



Intense acts of violence during video game play make daily life aggression appear innocuous: A new mechanism why violent video games increase aggression

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HIGHLIGHTS

- Two experiments address a new mechanism why violent video games increase aggressive behavior.
- Playing violent video games alters the perception of one's own aggressive behavior.
- This biased perception in turn accounts for the violent video game effect.

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ABSTRACT

Computer players often deny that playing violent video games makes them aggressive, which is in contrast to the findings of a recent comprehensive meta-analysis. The present research examines whether comparison processes between the players' intense acts of violence in a video game and their comparatively harmless aggressive behavior in daily life not only account for this apparent discrepancy but also underlie the effect of playing violent video games on aggressive behavior. In fact, two experiments reveal that playing a violent video game leads to a bias in the perception of what counts as aggressive, which in turn evokes aggressive behavior.

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Introduction

Empirical investigations have shown that playing violent video games is associated with an increase in aggressive behavior. The most comprehensive meta-analysis so far (Anderson et al., 2010) found that violent video game exposure significantly increases aggressive thoughts, hostile affect, and aggressive behavior. Although effect sizes are only small to medium and some studies fail to find that violent video games cause aggression (e.g., Adachi & Willoughby, 2011), it appears that individuals who frequently play violent video games become more aggressive. However, if one asks avid computer players whether violent video games make them aggressive, you will most likely get a definite "no" (Bushman, 2012). I argue that comparison processes between the players' behavior in a video game and their behavior in daily life account for this apparent discrepancy. In many violent video games, the player uses guns and missiles to kill as many game characters as possible. Relative to those intense acts of violence, daily life aggressive behavior appears to be harmless. That is, after causing serious injury and death during video game play, acts such as shouting at or shoving others are perceived as relatively non-aggressive. In contrast, someone who does not play violent video games is more likely to perceive daily life aggression as such it is.

What is more important: The violent video game player's biased view of what counts as aggressive may explain why playing violent video games increases aggression. Most individuals restrain themselves from yielding violent impulses. However, when an impulse is perceived as relatively harmless, the impulse is less likely to be stifled. For instance, a blow in a real-life argument appears to be innocuous compared to killing (during video game play) and thus one does not inhibit the impulse to perform the blow. Taken together, the comparison approach suggests that performing intense violent acts during video game play leads to a bias in the perception of the aggressiveness of one's subsequent behavior. This biased perception in turn should increase the likelihood of aggressive behavior.

Previous research into why playing violent video games increases subsequent aggressive behavior has mainly highlighted the role of priming existing knowledge structures. For instance, playing violent video games increases the accessibility of antisocial thoughts, which in turn evoke aggressive behavior (Anderson & Dill, 2000; Anderson et al., 2004). Both the present comparison and the priming approach suggest that playing violent video games increases subsequent aggressive behavior. In terms of underlying processes, however, the comparison approach and the priming mechanism differ. According to the comparison approach, after violent video game play one's own aggressive behavior

should be viewed as less aggressive. According to the priming mechanism, stimuli are more likely to be interpreted as an aggressive cue after playing violent video games (Kirsh, 1998; Strull & Wyer, 1979) and thus daily life aggressive behavior should be perceived as *more* aggressive. I will return to the priming perspective in the Discussion of Experiment 1 as well as the General Discussion.

To sum up, the present two experiments examine the comparison prediction that playing violent video games decreases the perception of one's own daily life aggressive behavior being aggressive. Experiment 2 also examines whether perceptions of what counts as aggressive underlie the effect of playing violent video games on aggressive behavior.

Experiment 1

In Experiment 1, participants played a violent video game or a neutral video game. About half of the participants were asked to imagine that they performed a wide spectrum of daily-life aggressive behaviors. For each behavior, they indicated its aggressiveness. To examine whether playing violent video games also affects the perception of aggressive behavior shown by others, the remaining participants rated the same behaviors but performed by someone else. When judging other persons, the self plays an important part (Dunning & Hayes, 1996). For instance, people's assessment of another person's athleticism depends in part on their own athletic activity (Dunning & Cohen, 1992). Importantly, however, the impact of video game play on perceptions of aggressiveness should be more pronounced for the player's own behavior than for behavior performed by others. Research on social comparison has shown that individuals are particularly likely to compare themselves with others who are similar to them (Wood, 1989) and who are viewed as relevant to the self (Lockwood & Kunda, 1997). Because there is nothing more similar or relevant to the self than the own person, one's behavior in a video game should be more likely to serve as a comparison standard for one's own subsequent behavior than for others' behavior (Higgins, 1996), and thus playing a violent (relative to a neutral) video game should lead players to perceive their daily life aggressive behavior to be particularly non-aggressive.

Method

Participants, procedure, and materials

Participants were 82 adults (61 women, 21 men, mean age: 21.9 years). As in previous research (Greitemeyer, Osswald, & Brauer, 2010), participants learned that they would take part in two unrelated studies, the first study about the enjoyment factor of video games, the second study about impression formation. Then, participants played a randomized assigned violent (Counterstrike, Trooper Assassin) or neutral (Super Bubbles, Penguin) video game. To make sure that any findings were not due to specific features of the particular video games employed, two violent and two neutral video games were used.¹ After 15 minutes, the experimenter explained that the game session was over, and participants responded to two items measuring their liking of the video game (Cronbach's $\alpha = .97$), three items measuring perceived difficulty of the video game (Cronbach's $\alpha = .78$), and two items measuring excitement properties of the video game (Cronbach's $\alpha = .49$). These items were assessed on Likert-type scales from 1 (*not at all*) to 7 (*very much*). To assess mood, participants indicated how

they feel at the moment. The scale was from 1 (*bad*) to 7 (*good*). Such a one-item mood measure has been used in previous studies on affective forecasting (e.g., Greitemeyer, 2009). Afterwards, they were told that the first study was over.

To measure perception of daily life aggressive behavior, I adapted a procedure by Matlock and Aman (2011). Participants read 52 aggressive behaviors that were either shown by them (e.g., "I shove or push others") or by someone else (e.g., "Someone shoves or pushes others"). For each behavior, participants indicated to what extent this behavior can be characterized as being aggressive, on a scale from 1 (*not at all*) to 9 (*very much*). These ratings were highly correlated (Cronbach's $\alpha = .99$) and were thus pooled in a perceived aggressiveness scale. Finally, participants were thanked and asked what they thought the study was about. None of the participants noted the hypothesis that playing violent video games affects the perception of daily life aggressive behavior. The same applies to Experiment 2.

Results and discussion

The pattern of findings was similar across the two violent and two neutral video games so the data were collapsed. When testing a priori predictions, an overall analysis of variance fails to provide an adequate statistical test of possible mean differences across conditions. Instead, planned comparisons are more adequate to answer specific research questions (Rosenthal & Rosnow, 1985; Steiger, 2004). Therefore, when examining whether one's own behavior after playing a violent (relative to a neutral) video game is perceived as particularly nonaggressive, planned contrasts were performed on the data. In fact, participants who played the violent video game perceived their daily life aggressive behavior as being less aggressive ($M = 4.23$, $SD = 2.40$; contrast weight: 3) compared to participants who played the violent video game and rated others' behavior ($M = 6.26$, $SD = 0.87$; contrast weight: -1), participants who played the neutral video game and rated their own behavior ($M = 5.40$, $SD = 2.12$; contrast weight: -1), and participants who played the neutral video game and rated others' behavior ($M = 6.17$, $SD = 1.07$; contrast weight: -1), $t(78) = 3.73$, $p < .001$, $d = 0.84$. In contrast, no significant orthogonal contrast was found when comparing the violent video game/others' behavior condition (contrast weight: 2) with the neutral video game/own behavior condition (contrast weight: -1) and neutral video game/others' behavior condition (contrast weight: -1 ; violent video game/own behavior condition received the contrast weight 0), $t(78) = 1.00$, $p = .318$, $d = 0.36$. Finally, no significant orthogonal contrast was found when comparing the neutral video game/own behavior condition (contrast weight: 1) with the neutral video game/others' behavior condition (contrast weight: -1 ; violent video game/own behavior condition and violent video game/others' behavior condition both received the contrast weight 0), $t(78) = 1.45$, $p = .151$, $d = 0.46$. These findings are illustrated in Fig. 1.²

Playing the violent video game ($M = 4.56$, $SD = 1.29$) led to more negative mood scores than playing the neutral video game ($M = 5.02$, $SD = 1.06$), but the difference did not achieve traditional levels of statistical significance, $t(80) = 1.77$, $p = .081$, $d = 0.39$. Liking of the violent video game ($M = 2.32$, $SD = 1.27$) was lower than liking of the neutral video game ($M = 4.40$, $SD = 1.53$), $t(80) = 6.65$, $p < .001$, $d = 1.48$. Moreover, the violent video game was perceived as being

¹ In a pilot test ($N = 114$), participants played either one of the violent or one of the neutral video games and responded to the question how violent the content of the video game was (among other items that are not relevant for the present context), using a scale from 1 (*not at all*) to 7 (*very much*). The content of the violent video games ($M = 5.06$, $SD = 1.53$) was perceived as being more violent than the content of the neutral video games ($M = 1.06$, $SD = 0.31$), $t(112) = 18.34$, $p < .001$, $d = 3.62$. There were no significant differences between the two violent video games and between the two neutral video games, respectively.

² As just noted, planned comparisons are more adequate than an overall analysis of variance (ANOVA) to test a priori predictions. For the sake of completeness, ratings of perceived aggressiveness were also subjected to a 2 (video game condition: violent vs. neutral) \times 2 (person's behavior: own vs. other) ANOVA. The ANOVA revealed a main effect of person's behavior, $F(1, 78) = 13.09$, $p = .001$, $\eta^2 = .14$. Own behavior ($M = 4.87$, $SD = 2.30$) was perceived as being less aggressive than behavior of other's ($M = 6.21$, $SD = 0.96$), which illustrates a self-serving bias (Alicke, 1985). In contrast, neither the main effect of video game condition, $F(1, 78) = 1.93$, $p = .169$, $\eta^2 = .02$, nor the interaction between video game condition and person's behavior was significant, $F(1, 78) = 2.61$, $p = .110$, $\eta^2 = .03$.

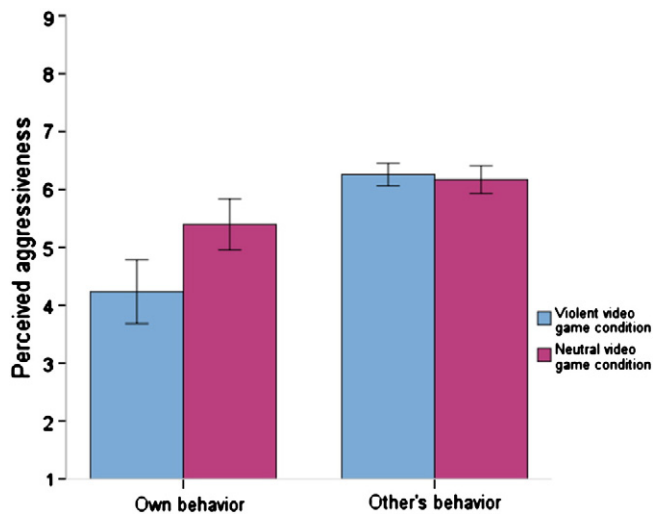


Fig. 1. Perception of aggressive behavior as a function of video game condition and person showing the behavior. Error bars depict standard errors.

more difficult ($M = 4.24$, $SD = 1.52$) and more exciting ($M = 3.56$, $SD = 1.34$) than the neutral video game (difficult: $M = 2.81$, $SD = 1.24$; exciting: $M = 2.84$, $SD = 1.30$), $t(80) = 4.69$, $p < .001$, $d = 1.03$, $t(80) = 2.49$, $p = .015$, $d = 0.55$, respectively. However, when controlling for liking, perceived difficulty, excitement, and mood in a multiple regression, the effect of the contrast (violent video game/own behavior compared to the other three experimental conditions) on perceived aggressiveness remained significant, $\beta = .46$, $t(76) = 4.00$, $p < .001$, whereas all other predictors received a non-significant regression weight, all β s $< .20$, all t s < 1.56 , all p s $> .123$.

Experiment 1 provided preliminary support for the idea that after performing intense acts of violence during video game play one's own daily life aggressive behavior appears relatively harmless. It is noteworthy that the violent and neutral video games employed differed in terms of liking, perceived difficulty, and excitement. However, the effect on perceived aggressiveness remained significant when controlling for these video game properties. Unexpectedly, perceived aggressiveness of others' behavior was not affected by previous video game play. That is, others' daily life aggressive behavior was *not* perceived as less aggressive after violent video game play. It may be that one's video game behavior only serves as a reference point for judging one's own subsequent behavior. Alternatively, video game behavior is used as a reference point that affects judgments of others' behaviors, but the increased accessibility of hostile thoughts after playing violent video games (Anderson & Dill, 2000) counteracts the contrasting effects of the comparison process. In any case, future research is definitely needed to address why video game play behavior does not affect the evaluation of others' behavior.

Most importantly, however, Experiment 1 suggests that playing a violent (relative to a neutral) video game alters the perception of one's own daily life aggressive behavior, which may have an influence on actual aggressive behavior. Experiment 2 addressed whether biased perceptions of what behaviors count as aggressive may underlie the violent video game effect. It is anticipated that – because daily life aggressive behavior is perceived as relatively non-aggressive after violent video game play – playing violent video games increases subsequent aggressive behavior.

Experiment 2

Experiment 2 had two main goals. First, it aimed to replicate the finding from Experiment 1 that playing violent video games reduces the perception of one's own daily life aggressive behavior being aggressive. Second, it addressed whether this biased view of what counts as

aggressive would account for increased aggressive behavior (i.e., administering hot chili sauce) after playing violent video games. In order to draw more general conclusions, a different set of video games was used in Study 2.

Method

Participants, procedure, and materials

Participants were 45 adults of a community sample. Two participants were excluded from the following analyses, due to extreme responses on the chili sauce task (i.e., more than 3 standard deviations above the mean), leaving a final sample of 43 participants (24 women, 19 men, mean age: 31.9 years). After participants played a randomized assigned violent (Wolfenstein) or neutral (Tetris) video game for 15 minutes, they responded to two items measuring their liking of the video game (Cronbach's $\alpha = .98$), two items measuring perceived difficulty of the video game (Cronbach's $\alpha = .90$), two items measuring excitement properties of the video game (Cronbach's $\alpha = .84$), and one item measuring mood. These items were assessed on Likert-type scales from 1 to 7 (with the same anchors as in Experiment 1). Then, the perceived aggressiveness of their own behavior was assessed as in Experiment 1 (Cronbach's $\alpha = .91$). (Perceptions of others' behavior were not assessed.)

To measure aggressive behavior, participants were asked to administer hot chili sauce (Greitemeyer, 2011; Lieberman, Solomon, Greenberg, & McGregor, 1999). Concretely, participants learned that hot and sweet sauces would be tested in context of another marketing study, but on this very day it was the hot chili sauce that was being tested. The experimenter asked the participant to administer the sauce because she had to be blind for the amount that had to be tasted. The participants received a brief summary of the taste preferences of two individuals (one female, one male) who because of good payment would be willing to participate in the marketing study. Both individuals allegedly did not like hot spices (the summary involved to what extent they liked meat, fish, vegetables, and fruits and sweet, sour, hot, and bitter taste). Participants were then shown six bottles containing between 5ml and 100ml of the hot chili sauce and were asked to administer one of these bottles. They were further told that the other participants would have to consume all of it, and that the other participants would not learn who administered the sauce. Responses to the female and the male individuals were highly correlated ($r = .90$) and were thus combined into an overall index of aggressive behavior (reflecting the amount of chili sauce administered in ml).³ Finally, to make sure that the video games indeed differed in the perceived content of the game, participants indicated how violent the video game was, using a scale from 1 (*not at all*) to 7 (*very much*).

Results and discussion

As intended, the content of the violent video game ($M = 4.55$, $SD = 1.79$) was perceived as being more violent than the content of the neutral video game ($M = 1.05$, $SD = 0.22$), $t(41) = 8.88$, $p < .001$, $d = 2.74$. Thus, the manipulation was successful.

Playing the violent video game decreased ratings of perceived aggressiveness (violent condition: $M = 6.23$, $SD = 1.28$; neutral condition: $M = 7.20$, $SD = 0.70$), $t(41) = 3.03$, $p = .004$, $d = 0.94$, and increased aggressive behavior (violent condition: $M = 20.34$, $SD = 21.03$; neutral

³ Some readers may wonder why perceived aggressiveness of administering chili sauce was not used as a mediating variable. Instead, perceived aggressiveness of behaviors that are not related to chili sauce administration was measured. In my view, this enabled the most conservative test of whether perceptions of aggressiveness may account for the violent video game effect. Moreover, demand effects are minimized. If anything, the mediating effect of the perceived aggressiveness of the behavior that is subsequently measured should be more pronounced.

condition: $M = 8.33$, $SD = 5.88$), $t(41) = 2.52$, $p = .016$, $d = 0.78$. Ratings of perceived aggressiveness were negatively correlated with aggressive behavior, $r(43) = -.46$, $p = .002$. Finally, it was addressed whether perceived aggressiveness would mediate the effect of type of video game on aggressive behavior. As noted above, type of video game significantly predicted perceived aggressiveness and aggressive behavior, respectively. When type of video game and perceived aggressiveness were entered simultaneously to predict aggressive behavior, type of video game did not receive a significant regression weight, whereas perceived aggressiveness did (Fig. 2). To test whether the indirect effect of type of video game on aggressive behavior was due to differences in perceived aggressiveness, a bootstrapping analysis (with 1,000 iterations) was used, recommended by Preacher and Hayes (2004) for small samples. This analysis revealed a trend such that the effect of playing violent video games on aggressive behavior was mediated by the perception of what counts as aggressive, although this trend fell just short of statistical significance ($p = .064$) and the confidence interval for the indirect effect included 0 (-11.80 to 0.45).

Mood was not affected by video game play (violent video game condition: $M = 5.18$, $SD = 1.22$; neutral video game condition: $M = 5.67$, $SD = 1.15$), $t(41) = 1.12$, $p = .267$, $d = 0.41$. Liking of the video games was also similar (violent video game: $M = 3.93$, $SD = 1.86$, neutral video game: $M = 3.64$, $SD = 1.59$), $t(41) = 0.55$, $p = .588$, $d = 0.17$. In contrast, the violent video game was perceived as being more difficult ($M = 3.16$, $SD = 1.57$) and more exciting ($M = 4.18$, $SD = 1.65$) than the neutral video game (difficult: $M = 2.12$, $SD = 0.91$; exciting: $M = 2.62$, $SD = 1.17$), $t(41) = 2.64$, $p = .012$, $d = 0.81$, $t(41) = 3.56$, $p = .001$, $d = 1.09$, respectively. However, when controlling for liking, perceived difficulty, excitement, and mood in a multiple regression, the effect of video game condition on perceived aggressiveness remained significant, $\beta = .55$, $t(37) = 3.12$, $p = .004$, whereas all other predictors received a non-significant regression weight, all β s $< .30$, all t s < 1.49 , all p s $> .145$. Likewise, the effect of video game condition on aggressive behavior remained significant when controlling for liking, perceived difficulty, excitement, and mood, $\beta = .52$, $t(37) = 2.96$, $p = .005$. Perceived difficulty tended to predict aggressive behavior, $\beta = .33$, $t(37) = 1.91$, $p = .064$. The remaining predictors did not receive a significant regression weight, all β s $< .17$, all t s < 0.93 , all p s $> .362$.

Replicating Experiment 1, Experiment 2 showed that playing a violent video game affects the perception of one's own daily life aggressive behavior. More importantly, Experiment 2 also suggested that differences in these perceptions underlie the effect of violent video games on aggressive behavior. It is important to note that only one violent and one neutral video game were employed. Thus, some results might be due to specific features of the particular games used other than the extent to which the content is violent (such as competitiveness or graphics) and are not generalizable to other video games. Although the main findings were unaffected by liking, perceived difficulty, excitement, and mood properties of the video games, future research using different video games would establish the generalizability of the present findings.

General discussion

Human perception is comparative in nature (Kahneman & Miller, 1986). When making evaluations, one refers to a comparison of the target with a standard. A standard of comparison could be social in nature, in that people compare themselves with others (Festinger, 1954). For instance, others are perceived as less hostile when compared to Adolf Hitler or Charles Manson, but are perceived as more hostile when compared to the Pope or Peter Pan (Herr, 1986). The standard of comparison could also involve temporal-self information (Albert, 1977; Wilson & Ross, 2000), in that how people evaluate themselves depends on what they did before. The present research suggests that performing intense acts of violence during video game play appears to serve as a standard that influences comparative evaluation. In fact, both experiments revealed that acts such as taking others' things by force or making insulting comments were perceived as less aggressive after participants played a violent (compared to a neutral) video game. This biased perception of what behaviors count as aggressive in turn tends to account for increased aggressive behavior after violent video game play. Individuals often experience violent impulses, but refrain from acting on them. However, when viewing the impulse as relatively harmless, they are less willing to stifle their aggressive impulses. After all, why should one suppress a relatively non-aggressive behavior.

To address the effects of violent video games, many researchers refer to the General Aggression Model (GAM) proposed by Anderson and colleagues (e.g., Anderson & Bushman, 2002). According to this model, exposure to violent video content affects the player's present internal state, consisting of cognition, affect, and arousal, which in turn determines a behavioral response (e.g., aggression). The present findings support GAM's notion that violent video games increase the likelihood of aggressive behavior. However, it also extends this model, in that a new mechanism was identified that tends to account for the violent video game effect.

Of course, comparison processes are not the only mechanism by which violent video games increase aggressive behavior. For instance, playing violent video games increases dehumanization (Greitemeyer & McLatchie, 2011), which in turn evokes aggressive behavior. Note that this (and related) investigation has dealt with perceptions of other individuals (e.g., victims are dehumanized), whereas the comparison approach deals with perceptions of one's own behavior. It thus appears that playing violent video games increases the accessibility of hostile thoughts (priming mechanism), which in turn is related to subsequent aggression but does not influence how this own aggressive behavior is perceived.

Perhaps most akin to the present approach are mechanisms that are based on normative beliefs and desensitization to violence. Normative beliefs approaches (Huesmann & Guerra, 1997) propose that playing violent video games leads to the view that aggression is an appropriate way of dealing with interpersonal conflicts. In fact, playing violent video games has been shown to increase the normative acceptance of physical aggression. In one study (Krahé & Möller, 2004), the endorsement of normative beliefs condoning aggression was enhanced among adolescents

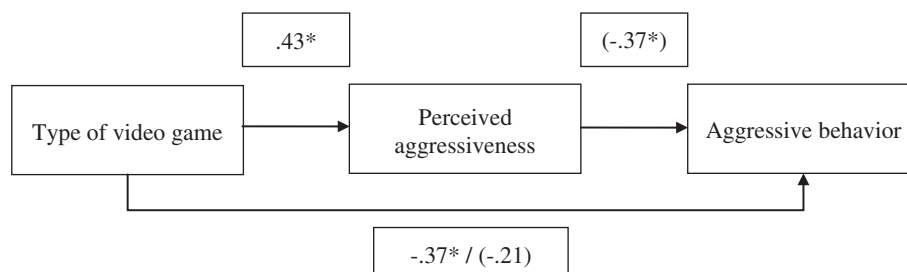


Fig. 2. Mediation of the effect of type of video game on aggressive behavior by perceived aggressiveness. Type of video game was coded: 1 = violent video game; 2 = neutral video game. Coefficients in parentheses are parameter estimates containing both predictors. * $p < .05$.

who reported to frequently play violent video games. In contrast to these findings, however, the present studies revealed that – rather than accepting violence – players of violent video games would deny that their subsequent behavior is aggressive.

Players of violent video games have been shown to becoming desensitized to violence (Bartholow, Bushman, & Sestir, 2006; Carnagey, Anderson, & Bushman, 2007), which in turn accounts for the violent video game effect (Engelhardt, Bartholow, Kerr, & Bushman, 2011). This decreased responsiveness to aggressive stimuli is in line with the present finding that playing violent video games makes one's own behavior appear relatively non-aggressive. However, when the target was not the self but someone else, violent video game play had no impact on how aggressive the behavior was perceived. It thus appears that generalized decreased perceived aggressiveness as a result of desensitization to violence is not driving the effects. Rather, the players' behavior only serve as a standard for their own, but not for others' subsequent behavior.⁴

It is important to note that the sample size in both studies was relatively small, which is a weakness of the present work. Note also that short-term effects of video game play were examined. Immediately after participants stopped playing the video game, their perceptions of daily life aggression as well as their aggressive behavior were assessed. Hence, future research on the long-term effects of repeated violent video game play on perceptions of daily life aggression is clearly needed. A further limitation involves the use of video games that are fairly dated. Presumably, modern video games should be more involving and thus may even affect the perceptions of daily life aggression to a greater extent.

Some recent ultraviolent video games involve highly realistic depictions of human injury and death (such as blood and gore). Because compared to those games daily life aggression appears even more innocuous, the effects of ultraviolent video games on aggressive behavior may be more pronounced (Anderson & Ford, 1986). Testing this notion would be an interesting avenue for future research. Future research may also address whether the present research's finding that playing violent video games alters the player's perception of the aggressiveness of their own behavior might provide an explanation as to why individuals who play violent video games might believe that they are uninfluenced by playing such video games, and consequently why they deny the existence of a relation between playing violent video games and aggressive behavior.

According to the present research, it appears that one's video game play behavior does not alter the judgment of behavior of others. It would be interesting to examine whether the observation of aggressive behavior of others alters the judgment of one's own behavior (Herr, 1986) and, in turn, the likelihood of acting aggressively. For instance, like playing violent video games, television violence is associated with subsequent aggressive acts (Bushman & Huesmann, 2006). It may well be that watching violence on television or the movies also bias perceptions of what counts as aggressive. This newly discovered mechanism may thus not only explain in part why violent video games increase aggressive behavior but accounts for the effects of media violence in general.

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⁴ Note, however, that most previous research into the effects of media violence exposure on desensitization relied on reactions to visual and/or auditory stimuli, rather than ratings of hypothetical behaviors briefly described in text, which may account for the non-significant effect of video game condition on the perception of other's aggressive behavior.