greater interest however, video game violence exposure was a significant predictor of reduced depression scores ($\beta = -.16$; $t = -1.98$, partial $r = -.20$, $-.38 \leq r \leq -.01$) indicating that individuals more experienced with violent video games were better able to avoid depression following a stressful experience. Collinearity diagnostics demonstrated the absence of multicollinearity effects with the lowest tolerance value of .62 and highest VIF of 1.62.

Table 3. Effects of real-life violent game exposure on hostility regression

Variable	*b*	Beta	*t* test	Significance
Constant	24.87		2.35	.02
Hostility prescore	.73	.57	7.13	.001*
Video game violence	−.27	−.25	−2.77	.01*
Trait aggression	.30	.12	1.49	.14
Gender	−4.53	−.10	−1.14	.26

Table 4. Effects of real-life violent game exposure on depression regression

Variable	*b*	Beta	*t* test	Significance
Constant	2.88		1.27	.21
Depression prescore	.69	.74	8.61	.001*
Video game violence	−.05	−.16	−1.98	.05*
Trait aggression	.02	.03	0.38	.70
Gender	−1.04	−.08	−0.97	.34

Discussion

No evidence was provided that short-term exposure to violent video games either increased or decreased aggressive behavior in the laboratory. Similarly violent game exposure in real life was not related to laboratory aggression. Given the use of effect size confidence intervals we can conclude that our evidence contradicts both the social learning and catharsis hypotheses regarding violent video game effects on aggressive behavior.

As with aggressive behavior, the evidence did not support that short-term randomized exposure to violent video games either increased or decreased hostile feelings or depression. By contrast long-term exposure to violent video games was associated with *reduced* hostile feelings and depression following a stressful task. Subjects who were exposed to violent video games were not less aggressive, but they were less hostile and depressed.

It does appear plausible that the use of violent video games, at least for some individuals, may provide a mood-management activity that provides them with an ability to tolerate stress. It should be emphasized, however, that these results come from the quasi-experimental portion of this

study, and as such true causality is difficult to infer. Violent games may provide a mechanism through which players can assert control over a virtual environment, offsetting feelings of helplessness or lack of control over real life, as well as hostile feelings arising independently or as sequelae of depression. Violent games, by providing both a means of aggressively demonstrating dominance and clear goal-directed behavior, may provide a particularly good medium by which the impact of real-life frustrations on depressed mood and hostile feelings may be reduced.

There has been other research (e.g., Ryan et al., 2006) that has suggested that playing video games, both violent and nonviolent, can lead to improved self-esteem and psychological well-being. Their view that video game play promotes well-being through autonomy and competence is consistent with the mood-management view presented in this paper.

The utility of violent video games as mood-management tools may have implications for the treatment of mood disorders, as well as other health-related conditions in which feelings of helplessness or hostility may be an issue. One study has offered some support for this potential. A violent first-person shooter game, Re-Mission, has been demonstrated to improve treatment adherence and self-efficacy of youth with cancer (Kato, Cole, Bradlyn, & Pollock, 2008). As such violent games may serve a psychoneuroimmunology-related function in decreasing depression and hostility and increasing feelings of control and self-efficacy for those with medical conditions.

The fervor over violent video games which has become intensely politicized (we would argue this unfortunately extends to the scientific community) may be "much ado about nothing." In the end, a game may simply be a game. Naturally it is quite acceptable and understandable for parents to monitor their children's consumption of violent video games for moral reasons. We applaud efforts to maintain accurate rating systems (whether the ESRB, PEGI, CERO, or BBFC) for video games and condemn efforts of video game producers to circumvent rating systems. At the same time we view it incumbent upon the scientific community to honestly portray the minimal practical risks of violent video game play for the majority of individuals. At this task we submit that the scientific community has failed and has, instead, indulged in the wider social moral panic surrounding this emerging technology, eschewing a rigorous (and indeed skeptical) analysis of the scientific data in favor of political posturing.

There has been research to suggest that violent video games may lead to some specific benefits, most notably improved visuospatial skills (e.g., Castel, Pratt, & Drummond, 2005; Ferguson, 2007b; Green & Bavelier, 2007). The effect sizes for this research appear to be considerably stronger than for the relationship between violent video games and aggression (Ferguson, 2007b). Thus a careful balancing of pros and cons of violent games should be undertaken.

The current study is not without limitations. First, although college students do represent a common demographic for video game playing, considerable caution should be used when applying results from the present study to noncollege populations. Related to this our sample was a Hispanic majority sample and caution should be used in applying results to other ethnic groups. However, we do view the use of a Hispanic majority sample as a broadening of previous Caucasian majority samples of Midwestern Americans commonly used in previous research (e.g., Anderson & Dill, 2000). Secondly, as with any laboratory-based study, effects may not always generalize to real-world environments, particularly as the development of highly valid aggression measures continues to be an ongoing process (Ritter & Eslea, 2005). In particular, generalizing results using laboratory aggression measures such as the TCRTT used in this study to serious acts of physical aggression or violence must be undertaken with the greatest caution, given the external validity limitations of such measures (Ferguson & Rueda, 2009).

We are hopeful that the data presented here are helpful in evaluating the impact of violent video games on behavior. Should this article foster further dialog on the matter, we believe that our purpose will have been served.

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