

Effects of Prosocial Video Games on Prosocial Behavior

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Previous research has documented that playing violent video games has various negative effects on social behavior in that it causes an increase in aggressive behavior and a decrease in prosocial behavior. In contrast, there has been much less evidence on the effects of prosocial video games. In the present research, 4 experiments examined the hypothesis that playing a prosocial (relative to a neutral) video game increases helping behavior. In fact, participants who had played a prosocial video game were more likely to help after a mishap, were more willing (and devoted more time) to assist in further experiments, and intervened more often in a harassment situation. Results further showed that exposure to prosocial video games activated the accessibility of prosocial thoughts, which in turn promoted prosocial behavior. Thus, depending on the content of the video game, playing video games not only has negative effects on social behavior but has positive effects as well.

Keywords: prosocial behavior, video games, priming

Video games were first created in the 1970s and since then have grown into a multibillion-dollar industry: The annual U.S. retail sales of video games reached more than \$9.9 billion in 2004 alone. Recent large-scale surveys show that 70% of homes with children ages 2 to 17 years have computers and 68% have video game equipment (Woodard & Gridina, 2000). Eighty-seven percent of children play video games regularly (Walsh, Gentile, Gieske, Walsh, & Chasco, 2003). Children ages 2 to 7 years spend an average of 3 to 5 hr a week playing video games (Gentile & Walsh, 2002), while 8th- and 9th-grade students average 9 hr per week (Gentile, Lynch, Linder, & Walsh, 2004). Video games are popular not only among children but also among young and middle-aged adults. As revealed by the November 2005 Nielsen Active Gamer study, the age group among players is expanding rapidly into the 25–40 age group (Nielsen Entertainment, 2005).

Despite the widespread popularity of video games, psychological studies on their effects are somewhat limited (Lee & Peng, 2006). In particular, studies on the positive effects of video games on social behavior are exceedingly rare as most of the existing research has illuminated the negative effects of violent video games. In fact, playing violent games (in which the predominant

goal is to injure or kill another game character) has been shown to lead to an increase in aggressive thoughts, feelings, and behavior (e.g., Anderson et al., 2004). However, are the social consequences of playing video games always negative? In the framework of the current research, we examine the possibility that playing video games with prosocial content (in which the predominant goal is to benefit another game character) may promote prosocial behavior. We begin by reviewing the results of previous research into the effects of violent video games on aggressive tendencies and present two theoretical models that attempt to explain these effects. Next, we discuss some indirect evidence for our main hypothesis that prosocial tendencies might be fostered by playing prosocial video games. We then present the results of four experiments that empirically tested this hypothesis.

Effects of Violent Video Games

The effects of violent video games on aggressive thoughts, feelings, and behavior are well documented. For instance, playing violent video games leads to an increase in aggressive thoughts (Anderson & Dill, 2000). Participants who had played a violent (relative to a nonviolent) video game were also more likely to produce a hostile expectation bias, which is the tendency to perceive harmful actions by others as intentional rather than accidental (Bushman & Anderson, 2002). Video games influence aggressive affect: Playing a violent video game increases state hostility and anxiety levels (Anderson & Ford, 1986). Finally, violent video games are positively associated with aggressive behavior. Correlational evidence (Gentile et al., 2004) indicated that playing violent video games is positively related to arguing with teachers and getting involved in physical fights. A longitudinal study of violent video game effects on aggression in children obtained

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similar results: Children who played more violent video games early in the school year became more aggressive (verbally and physically) and less helpful later in the school year (Anderson, Gentile, & Buckley, 2007). Also, experimental designs showed the positive association of violent video games and aggressive behavior: Participants who had played a violent video game set higher levels of noise punishment than participants who had played a neutral video game (Bartholow & Anderson, 2002). Meta-analyses have confirmed that violent video games cause an increase in aggressive behavior in children and adults (Anderson & Bushman, 2001; Sherry, 2001). Anderson and Bushman (2001) concluded that playing violent video games significantly increases aggression-related affect and thoughts, physiological arousal, and aggressive behavior. Sex, age, and type of research (survey vs. experiment) did not moderate the negative effects of violent video games.

Playing violent video games not only causes an increase in antisocial behavior but also leads to a decrease in prosocial behavior. For instance, participants who had played a violent video game donated less money to a charity (Chambers & Ascione, 1987). Subsequent research (Wiegman & van Schie, 1998) has shown that children with a high preference for violent video games showed significantly less prosocial behavior than those with a low preference for violent video games. In addition, participants who had played a violent video game were less likely to reward a confederate of the experimenter than participants who had played a nonviolent game (Ballard & Lineberger, 1999). Participants in a violent video game condition were also less likely to cooperate than participants in a nonviolent control condition (Sheese & Graziano, 2005). These findings were corroborated in the meta-analysis by Anderson and Bushman (2001): Playing violent video games significantly decreases prosocial behavior.

Thus, there has been accumulating evidence that exposure to violent video games leads to increased aggressive behavior while decreasing prosocial behavior. Surprisingly, almost no published studies have examined whether playing prosocial video games can increase prosocial behavior. As Anderson et al. (2004) put it, "a set of questions concerns possible positive effects of games designed to promote prosocial behaviors. . . . Virtually no research exists on this topic" (p. 244). The aim of the present research was to address whether playing video games not only affects social behaviors negatively (as previous research has shown) but may do so positively as well. More concretely, we tested the hypothesis that exposure to prosocial video games promotes prosocial action. The hypothesis builds upon two theoretical models, which address the effects of video games on social behavior.

Theoretical Perspectives: The General Aggression Model and the General Learning Model

Anderson and colleagues (e.g., Anderson & Bushman, 2002) proposed the general aggression model (GAM) to explain the effects of violent video games on antisocial behavior. According to this model, aggressive contents of violent media instigate aggressive behavior through their impact on the person's internal states (cognitive, affective, and arousal). These three routes are interrelated and influence each other. The present internal states, in turn, affect how events are perceived and interpreted, as well as what behavioral response is chosen. Thus, exposure to media violence

may evoke associations with aggressive cognitions, arousal, and affect related to violence, which may instigate aggressive actions.

Whereas there has been some evidence for the mediating effects of aggressive thoughts on aggressive action, so far evidence for the affective and the arousal route of the GAM is missing. For instance, Anderson and Dill (2000) found that participants who had played a violent (relative to a neutral) video game delivered longer noise blasts after they had been provoked. This effect was mediated by differences in the accessibility of aggression-related thoughts (see also Anderson et al., 2004). In contrast, because the video games were matched on arousal and aggressive affective properties, neither arousal states nor state hostility were differently affected by playing the video games.

Recently, Buckley and Anderson (2006) expanded the GAM into a general learning model (GLM) to explain how video games affect behavior. Like the GAM, the GLM proposes that input variables (personal and situational) affect a person's internal states (cognition, affect, and arousal) that guide the person's responses. Most importantly for the present investigation, the GLM proposes that the kind of associations that are activated by a video game depends on the content of the game played. As pointed out by Buckley and Anderson (2006), "playing a prosocial game can increase many forms of nonviolent outcome variables, such as the accessibility of prosocial thoughts" (p. 371), which may promote prosocial action.

However, whereas the predictive validity of the GAM for the effects of playing violent video games on aggressive tendencies is well documented, evidence for the predictive validity of the GLM for the effects of playing prosocial games on prosocial tendencies has been sparse. In the present research, we examined the hypothesis that playing a prosocial (relative to a neutral) video game promotes prosocial action. Because the effects of violent video games on aggression seem to operate mainly through the cognitive route of the GAM (e.g., Anderson et al., 2004; Anderson & Dill, 2000), we anticipated that exposure to a prosocial (relative to a neutral) video game would activate the accessibility of prosocial thoughts, which then would instigate prosocial behavior. However, we also controlled for the affective and the arousal route of the GLM. Before we present this research, some evidence for the possibility that prosocial media might increase prosocial behavior is briefly reviewed in the following.

Positive Effects of Exposure to Media on Social Behavior

Recent research (Greitemeyer, 2009a, 2009b) revealed that exposure to prosocial songs is related to prosocial tendencies: Listening to music with prosocial (relative to neutral) lyrics increased the accessibility of prosocial thoughts, empathy, and prosocial behavior. Similarly, there is evidence that television with prosocial content fosters prosocial behavior. For instance, in research by Sprafkin, Liebert, and Poulos (1975), children were exposed to films about the dog Lassie. In a prosocial condition, Lassie saved her puppies by barking for help. In the control condition, Lassie exhibited no prosocial behavior. Children in the prosocial condition were then more likely to help a puppy in need of help. This finding was corroborated by an early meta-analysis (Hearold, 1986): People who watched prosocial television content behaved more positively and held more positive attitudes. This analysis

even revealed that the effects of television with prosocial content on prosocial behavior were stronger and more enduring than the effects of television with antisocial content on antisocial behavior. Although a more recent meta-analysis by Mares and Woodard (2005) suggested that the effects of prosocial and antisocial television on social behavior are similarly strong (see also Paik & Comstock, 1994), one can conclude that television exposure may not only promote antisocial behavior but may also lead to prosocial behavior. As Mares and Woodard (2005) put it, "it is as easy to persuade viewers to be pleasant as it is to persuade them to be violent" (p. 313).

Compared to television, video games may have an even greater impact on social behavior. As suggested by Anderson and Dill (2000), the effects of violent video games (relative to television shows or movies) on antisocial behavior should be stronger as a result of the player's identification with the characters in the game, as a result of the addictive nature of video games, and because video games allow people to actively participate instead of just passively watching. Furthermore, the longitudinal study of Anderson et al. (2007) suggested that video game effects on aggression are stronger than television and movie effects. Video games offer excellent conditions for learning to occur: They simultaneously expose the player to modeling, rehearsal, and reinforcement of the social behavior that is involved in the game's theme (Buckley & Anderson, 2006).

Thus, there are good reasons to assume that playing video games with prosocial content may foster prosocial behavior. So far, however, empirical evidence for this hypothesis has been relatively sparse. In one study (Chambers & Ascione, 1987), children played a video game with either prosocial or aggressive content. In a control condition, no video game was played. Children who had played the aggressive video game donated significantly less than children who had played the prosocial video game. In contrast, relative to the control condition, playing the prosocial video game had no effect on donating. However, according to the authors of the study, this finding could have been due to the particular prosocial video game used: It involved prosocial acts only to a small extent (it mainly involved escaping danger). Thus, and because no manipulation check has been reported, it is unclear whether the prosocial video game employed was truly prosocial. Recently, Gentile and colleagues (2009) tested and found support for the hypothesis that playing prosocial (relative to neutral) video games is related to prosocial behavior. However, although these results are encouraging, assessed prosocial tendencies either relied on participants' self-report or were targeted toward a hypothetical partner. Moreover, Gentile and colleagues did not address the psychological mechanism by which playing prosocial video games increases prosocial behavior. To address these limitations, the present research (a) employed video games that clearly differ in the extent to which other game characters are supported, (b) assessed actual behavior toward real persons, and (c) aimed to clarify why playing prosocial video games increases prosocial behavior.

Overview of the Present Research

In four experiments, the effects of playing a prosocial video game on prosocial tendencies were examined. To this end, partic-

ipants played either a prosocial or a neutral video game (Experiment 1 also included an aggressive video game). A pilot study addressed the affective and arousal properties of the video games used in the main experiments. In Experiments 1–4, different measures of helping were assessed. In addition, Experiment 4 tested the hypothesis that the effect of the type of video game on prosocial behavior is mediated by the cognitive route of the GLM. More specifically, we expected that playing a prosocial (relative to a neutral) video game would increase the accessibility of prosocial thoughts, which in turn would foster helping behavior. In all experiments, participants were tested individually. Note that only the short-term effects of playing prosocial video games were examined. This point is more thoroughly discussed in the General Discussion.

Pilot Study

A first goal of the pilot study was to make sure that the prosocial, neutral, and aggressive video games used in the main experiments indeed differed in the perceived content (how prosocial and how antisocial) of the game. A second goal was to match the video games on affective and arousal dimensions. If affective and arousal properties of the video games used are relatively similar, then possible effects of the video games on prosocial behavior cannot work through the affective and the arousal route of the GLM.

To these ends, 54 participants (38 women, 16 men) were randomly assigned to play one of four video games. Participants were from the same participant pool as in the main experiments (German students, Ludwig-Maximilians-University, Munich, Germany). The age of the participants ranged from 19 to 58 years ($M = 26.15$). For participation, they received €3 (approximately \$4.50). Participants were told that we were choosing video games for use in future research and that they would be asked a variety of questions about their game experience. The four video games chosen were Lemmings, City Crisis, Tetris, and Lamers. Lemmings and City Crisis were chosen as prosocial video games, Tetris was chosen as a neutral video game, and Lamers was chosen as an aggressive video game. In Lemmings, players must guide groups of small beings through different worlds. The goal is to take care of the beings and to save them by leading them to the exit. In City Crisis, the goal of the game is to save lives and to promote the security of a city. The player acts as a helicopter pilot who has to rescue citizens from burning houses, support the police by chasing burglars, and so on. In Tetris, falling geometrical figures must be correctly positioned (Anderson & Dill, 2000, employed Tetris, which closely resembles Tetris as neutral video game). Lamers is the aggressive version of Lemmings: All beings must be killed, and the goal is that no one reaches the exit.

After participants played the video game for 10 min, affective and arousal data were assessed. Positive and negative emotions were assessed by employing the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The Perceived Arousal Scale (Anderson, Deuser, & DeNeve, 1995) contains 31 adjectives describing feelings of arousal (e.g., aroused) or lack of arousal (e.g., drowsy). Lack-of-arousal items were reverse scored. Then, participants completed a short questionnaire about the video game. They indicated how exciting the game was, how frustrating the game was, how prosocial the game was, and how

antisocial the game was (adopted from Anderson & Dill, 2000). These items were assessed using a scale from 1 (*low*) to 7 (*high*). Finally, they indicated how many of their actions during game play were prosocial and antisocial, respectively. These items were assessed using a percentage scale.

Mean ratings (and standard deviations) of the games are reported in Table 1. As can be seen, mood and arousal properties of the video games used were relatively similar. In addition, ratings of excitement and frustration were also relatively equal. In contrast, ratings of the content of the game significantly differed: As intended, the content of the two prosocial video games was perceived as being more prosocial than the content of the neutral video game and the aggressive video game, whereas the content of the aggressive video game was perceived as being more antisocial than the content of the neutral video game and the two prosocial video games. Moreover, participants in the prosocial video game conditions reported performing more prosocial acts than participants in the neutral video game condition and participants in the aggressive video game condition, whereas participants in the aggressive video game condition reported performing more antisocial acts than participants in the neutral video game condition and participants in the prosocial video game conditions.

In summary, as intended, the video games used clearly differed in the extent to which they were perceived as being prosocial and antisocial, respectively. At the same time, however, they matched on affective and arousal dimensions. Thus, effects of prosocial video games on prosocial behavior (if there are any) cannot be due to the affective and the arousal route of the GLM.

Experiment 1: Spontaneous Helping After a Mishap

Experiment 1 examined the influence of a prosocial, a neutral, and an aggressive video game on spontaneous, unrequested assistance. A frequently used measure of spontaneous prosocial behavior was adopted as the dependant variable: The experimenter accidentally spilled some pencils on the floor, and the participants could help him or her to pick them up (e.g., Macrae & Johnston, 1998). We expected that participants who had played a prosocial (relative to a neutral or aggressive) video game would be more

likely to help. In addition, we expected that the aggressive (relative to the neutral) video game would lower the degree of helping behavior.

Method

Participants and design. Fifty-four students (34 women, 20 men, Ludwig-Maximilians-University, Munich, Germany) were randomly assigned to one of the three video game conditions (prosocial vs. neutral vs. aggressive). The age of the participants ranged from 19 to 43 years ($M = 21.81$). For participation, partial course credit was given. The experiment was run by two female and two male experimenters.

Procedure and materials. When participants arrived at the laboratory, they were told that the aim of the study was to examine the enjoyment factor of classic video games. The prosocial game was Lemmings, the aggressive game was Lamers, and the neutral game was Tetris.

After a short explanation of the video game, the participant began playing the game. After 8 min, the experimenter explained that the game session was over and reached for the questionnaires the participant was required to fill out. By reaching for the questionnaires that were positioned on the table next to the participant, the experimenter knocked a cup of pencils off the table and onto the floor. The experimenter said something under her or his breath, paused to see whether the participant would help to pick up the scattered pencils, and then proceeded to pick them up. Whether the participant stood up and helped or not was recorded. Note that the experimenter was aware of the participant's experimental condition and thus could have subtly influenced the participant's behavior. We tried to avoid these experimenter effects by thoroughly training experimenters prior to the main experiment. The aim of this training was to keep the experimenters' behavior the same across conditions. For instance, experimenters were trained to pause for exactly 5 s before they picked up the pencils themselves (see van Baaren, Holland, Kawakami, & van Knippenberg, 2004).

Then, after the pencils were picked up, participants completed the PANAS. Participants also responded to two questions measur-

Table 1

Mean Ratings (Standard Deviations in Parentheses) of Experienced Affect and Arousal and Video Game Ratings as a Function of Type of Video Game (Pilot Study)

Game rating	Video game				F^a	η^2
	Lemmings (prosocial)	City Crisis (prosocial)	Tetris (neutral)	Lamers (aggressive)		
Positive affect	2.76 (0.59)	2.76 (0.67)	2.64 (0.52)	2.42 (0.52)	1.10	.06
Negative affect	1.37 (0.47)	1.25 (0.24)	1.30 (0.39)	1.45 (0.50)	0.58	.03
Arousal	3.50 (0.53)	3.51 (0.69)	3.67 (0.56)	3.71 (0.42)	0.49	.03
Exciting	3.31 (1.32)	3.00 (1.68)	3.07 (1.54)	2.64 (1.50)	0.45	.03
Frustrating	1.92 (1.26)	2.77 (1.54)	2.21 (1.85)	2.14 (1.41)	0.72	.04
Prosocial	4.75 (1.82)	5.15 (1.52)	1.93 (1.14)	1.07 (0.47)	32.02*	.66
Antisocial	1.67 (0.98)	2.15 (1.14)	1.00 (0.00)	5.36 (1.14)	58.21*	.78
Prosocial acts	68.30 (31.00)	72.30 (29.80)	6.40 (13.40)	3.10 (8.50)	36.73*	.70
Antisocial acts	19.20 (23.10)	6.20 (13.90)	1.40 (5.30)	92.90 (12.70)	115.74*	.88

^a $df = 3, 50$.

* $p < .001$.

ing their liking of the video game on a 7-point Likert-type scale (0 = *not at all*, 6 = *absolutely*). These two items were highly correlated and were thus collapsed into one liking scale ($\alpha = .86$). Finally, participants answered demographic questions, were thanked, were probed for suspicion, and were thoroughly debriefed. In debriefing, none of the participants indicated any suspicion of a relationship between playing the video game and the spilling of the pencils. In addition, none of the participants suspected playing the video game to have influenced the decision to help pick up the pencils.

Results and Discussion

As expected, participants who had played a prosocial video game were more likely to pick up the pencils than were those who had played a neutral or an aggressive video game, $\chi^2(2, N = 54) = 6.51, p < .05, w = .35$ (medium effect size; Cohen, 1988). Of the 18 participants who had played the prosocial game, 12 helped to pick up the pencils. Of the 18 participants who had played the neutral game, 6 helped. Of the 18 participants who had played the aggressive game, 5 helped. That is, 67% of the participants in the prosocial video game condition helped, whereas 33% in the neutral video game condition and 28% in the aggressive video game condition did so. In other words, most participants in the prosocial video game condition helped, whereas most participants in the other conditions failed to do so.

No significant effects were found for mood, either on the positive affect scale (prosocial: $M = 2.54, SD = 0.66$; neutral: $M = 2.73, SD = 0.61$; aggressive: $M = 2.52, SD = 0.59$), $F(2, 51) = 0.64, p = .53, \eta^2 = .02$, or on the negative affect scale (prosocial: $M = 1.19, SD = 0.30$; neutral: $M = 1.40, SD = 0.45$; aggressive: $M = 1.53, SD = 0.57$), $F(2, 51) = 2.74, p = .09, \eta^2 = .08$. Participants liked the aggressive game ($M = 2.75, SD = 1.32$) less than the prosocial ($M = 4.00, SD = 1.21$) and the neutral games ($M = 4.06, SD = 1.26$), $F(2, 51) = 6.14, p < .01, \eta^2 = .19$. This finding may account for the decreased likelihood of receiving help in the aggressive video game condition (relative to the prosocial game condition). However, because liking did not differ between the prosocial and the neutral game conditions, it cannot account for the increased likelihood of receiving help in the prosocial video game condition relative to the neutral game condition. In addition, liking was not significantly associated with picking up the pencils, $r(54) = .01, p = .97$. Finally, when we controlled for positive and negative mood, liking of the video game, participant sex, sex of experimenter, and the interaction of the latter two, type of video game still significantly predicted helping behavior ($\beta = 1.61, SE = 0.73, Wald = 4.84, p < .05$).

In summary, these results offer an initial confirmation of our assumption that prosocial video games may promote prosocial behavior. Of particular significance is the fact that the participants in the prosocial game condition did help more not only in comparison to the participants in the aggressive condition but also in comparison to the participants who played the neutral game. Unexpectedly, participants in the aggressive condition were almost equally likely to help as participants in the neutral condition. Prior research has shown that exposure to violent (relative to neutral) video games decreases prosocial behavior (Anderson & Bushman, 2001). Note, however, that participants in the present study played the video games for only 8 min, whereas most previous experi-

mental video game studies used considerably longer exposure times. Thus, it is conceivable that longer exposure to the video games would have yielded significant differences among the neutral and the aggressive video game condition.

Experiment 2: Assistance in Further Studies

As noted above, experimenters in Experiment 1 were aware of the participants' experimental condition, and thus, they might have subtly influenced the participants' responses. Therefore, in Experiment 2, the experimenter who assessed the dependent measure was unaware of the participants' experimental condition. In addition, a different measure of requested helping was assessed: After participants thought the study was over, they were asked if they were willing to assist in further studies and how much time they would devote. This measure was modified from Nelson and Norton (2005, Study 2). We expected that participants in the prosocial video game condition would be more willing to take part in further experiments and would devote more time than participants in the neutral video game condition.

In Experiment 2 (and the following experiments), we did not utilize an aggressive video game condition. Experiment 1 demonstrated that the prosocial video game led to more helping than the aggressive video game. Because aggressive (relative to neutral) video games usually lead to a decrease in prosocial behavior (for a review, see Anderson & Bushman, 2001), comparing the effects of prosocial video games on prosocial behavior with those of neutral video games is the more conservative test.

Method

Participants and design. Forty students (20 women, 20 men, Ludwig-Maximilians-University, Munich, Germany) ages 18 to 56 years ($M = 26.28$) were randomly assigned to one of the two video game conditions (prosocial game vs. neutral game). They received partial course credit for participation.

Procedure and materials. The procedure and materials were similar to Experiment 1. The same prosocial and neutral video games were employed (Lemmings and Tetris). After participants played for 10 min, the experimenter stopped the game and handed the participants a short questionnaire that included demographic questions and the two items of the liking scale ($\alpha = .94$). Then, participants were told that the experiment was over. At this time, the experimenter introduced a confederate who allegedly needed participants for her master's thesis. The confederate, who was unaware of the participants' experimental condition, asked the participants to indicate whether they would be willing to take part in further experiments. For these experiments, however, no compensation would be provided. Participants indicated if they would be willing to take part (yes or no) and how much time (in minutes) they could devote. Finally, participants were probed for suspicion, debriefed, and thanked. None of the participants indicated any relation between playing the video game and willingness to take part in further studies.

Results and Discussion

Replicating Experiment 1, playing a prosocial (relative to a neutral) video game fostered prosocial behavior: All 20 partici-

pants who played Lemmings were willing to assist in further studies, whereas 13 out of 20 participants who played Tetris offered their further assistance, $\chi^2(1, N = 40) = 8.43, p < .01, w = .46$ (medium effect size; Cohen, 1988). That is, 100% of the prosocial video game condition helped, whereas 68% in the neutral video game condition did so. In addition, participants who played Lemmings were willing to devote more time ($M = 33.06, SD = 27.34$) than participants who played Tetris ($M = 14.74, SD = 16.20$), $t(35) = 2.50, p < .05$, Cohen's $d = .82$. (Some participants did not respond to this item. When these participants were treated as if they were not willing to further assist, the effect of type of video game on prosocial behavior was very similar.)

As in Experiment 1, no difference on the liking scale for the prosocial and the neutral games emerged, $t(38) = 0.66, p = .51$, Cohen's $d = .21$: Liking of Lemmings ($M = 3.28, SD = 1.39$) was similar to liking of Tetris ($M = 2.90, SD = 2.11$). Furthermore, when we controlled for liking of the video game and participant sex, the effect of type of video game on willingness to assist in further experiments in minutes remained significant ($\beta = .36, p < .05$). Similar findings were obtained when we used the dichotomous variable.

Experiment 3: Helping a Harassed Woman

A major limitation of Experiments 1–2 was that we used only one prosocial video game. Thus, our findings may have been due to specific features of the particular game used and are not generalizable to other prosocial video games. Furthermore, the requested prosocial behaviors in Experiments 1–2 were relatively simple, with only a few action alternatives (picking up a pencil or not, being willing to assist in further studies or not), and did not involve severe negative consequences. Previous research (e.g., Greitemeyer, Fischer, Kastenmüller, & Frey, 2006; Weyant, 1978) has shown that the decision to help or not is affected differently for low- and high-cost behaviors. For instance, the number of bystanders affected helping with low potential costs for the help-giver but did not affect helping with high potential costs (Fischer, Greitemeyer, Pollozek, & Frey, 2006). Possibly, prosocial video games promote relatively simple low-cost prosocial behavior (as Experiments 1–2 suggest) but do not affect high-cost helping activities. To test this notion, in Experiment 3, participants played a different prosocial game, and a complex prosocial behavior with high potential costs for the help-giver was requested. As in Experiment 2, we made sure that the experimenter who recorded the dependent measure was masked to the participant's experimental condition. As an additional refinement, a manipulation check was included. This was done (a) to make sure that the video games differed in the extent to which they were perceived as being prosocial and (b) to test whether perceived content would mediate the effect of type of video game on helping behavior. If prosocial content indeed is what distinguishes the video games used, this is exactly what should occur (Bushman & Anderson, 2002).

Method

Participants and design. Thirty-six students (13 women, 23 men, Ludwig-Maximilians-University, Munich, Germany) were randomly assigned to one of the two video game conditions

(prosocial vs. neutral video game). For participation, they received €4 (approximately \$6.00). Ages ranged from 19 to 43 years ($M = 23.64$).

Procedure and materials. Participants arrived at the laboratory, where two female experimenters were waiting for them. Tetris was used as the neutral video game; the prosocial video game was City Crisis. One of the experimenters began the game, while the other experimenter was not aware of the participant's experimental condition. After participants played the video games for 8 min, the experimenter who started the game left the room and informed a male confederate that he should enter the laboratory in another 2 min. The confederate was also masked to the experimental condition. He was instructed to play the role of a lonesome ex-boyfriend who does not want to accept that his girlfriend left him and who harasses his ex-girlfriend. When the confederate entered the laboratory room, he completely ignored the participant and approached the female experimenter with the words "Ah, there you are! I was looking for you in the whole building! Why do you ignore me like that? Why do you do that to me? Now you have to talk to me!" The confederate talked loudly, then shouted and kicked a trash can, and in the end, he pulled the arm of the female experimenter to force her to leave the room with him. The female experimenter was instructed to react reservedly and passively. She always repeated the following sentences with a low voice: "Shush, be quiet please. I have to work in here, I cannot talk to you. You are disturbing the experiment. Please do not be so loud."

As a measure of prosocial behavior, whether the participant intervened or not was recorded. This was done by the experimenter and the confederate. There was perfect agreement. The minimum criterion was that the participant said something intended to stop the ex-boyfriend, either to the female experimenter (e.g., asking if she needed help or felt harassed) or to the male confederate (e.g., saying that he should leave her alone). If the participant intervened, the confederate was instructed to stop and to leave the laboratory. If the participant did not intervene, the second experimenter entered the room after 2 min, when the confederate started pulling the female experimenter's arm. In a loud voice, she said to the confederate, "You again! Get lost or I will call someone to kick you out!" After the confederate left, the harassed experimenter apologized for the disturbance and asked the participant to go on with the experiment. The participant played the video game for another minute and filled out a short questionnaire afterward. The questionnaire included the PANAS, the two items of the liking scale ($\alpha = .83$), and two manipulation-check questions ("How prosocial was the content of the video game?" and "How courageous was the content of the video game?") to answer on a 7-point scale (0 = *not at all*, 6 = *absolutely*). These were highly correlated ($r = .68$) and thus combined into a prosocial index ($\alpha = .80$). Because experience of the harassment situation could have been a strain for the participants, the debriefing was thorough and detailed to make sure that participants did not feel any emotional harm. In debriefing, none of the participants revealed suspicion about any relatedness between playing the video game and the harassment situation. Moreover, none of them indicated any belief that the harassed situation was not real.

Results and Discussion

The manipulation check was successful: The perceived content of the prosocial game received a higher score on the prosocial index ($M = 3.91$, $SD = 1.45$) than the perceived content of the neutral game (prosocial: $M = 1.62$, $SD = 1.43$), $t(32) = 4.64$, $p < .001$, Cohen's $d = 1.59$.

Most importantly, as in Experiments 1–2, playing a prosocial video game fostered helping behavior. Ten out of 18 participants who played City Crisis intervened, whereas 4 out of 18 participants who played Tetris did so, $\chi^2(1, N = 36) = 4.21$, $p < .05$, $w = .34$ (medium effect size; Cohen, 1988). That is, 56% of the participants in the prosocial video game condition helped, whereas 22% in the neutral video game condition did so.

No difference on the liking scale for the prosocial and the neutral games emerged, $t(34) = 0.53$, $p = .60$, Cohen's $d = .18$: The degree of liking of City Crisis ($M = 2.53$, $SD = 1.51$) was similar to that of Tetris ($M = 2.78$, $SD = 1.33$). There were also no significant effects on mood, either on the positive (prosocial: $M = 2.45$, $SD = 0.77$; neutral: $M = 2.58$, $SD = 0.66$), $t(34) = 0.54$, $p = .60$, Cohen's $d = .18$, or on the negative affect scale (prosocial: $M = 1.53$, $SD = 0.59$; neutral: $M = 1.67$, $SD = 0.61$), $t(34) = 0.71$, $p = .49$, Cohen's $d = .23$. Finally, when we controlled for positive and negative mood, liking of the game, and participant sex, the effect of type of video game on helping remained significant ($\beta = 1.89$, $SE = 0.89$, Wald = 4.51, $p < .05$).

In contrast, when the prosocial index was used as a covariate, the effect of type of video game on helping disappeared ($\beta = 0.80$, $SE = 0.94$, Wald = 0.72, $p = .40$).¹ Thus, one can have confidence that, indeed, the extent to which the video games are prosocial in content (and not any other game features) accounts for the effect of type of video game on helping behavior.

The results of this experiment replicate and expand upon Experiments 1–2. Playing a prosocial video game not only fostered low-cost prosocial behavior (as Experiments 1–2 revealed) but also fostered high-cost prosocial behavior. Research has shown that prosocial behavior is less likely when the consequences are higher (Piliavin, Dovidio, Gaertner, & Clark, 1981). In this regard, Schwartz and Howard (1981) argued that people anticipate (more or less consciously) positive and negative consequences and integrate this weighing into their decision to help or not. If the negative consequences clearly surmount the positive consequences, helping is rather unlikely. Participants in this experiment had to anticipate severe negative consequences if they decided to intervene. They might have been insulted or even attacked by the (allegedly) furious ex-boyfriend. Accordingly, only about 1 out of 5 participants who had played a neutral video game intervened. In stark contrast, almost 3 out of 5 participants who had played a prosocial video game intervened. Thus, it seems that playing a prosocial video game could instigate prosocial behavior even when the participant feared severe negative consequences. Note, however, that it is conceivable that some participants who intervened did not do so to benefit the harassed experimenter but rather to harm the offender. To disentangle these different motives, future research is needed.

To summarize Experiments 1–3, we feel it safe to conclude that playing a prosocial (relative to a neutral) video game fosters prosocial behavior. In Experiment 1, participants who had played a prosocial video game were twice as likely to help. Experiment 2 showed that participants who had played a prosocial game would have devoted

more than twice the time to assist in further experiments. Finally, Experiment 3 demonstrated that participants who had played a prosocial video game were almost three times as likely to intervene.

Experiment 4: Accessibility of Prosocial Thoughts as a Mediating Mechanism

In Experiment 4, we sought to examine why playing prosocial video games fosters prosocial behavior. Past research into the effects of violent video games on aggressive behavior has demonstrated that these effects operate primarily through the cognitive route of the GAM: Exposure to violent media increases the accessibility of aggressive thoughts (e.g., Bushman, 1998; Bushman & Anderson, 2002; Bushman & Geen, 1990), which in turn instigates aggressive behavior (Anderson et al., 2004; Anderson & Dill, 2000). Likewise, Experiment 4 tested the idea that playing a prosocial video game primes prosocial knowledge structures, which in turn increase prosocial behavior.

To measure accessibility of prosocial constructs, we adopted a procedure used by Bushman and Geen (1990). In their research, participants watched videotapes that varied in violent content and were then asked to list those ideas that they were thinking about while watching the videotapes. As expected, participants who had been exposed to televised violence formed more aggressive thoughts. Building upon this finding, the mediating qualities of violent cognitions on aggressive behavior were demonstrated in several studies (e.g., Anderson et al., 2004; Anderson & Dill, 2000).

Experiment 4 also addressed a limitation of Experiment 1 in which the experimenter was aware of the participant's experimental condition and thus could have subtly influenced the participant's behavior. Thus, Experiment 4 assessed the same dependent measure as in Experiment 1 (i.e., picking up spilled pencils); however, the experimenter who spilled the pencils and recorded the number of pencils picked up was not aware of the participant's experimental condition.

Method

Participants and design. Thirty-seven students (27 women, 10 men, Ludwig-Maximilians-University, Munich, Germany) were randomly assigned to one of the two video game conditions (prosocial vs. neutral). The age of the participants ranged from 19 to 30 years ($M = 21.78$). For participation, they received partial course credit.

Procedure and materials. When participants arrived at the laboratory, they were greeted by two experimenters. They were told by the first experimenter that the aim of the study was to examine the enjoyment factor of classic video games. The prosocial video game was Lemmings, and the neutral video game was Tetris. After a short explanation of the video game, participants began playing the games (the second experimenter was waiting in an adjoining room and was unaware of the video game the participant played). After 10 min, the first experimenter explained that

¹ An unpublished study (Greitemeyer & Osswald, 2008) using Lemmings as the prosocial video game revealed that the effect of type of video game on prosocial behavior also disappears when controlling for perceived content of the video game.

the game session was over. Participants were then asked to write down all ideas that they were thinking about while playing the video game (Bushman & Geen, 1990). Three min were allowed for this procedure. In the meantime, the first experimenter said that she had to leave to look after another participant. While the participants filled out the thought questionnaire, the second experimenter arrived. After participants had finished the thought task, the second experimenter reached for the next questionnaires the participants were asked to fill out. As in Experiment 1, the experimenter knocked a cup of pencils off the table and onto the floor. Whether the participants stood up and helped or not and how many pencils they picked up were recorded. After the pencils were picked up, the participants completed the PANAS and responded to the two questions of the liking scale ($\alpha = .97$). Furthermore, they indicated how difficult they perceived the game to be (on a 7-point scale, 0 = *not at all*, 6 = *absolutely*). Finally, participants answered demographic questions, were thanked, were probed for suspicion, and were thoroughly debriefed. In debriefing, none of the participants indicated any suspicion of a relationship between playing the video game and the spilling of the pencils. In addition, none of the participants indicated that their thoughts after playing the video game had affected their decision to help pick up the pencils.

Results and Discussion

Accessibility of prosocial thoughts. Two independent raters who were masked to the experimental condition and to the hypothesis of the study rated all written thoughts reported by the participants. Each thought was coded: (a) number of prosocial thoughts and (b) number of neutral thoughts (none of the participants listed any aggressive thoughts). Examples of prosocial thoughts included “I thought about how to save as many Lemmings as possible” (participant in the prosocial condition) and “I should do more voluntary tasks in my dormitory” (participant in the neutral condition). Examples of neutral thoughts included “I thought that I liked how the game was animated” (participant in the prosocial condition) and “It was important to me not to make any mistakes” (participant in the neutral condition). Interrater agreement was high (Cohen’s $\kappa = .80$). Disagreements were resolved through discussion.

As expected, participants who had played the prosocial video game reported more prosocial thoughts ($M = 1.26$, $SD = 1.15$) than participants in the neutral condition ($M = 0.06$, $SD = 0.24$), $t(35) = 4.38$, $p < .001$, $d = 1.44$. In contrast, there were no significant differences with regard to the number of reported neutral thoughts (prosocial condition: $M = 3.26$, $SD = 1.73$; neutral condition: $M = 3.89$, $SD = 1.57$), $t(35) = 1.15$, $p = .26$, $d = 0.38$.

Picking up the pencils. As in Experiment 1, participants who had played a prosocial video game were more likely to pick up the pencils than were those who had played a neutral video game, $\chi^2(2, N = 37) = 6.31$, $p < .05$, $w = .41$ (medium effect size; Cohen, 1988): Sixty-three percent of the participants in the prosocial video game condition helped to pick up the pencils, whereas only 22% of those in the neutral video game condition did so. Furthermore, participants in the prosocial condition picked up more pencils ($M = 5.11$, $SD = 5.09$) than participants who had played a neutral video game ($M = 1.44$, $SD = 2.87$), $t(35) = 2.67$,

$p < .05$, Cohen’s $d = .89$. Number of picked-up pencils was significantly related to the number of reported prosocial thoughts, $r(37) = .56$, $p < .001$, but not to the number of reported neutral thoughts, $r(37) = -.11$, $p = .53$.

The degree of liking of Lemmings ($M = 3.18$, $SD = 1.91$) was relatively similar to that of Tetris ($M = 4.22$, $SD = 1.70$), $t(35) = 1.74$, $p = .09$, Cohen’s $d = .57$. The two games were also seen as equally difficult (Lemmings: $M = 1.00$, $SD = 1.49$; Tetris: $M = 1.39$, $SD = 1.61$), $t(35) = 0.76$, $p = .45$, Cohen’s $d = .25$. Furthermore, there were no significant effects on mood, either on the positive (prosocial: $M = 2.52$, $SD = 0.90$; neutral: $M = 2.56$, $SD = 0.57$), $t(35) = 0.19$, $p = .86$, Cohen’s $d = .05$, or on the negative affect scale (prosocial: $M = 1.30$, $SD = 0.36$; neutral: $M = 1.24$, $SD = 0.29$), $t(35) = 0.59$, $p = .58$, Cohen’s $d = .18$. When we controlled for positive and negative mood, liking of the video game, difficulty of the video game, and participant sex, the effect of type of video game on helping remained significant ($\beta = .39$, $p < .05$). Similar findings were obtained when we used the dichotomous variable.

Mediation analysis. Next, we tested the hypothesis that the accessibility of prosocial thoughts (number of reported prosocial thoughts) mediates the effect of playing a prosocial (relative to a neutral) video game on helping behavior (number of pencils picked up). In fact, when type of video game and accessibility of prosocial thoughts were entered simultaneously, the regression equation accounted for substantial variance in helping behavior, $R^2 = .33$, $F(2, 34) = 8.23$, $p < .01$. Moreover, accessibility of prosocial thoughts received a significant regression weight, $t(34) = 2.81$, $\beta = .49$, $p < .01$, whereas type of video game did not, $t(34) = 0.68$, $\beta = .12$, $p = .50$. This mediation pattern is shown in Figure 1. To test whether the indirect effect of type of game on helping behavior was due to the accessibility of prosocial thoughts, we used a bootstrapping analysis (with 1,000 iterations) recommended by Preacher and Hayes (2004) for small samples. This analysis revealed that the indirect effect was significantly different from zero ($p < .05$, 95% confidence interval [0.40, 4.80]). Similar results were obtained for the dichotomous helping variable.

To summarize, Experiment 4 had two major aims. First, it addressed a shortcoming of Experiment 1 where the experimenter who elicited and recorded the dependent measure was aware of the participant’s experimental condition. Thus, because the effect of playing a prosocial (relative to a neutral) video game on helping behavior was reliable (and similar to the effect in Experiment 1), Experiment 4 further provides evidence that it is unlikely that our findings were due to experimenter effects. Second and more important, Experiment 4 illuminated a mediating mechanism. Fol-

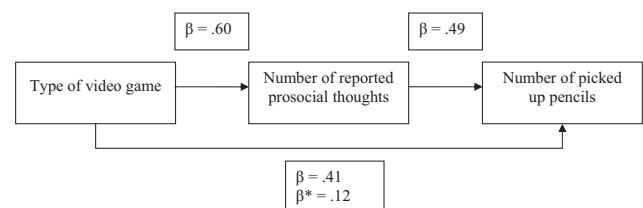


Figure 1. Mediation of the effect of type of video game on number of picked-up pencils by number of reported prosocial thoughts.

lowing previous research (Anderson et al., 2004; Anderson & Dill, 2000) revealing that the effects of violent media on aggressive behavior are mediated by differences in the accessibility of aggressive thoughts, Experiment 4 shows that the activation of prosocial thoughts elicits prosocial behavior. Thus, it appears that—as for the negative effects of violent video games on aggressive behavior—the effect of playing prosocial video games on prosocial behavior works primarily through the cognitive route of the GLM.

General Discussion

The present research shows that playing video games with prosocial content is positively related to increases in different kinds of prosocial behavior. Participants who had played a prosocial video game were more likely to help the experimenter pick up spilled pencils (Experiments 1 and 4), were more willing to assist in further experiments (Experiment 2), and were more likely to help a harassed experimenter (Experiment 3). By using these different types of prosocial behavior, we verified that playing prosocial video games increases unrequested and requested helping as well as low-cost and high-cost helping. It should be also noted that these effects were recorded even though participants played the video games for a relatively brief time period (8–10 min). Previous research has cogently shown that exposure to violent video games increases aggressive behavior and decreases prosocial behavior (e.g., Anderson & Bushman, 2001). The present research complements these findings by showing that playing video games could also positively affect social behavior.

We also sought to shed some light on the underlying mechanisms. According to the GLM, the effects of exposure to prosocial video games on prosocial behavior may materialize by affecting the player's internal state (consisting of cognitive, affective, and arousal variables). In our pilot study, we examined the affective and the arousal properties of the video games used. Because the prosocial and the neutral video games were relatively similar in these respects, the effect of type of video game on prosocial behavior cannot have been due to the affective and the arousal route of the GLM. In contrast, Experiment 4 offered some evidence for the mediating properties of the cognitive route: Participants who had played the prosocial (relative to the neutral) game displayed more prosocial thoughts, which in turn instigated prosocial behavior. Admittedly, other measures might also account for this finding. For instance, in our studies, we controlled for global positive and negative affect but not for specific prosocial feelings. An unpublished study (Osswald & Greitemeyer, 2008) revealed that the effect of type of video game on helping behavior was not mediated by differences in experienced empathy. Thus, although we cannot definitely rule out that not only the cognitive but also the affective route of the GLM can account for the effects of prosocial video games on prosocial behavior, we think it rather unlikely.

Note also that our findings closely resemble studies of the effects of playing or watching violent media on aggressive behavior. For instance, Anderson and Dill (2000) found that the effect of playing violent video games on aggressive behavior was mediated by differences in accessibility of aggression-related thoughts (whereas aggressive affect could not account for this effect). Likewise, whereas accessibility of prosocial thoughts instigated

prosocial action in Experiment 4 of the present research, in none of our experiments could affective measures account for the effect of playing a prosocial video game on prosocial behavior. In sum, it appears that the effect of playing video games on social behavior works primarily through the cognitive route, and this can be applied to negative effects of violent video games as well as to positive effects of prosocial video games.

On a more general level, our results (in tandem with previous research into the effects of violent video games on aggressive thoughts and behavior) appear to suggest that the effects of prosocial and antisocial video games on prosocial and antisocial behavior can be incorporated within the same theoretical system. The GLM could provide such a useful framework for explaining the effects of video games on interpersonal behavior. According to this model, "video games teach whatever concepts are repeatedly rehearsed within them" (Buckley & Anderson, 2006, p. 366). What concepts are being rehearsed depends on the content of the video game: The content of the video games played affects the player's internal state, and these internal states in turn affect whether someone responds prosocially or antisocially. For example, whereas playing a prosocial video game increases the accessibility of prosocial cognitions that instigate prosocial behavior, playing an antisocial video game increases the accessibility of antisocial cognitions that instigate antisocial behavior. We believe that bringing the effects of video games on helping and aggression together within a common theoretical framework is definitely a valuable endeavor. The present research that tested (and supported) some of the predictions of the GLM is a promising starting point. Nevertheless, future research that more thoroughly addresses the whole model (such as by including personality variables) is definitely needed. This leads us to the next issue we want to consider here, namely, limitations of the present research and future research.

Limitations and Future Research

As noted above, we assessed only the short-term effects of playing prosocial video games. Meta-analyzing more than 400 studies on the effects of media violence on aggressive and prosocial behavior, Bushman and Huesmann (2006) argued that media effects on short-term social behavior are mostly due to the priming of existing well-encoded cognitions. In contrast, long-term effects of media exposure on social behavior seem to depend more on the learning of scripts, beliefs, and schemas. Note that the present research examined the effects of playing prosocial video games on immediate, subsequent behavior and thus may have been affected by priming. Long-term effects of playing prosocial video games on prosocial behavior (if there are any) might be mediated by other constructs.

Repeated exposure to media may affect long-term behavior (Huesmann & Miller, 1994). The meta-analysis conducted by Bushman and Huesmann (2006) showed indeed significant long-term effects of exposure to violent media on aggressive behavior; however, short-term effects were even stronger. Thus, additional research on the long-term effects of prosocial video games on prosocial behavior is clearly needed. Longitudinal studies examining whether repeated exposure to prosocial video games may produce a helping personality would be informative in this regard. It would also be interesting to vary testing lag between exper-

imental exposure and time of testing. However, the correlation between testing lag and effect size was not significant in the meta-analysis of the positive effects of television (Mares & Woodard, 2005).

In none of the present studies did participant gender significantly affect our main findings: both female and male participants alike were positively affected by playing a prosocial video game to an equal degree. Similarly, exposure to prosocial television content increased prosocial behavior in both female and male participants (Mares & Woodard, 2005), whereas violent video games led to increased aggression in both genders (Anderson & Bushman, 2001). Thus, it appears that the gender of participants does not influence the effects of media exposure on social behavior. In contrast, effects of violent media on aggression are moderated by age: Whereas the short-term effects of exposure to violent media are greater for adults than for children, the long-term effects are greater for children than for adults (Bushman & Huesmann, 2006). As noted above, whereas short-term effects of exposure are mostly due to priming of existing well-encoded cognitions, long-term effects require learning of scripts, beliefs, and schemas. Because adults are more likely to possess well-elaborated networks of associations, they should be affected by priming to a greater extent. Children, in contrast, are more likely to have minds that are modifiable and are thus more susceptible to learning. The present research using an adult sample suggests that the (short-term) effects of playing a prosocial video game on prosocial behavior may be mediated by the accessibility of prosocial constructs. Hence, one might expect that our findings would have been less pronounced for children. However, empirical evidence for this speculation awaits future investigation.

Finally, exposure to violent video games increases aggression and decreases prosocial behavior. Here, we have presented evidence that exposure to prosocial video games increases prosocial behavior. Whether prosocial video games also decrease aggression is an additional question left to future research (see also Greitemeyer & Osswald, 2009).

Practical Implications and Conclusions

Exposure to media with violent content has serious consequences, such as criminal actions (Anderson & Dill, 2000) or physical violence (Gentile et al., 2004). This has led to the suggestion that children should be prevented from viewing such content. In fact, reducing children's exposure to media violence leads to a reduction in aggressive tendencies (Robinson, Wilde, Navracruz, Haydel, & Varady, 2001). Yet the media also have the potential to be part of the solution. As pointed out by Mares and Woodard (2005), television with prosocial content increases prosocial behavior, reduces aggression, and encourages viewers to be more tolerant. In schools, educational video games have been effectively used to teach a variety of skills, such as algebra and geometry (Corbett, Koedinger, & Hadley, 2001). Likewise, as the present research suggests, video games with prosocial content could be used to improve social interactions.

However, content analyses of video games revealed that 70%–85% of video games involve some type of violence (Dietz, 1998), and most children prefer to play violent video games (Buchman & Funk, 1996). Accordingly, the frequency of playing video games is negatively related to measures of prosocial behavior (van Schie &

Wiegman, 1997). Hence, there is clearly a need for prosocial video games that are highly attractive to consumers. Convincing the video game industry to create such games would be an important first step.

References

- Anderson, C. A., & Bushman, B. J. (2001). Effects of violent video games on aggressive behavior, aggressive cognition, aggressive affect, physiological arousal, and prosocial behavior: A meta-analytic review of the scientific literature. *Psychological Science, 12*, 353–359.
- Anderson, C. A., & Bushman, B. J. (2002). Human aggression. *Annual Review of Psychology, 53*, 27–51.
- Anderson, C. A., Carnagey, N. L., Flanagan, M., Benjamin, A. J., Eubanks, J., & Valentine, J. (2004). Violent video games: Specific effects of violent content on aggressive thoughts and behavior. *Advances in Experimental Social Psychology, 36*, 199–249.
- Anderson, C. A., Deuser, W. E., & DeNeve, K. (1995). Hot temperatures, hostile affect, hostile cognition, and arousal: Tests of a general model of affective aggression. *Personality and Social Psychology Bulletin, 21*, 434–448.
- Anderson, C. A., & Dill, K. E. (2000). Video games and aggressive thoughts, feelings, and behavior in the laboratory and in life. *Journal of Personality and Social Psychology, 78*, 772–790.
- Anderson, C. A., & Ford, C. M. (1986). Affect of the game player: Short-term effects of highly and mildly aggressive video games. *Personality and Social Psychology Bulletin, 12*, 390–402.
- Anderson, C. A., Gentile, D. A., & Buckley, K. E. (2007). *Violent video game effects on children and adolescents: Theory, research, and public policy*. New York, NY: Oxford University Press.
- Ballard, M. E., & Lineberger, R. (1999). Video game violence and confederate gender: Effects on reward and punishment given by college males. *Sex Roles, 41*, 541–558.
- Bartholow, B. D., & Anderson, C. A. (2002). Effects of violent video games on aggressive behavior. *Journal of Experimental Social Psychology, 38*, 283–290.
- Buchman, D. D., & Funk, J. B. (1996). Video and computer games in the '90s: Children's time commitment and game preference. *Children Today, 24*, 12–16.
- Buckley, K. E., & Anderson, C. A. (2006). A theoretical model of the effects and consequences of playing video games. In P. Vorderer & J. Bryant (Eds.), *Playing video games: Motives, responses, and consequences* (pp. 363–378). Mahwah, NJ: Erlbaum.
- Bushman, B. J. (1998). Priming effects of media violence on the accessibility of aggressive constructs in memory. *Personality and Social Psychology Bulletin, 24*, 537–545.
- Bushman, B. J., & Anderson, C. A. (2002). Violent video games and hostile expectations: A test of the general aggression model. *Personality and Social Psychology Bulletin, 28*, 1679–1686.
- Bushman, B. J., & Geen, R. G. (1990). Role of cognitive-emotional mediators and individual differences in the effects of media violence on aggression. *Journal of Personality and Social Psychology, 58*, 156–163.
- Bushman, B. J., & Huesmann, L. R. (2006). Short-term and long-term effects of violent media on aggression in children and adults. *Archives of Pediatrics and Adolescent Medicine, 160*, 348–352.
- Chambers, J. H., & Ascione, F. R. (1987). The effects of prosocial and aggressive video games on children's donating and helping. *Journal of Genetic Psychology, 148*, 499–505.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.
- Corbett, A. T., Koedinger, K. R., & Hadley, W. H. (2001). Cognitive tutors: From the research classroom to all classrooms. In P. S. Goodman (Ed.), *Technology enhanced learning: Opportunities for change* (pp. 235–263). Mahwah, NJ: Erlbaum.

- Dietz, T. L. (1998). An examination of violence and gender role portrayals in video games: Implications for gender socialization and aggressive behavior. *Sex Roles, 38*, 425–442.
- Fischer, P., Greitemeyer, T., Pollozek, F., & Frey, D. (2006). The unresponsive bystander: Are bystanders more responsive in dangerous emergencies? *European Journal of Social Psychology, 36*, 267–278.
- Gentile, D. A., Anderson, C. A., Yukawa, S., Ihori, N., Saleem, M., Ming, L. K. . . . Sakamoto, A. (2009). The effects of prosocial video games on prosocial behaviors: International evidence from correlational, longitudinal, and experimental studies. *Personality and Social Psychology Bulletin, 35*, 752–763.
- Gentile, D. A., Lynch, P. J., Linder, J. R., & Walsh, D. A. (2004). The effects of violent video game habits on adolescent hostility, aggressive behaviors, and school performance. *Journal of Adolescence, 27*, 5–22.
- Gentile, D. A., & Walsh, D. A. (2002). A normative study of family media habits. *Journal of Applied Developmental Psychology, 23*, 157–178.
- Greitemeyer, T. (2009a). Effects of songs with prosocial lyrics on prosocial behavior: Further evidence and a mediating mechanism. *Personality and Social Psychology Bulletin, 35*, 1500–1511.
- Greitemeyer, T. (2009b). Effects of songs with prosocial lyrics on prosocial thoughts, affect, and behavior. *Journal of Experimental Social Psychology, 45*, 186–190.
- Greitemeyer, T., Fischer, P., Kastenmüller, A., & Frey, D. (2006). Civil courage and helping behaviour: Differences and similarities. *European Psychologist, 11*, 90–98.
- Greitemeyer, T., & Osswald, S. (2008). *Playing prosocial video games increases donations to charities*. Unpublished manuscript. University of Sussex, Brighton, England.
- Greitemeyer, T., & Osswald, S. (2009). Prosocial video games reduce aggressive cognitions. *Journal of Experimental Social Psychology, 45*, 896–900.
- Hearold, S. (1986). A synthesis of 1043 effects of television on social behavior. In G. Comstock (Ed.), *Public communication of behavior* (pp. 65–133). San Diego, CA: Academic Press.
- Huesmann, L. R., & Miller, L. S. (1994). Long-term effects of repeated exposure to media violence in childhood. In L. R. Huesmann (Ed.), *Aggressive behavior: Current perspectives* (pp. 153–186). New York, NY: Plenum Press.
- Lee, K. M., & Peng, W. (2006). What do we know about social and psychological effects of computer games? A comprehensive review of the current literature. In P. Vorderer & J. Bryant (Eds.), *Playing video games: Motives, responses, and consequences* (pp. 327–345). Mahwah, NJ: Erlbaum.
- Macrae, C. N., & Johnston, L. (1998). Help, I need somebody: Automatic action and inaction. *Social Cognition, 16*, 400–417.
- Mares, M. L., & Woodard, E. (2005). Positive effects of television on children's social interactions: A meta-analysis. *Media Psychology, 7*, 301–322.
- Nelson, L. D., & Norton, M. I. (2005). From student to superhero: Situational primes can shape future helping. *Journal of Experimental Social Psychology, 41*, 423–430.
- Nielsen Entertainment. (2005). *Active gamer report*. Retrieved from http://www.businessweek.com/innovate/content/nov2005/id20051122_489515.htm
- Osswald, S., & Greitemeyer, T. (2008). *Prosocial video games increase prosocial affect*. Unpublished manuscript. Ludwig-Maximilians-University, Munich, Germany.
- Paik, H., & Comstock, G. (1994). The effects of television violence on antisocial behavior: A meta-analysis. *Communication Research, 21*, 516–546.
- Piliavin, J., Dovidio, J., Gaertner, S., & Clark, R. (1981). *Emergency intervention*. New York, NY: Academic Press.
- Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, and Computers, 36*, 717–731.
- Robinson, T. N., Wilde, M. L., Navracruz, L. C., Haydel, K. F., & Varady, A. (2001). Effects of reducing children's television and video game use on aggressive behavior: A randomized controlled trial. *Archives Pediatrics and Adolescent Medicine, 155*, 17–23.
- Schwartz, S. H., & Howard, J. A. (1981). A normative decision-making model of altruism. In J. P. Rushton & R. M. Serentino (Eds.), *Altruism and helping behavior* (pp. 189–211). Hillsdale, NJ: Erlbaum.
- Sheese, B. E., & Graziano, W. G. (2005). Deciding to defect: The effects of video-game violence on cooperative behavior. *Psychological Science, 16*, 354–357.
- Sherry, J. L. (2001). The effects of violent video games on aggression: A meta-analysis. *Human Communication Research, 27*, 409–431.
- Sprafkin, J. N., Liebert, R. M., & Poulos, R. W. (1975). Effects of a prosocial televised example on children's helping. *Journal of Experimental Child Psychology, 20*, 119–126.
- van Baaren, R. B., Holland, R. W., Kawakami, K., & van Knippenberg, A. (2004). Mimicry and prosocial behavior. *Psychological Science, 15*, 71–74.
- van Schie, E. G., & Wiegman, O. (1997). Children and videogames: Leisure activities, aggression, social integration and school performance. *Journal of Applied Social Psychology, 27*, 1175–1194.
- Walsh, D., Gentile, D., Gieske, J., Walsh, M., & Chasco, E. (2003). *Eighth annual video game report card*. Minneapolis, MN: National Institute on Media and the Family.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*, 1063–1070.
- Weyant, J. M. (1978). Effects of mood states, costs, and benefits on helping. *Journal of Personality and Social Psychology, 36*, 1169–1176.
- Wiegman, O., & van Schie, E. G. (1998). Video game playing and its relation with aggressive and prosocial behavior. *British Journal of Social Psychology, 37*, 367–378.
- Woodard, E. H., IV, & Gridina, N. (2000). *Media in the home 2000: The fifth annual survey of parents and children* (Survey Series No. 7). Philadelphia, PA: University of Pennsylvania, Annenberg Public Policy Center.

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