

and Bushman, 2001; Anderson and Dill, 2000; Dill and Dill, 1998]. However, there are serious gaps [Anderson, 2002]. One is the paucity of experimental research on violent video game effects on young women. This is a particularly interesting group because of frequent claims that violent media have little impact on females and young adults. Historically, girls and young women have spent relatively less time playing computer games in general than boys and young men, and show less interest in playing violent games [Buchman and Funk, 1996; Rideout et al., 1999]. This, in conjunction with the fact that females are less likely to commit violent crimes, may account for the lack of research attention to this group. To date, there are only two published experimental studies in which the effects of exposure to violent video games on young women's aggressive behavior is explicitly addressed. Anderson and Dill [Study 2, 2000] found a small but reliable increase in females' aggressive behavior as a result of playing a violent video game. Bartholow and Anderson [2002] found a significant increase in aggression on one measure, but not on another.

The Present Experiment

One goal of the present experiment was to conduct a conceptual replication of violent video game effects on aggression by young women. A second goal was to provide a preliminary look at one potential moderating variable of violent video game effects—gender of the controlled character. From the TV/movie violence literature, we know that factors which increase identification with an aggressive character tend to increase the media violence effect. One obvious factor is the gender match between the participant and the video game character controlled by the participant. Of course, in all violent video games players must identify with their violent game characters to some extent in order to play the game. Thus, adding other features designed to increase identification with the main character may have relatively little impact. But, it is certainly possible that controlling a same sex character will increase identification with that character, and hence may increase the effect on subsequent behavior. Finally, the experiment was designed to look at two potential mediating variables—instrumental aggressive motivation and revenge motivation (hostile aggression motivation).

METHOD

Participants

Ninety-one female undergraduates enrolled in an introductory psychology class participated for course credit. Participants were randomly assigned to one of three conditions: 33 played a violent video game with a female protagonist; 30 played a violent video game with a male protagonist; 27 played a nonviolent video game. Data from one participant were discarded because of missing values on key mediating variables.

MATERIALS

Video games. Participants played one of two video games: *Street Fighter II*, or *Oh No! More Lemmings*. *Street Fighter* is a third person fighting game, in which the player controls an on-screen character (male or female) who engages in a series of fights with other

characters. It is a “third person” game because the player sees her character from an external perspective. Street Fighter was played on a Sony Playstation video game system with a 19-inch television. Lemmings is a children’s game that involves helping lemmings reach safety by directing them to safe routes, by cutting holes through walls, building steps over pitfalls, and through other similar means. Lemmings was played on a Macintosh computer. Both games are relatively simple to learn, and thus do not require much practice. After playing the assigned game, participants performed the competitive reaction time task.

Competitive reaction time task. A modified version of the Taylor Competitive Reaction Time (TCRT) task was used to assess aggressive behavior. The TCRT is a widely used and externally valid measure of aggression [Anderson et al., 1999; Carlson et al., 1989; Giancola and Chermack, 1998]. TCRT participants compete with a fictitious person to see who can respond first upon presentation of a tone. After each trial the “loser” receives an aversive stimulus (e.g., loud noise), the intensity of which is supposedly set by the opponent. There is no real opponent. The pattern of wins/losses and the intensity of aversive stimuli received by the participant on “lose” trials are predetermined. The participant’s aversive stimulus settings for the “opponent” constitute the measure of aggressive behavior.

In this study we used a two-phase version of the task, one that we have successfully used in several experimental studies of aggression [Anderson et al., 2000; Bartholow and Anderson, 2002; Lindsay and Anderson, 2000]. Phase 1 of this Retaliation Competitive Reaction Time task (RCRT) consists of 25 trials in which the “opponent” sets the intensity of aversive noise to be delivered to the participant on “lose” trials. Possible settings are from 1 (55 decibels) to 10 (105db). A “zero” no noise option is also available. The participant sees the intensity supposedly set by the opponent on each trial, and receives a noise blast of this intensity on “lose” trials. However, the participant does not set noise levels for her opponent in Phase 1. Phase 2 is identical, except that the roles are reversed. The participant’s aversive noise settings (0–10), supposedly to be delivered to the opponent, constitute the aggression measure.

All participants received the same series of 13 wins and 12 losses in Phase 1. Trial 1 was a “win.” The remaining 24 trials were divided into three blocks of eight, with the participant winning and losing half in each block. The pattern of noise settings by the supposed opponent was an increasing provocation pattern [Anderson et al., 2000]. The settings ranged from 2–4 (60–70db) in Block 1, 4–7 (70–85db) in Block 2, and 7–9 (85–95db) in Block 3.

At the conclusion of Phase 1 the experimenter reminded participants that in Phase 2 they would set noise intensities for their opponent and would not themselves receive noise. Participants were given sample noise blasts of “2” (60db) and “8” (90db) prior to Phase 1. The measure of aggressive behavior was the same as one recently reported by Bartholow and Anderson [2002]—the number of attempts to deliver high intensity noise blasts (settings 8–10) to the opponent across the 25 trials of Phase 2.

Questionnaire. Following the RCRT task, participants answered a number of questions about the experiment, modelled on a questionnaire used by Bartholow and Anderson [2002]. Six items asked participants to “indicate the extent to which this motive describes your motive when deciding on where to set the noise levels.” Responses were on a 5-point unipolar scale anchored at 1 (not at all), 2 (a little bit), 3 (somewhat), 4 (quite a lot) and 5 (a lot). The 6 items were: (a) I wanted to impair my opponent’s performance in order to win more; (b) I wanted to control my opponent’s level of responses; (c) I wanted to make my opponent mad; (d) I wanted to hurt my opponent; (e) I wanted to pay back my opponent for the noise levels he/she set; (f) I wanted to blast him/her harder than he/she

blasted me. The first two items represent instrumental reasons for aggressing. They were positively correlated, $r = .46$, $P < .001$, and were combined to form an “Instrumental Motivation” index with a coefficient alpha of .63. The latter four items represent a revengeful type of aggressive motive, were highly correlated, and were combined to form a “Revenge Motivation” index with a coefficient alpha of .80. These results are similar to those reported by Bartholow and Anderson [2002]. The final questions probed for suspicion.

Procedure

Upon arrival participants were seated in front of the video game equipment. They then read and signed a consent form. They were shown how to play the assigned game, and then played the game for 20 minutes. They next performed the competitive reaction time task. Participants were informed that they would have no contact with their opponent during or after the experiment. After the competitive reaction time task, participants completed the questionnaire described earlier. During the final debriefing the experimenter probed for suspicion, explained all procedures, answered questions, and thanked the participant for her help.

RESULTS AND DISCUSSION

Correlations

Self-reported revenge motivation was positively correlated with instrumental motivation ($r < .31$, $P < .001$). Both revenge and instrumental motivation were positively correlated with the number of times that participants tried to deliver high intensity noise blasts to their opponent ($r_{\text{revenge}} = .50$, $n = 90$, $P < .001$; $r_{\text{instrumental}} = .26$, $n = 90$, $P < .05$). Indeed, the revenge correlation was significantly larger than the instrumental correlation, $t(87) = 2.22$, $P < .05$.

ANOVA on Aggressive Motivation

A mixed model ANOVA was performed on the motivation measures, with one repeated measures factor (Motive: revenge vs. instrumental) and one between subjects factor (Video game: Street Fighter-Female character vs. Street Fighter-Male character vs. Lemmings). The video game factor was further broken down into two a priori contrasts testing: (a) the difference between the two Street Fighter conditions (female vs. male character), and; (b) the difference between the average of the Street Fighter conditions versus the Lemmings condition. The main effect of motive type was not significant, indicating that participants on average reported about the same levels of revenge ($M = 1.78$) and instrumental ($M = 1.92$) motivation, $F(1, 87) = 1.57$, $P > .20$. Similarly, the interactions involving motive type and the video game manipulation were nonsignificant, $F_s < 1$, suggesting that revenge and instrumental motivation were similarly affected by the video game manipulation. Note that neither type of motivation was rated very high in absolute terms (i.e., less than 2.0 on a 1–5 scale).

Of greater theoretical interest was the contrast comparing the two Street Fighter conditions to the Lemmings condition, which was significant, $F(1, 87) = 6.05$, $P < .02$, $d = .40$. Participants who had played the violent game reported significantly higher levels of

aggressive motivation than did those who had played the nonviolent game, $M_s = 1.98$ and 1.59 , respectively.

There was a tendency for participants in the Street Fighter-Female condition to report higher levels of aggressive motivation than those in the Street Fighter-Male condition. This was particularly true for revenge motivation, but it was not significant, ($M_s = 2.00$ and 1.79), $F(1, 87) = .98$. This suggests that if aggressive motivation is driving aggressive behavior in this context, there is likely to be little difference in aggression between the two Street Fighter conditions.

ANOVA on Aggressive Behavior

Those who had played Street Fighter attempted to deliver more very loud noise blasts than those who had played Lemmings, $M_s = 6.58$ and 4.56 , respectively, $F(1, 87) = 6.83$, $P < .02$, $d = .56$. These results support the hypothesis that even brief exposure to violent video games can cause short term increases in aggressive behavior by young women. Women in the Street Fighter-Female group produced slightly more aggression than those in the Street Fighter-Male group, but this effect of the sex of character manipulation did not approach statistical significance, $M_s = 7.03$ and 6.13 for the female and male versions, respectively, $F(1, 87) = 1.11$, $P < .30$, $d = .26$. It is interesting to note, however, that the Street Fighter-Female group yielded significantly more aggression than the Lemmings condition, $t(87) = 2.83$, $p < .01$), whereas the Street Fighter-Male group did not, $t(87) = 1.76$, $.10 > P > .05$. Thus, there is some evidence for the proposed same-sex identification effect, but it is weak at best. The small (and nonsignificant) effect size suggests that a much larger sample size will be needed to reliably detect a true same-sex identification effect.

Aggressive Motivation as a Mediator of Aggression

To test whether either instrumental or revenge aggressive motivation mediated the violent video game effect on aggressive behavior, the Street Fighter vs. Lemmings analysis of aggressive behavior was run again with each of the motivation measures as a covariate. Given the relatively small correlation between instrumental motivation and number of high intensity settings, mediation by instrumental motivation is likely to be weak at best. The larger correlation between revenge motivation and aggression suggests that it is a more likely mediation candidate. One methodological feature to keep in mind while considering the mediation analyses is that both types of aggressive motivation were assessed after the aggressive behavior took place. This differs from the usual procedure of assessing potential mediating factors before the key dependent variable. We chose this unusual procedure because earlier studies in our lab have found that measuring intervening states often destroys the effects of independent variables on later aggression-related processes [e.g., Lindsay and Anderson, 2000].

Instrumental aggressive motivation. Inclusion of instrumental motivation as a covariate had little impact on size of the violent game effect on aggression. The Street Fighter vs. Lemmings contrast remained significant, $F(1, 86) = 4.58$, $P < .05$. Furthermore, the mean difference between the Street Fighter and Lemmings conditions, adjusted for instrumental motivation ($M_s = 6.48$ and 4.80 , difference = 1.68), was only slightly smaller than the corresponding mean difference without instrumental motivation in the model ($M_s = 6.58$ and 4.56 , difference = 2.02). Finally, the unique variance in aggression attributable to instrumental motivation was just barely significant, $F(1, 86) = 4.00$, $P < .05$.

Thus, there is little evidence that the violent video game effect on aggression was mediated by instrumental aggressive motivation.

Revenge motivation. Inclusion of revenge motivation as a covariate reduced the violent video game effect on aggression to marginal significance, $F(1, 86) = 3.89, P < .06$. Furthermore, the mean difference between the Street Fighter and Lemmings conditions, adjusted for revenge motivation ($M_s = 6.40$ and 5.01 , difference = 1.39), was considerably smaller than the corresponding mean difference without revenge motivation in the model (difference = 2.02). Finally, note that the unique variance in aggression attributable to revenge motivation was highly significant, $F(1, 86) = 24.44, P < .001$. This is evidence that the violent video game effect on aggression was at least partially mediated by increases in revenge motivation.

New Directions

There are numerous questions requiring additional empirical attention. Top on the list might be the need to identify specific features of violent video games that increase or decrease their impact on aggressive thoughts, feelings, and behaviors. A second set of questions concerns the long term effects of repeated exposure to violent video games, especially on children and teens. Over 30 years of research on TV and movie violence suggests that long term exposure to violent video games will have a sizable negative impact on their development. Indeed, there is reason to believe that video game violence effects may be larger than TV violence effects because of the highly engaging and active nature of video games [Anderson and Dill, 2000].

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