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Exposure to violent video games increases automatic aggressiveness

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Abstract

The effects of exposure to violent video games on automatic associations with the self were investigated in a sample of 121 students. Playing the violent video game Doom led participants to associate themselves with aggressive traits and actions on the Implicit Association Test. In addition, self-reported prior exposure to violent video games predicted automatic aggressive self-concept, above and beyond self-reported aggression. Results suggest that playing violent video games can lead to the automatic learning of aggressive self-views.

Keywords: Video game violence; Aggressive media; Automaticity; Implicit Association Test

Introduction

There is a growing consensus within the social sciences that exposure to violent media increases aggression (Anderson & Bushman, 2002a; Bushman & Anderson, 2001; Singer & Singer, 1983). After half a century of research, the empirical evidence regarding the negative effects of violent television, movies and video games is overwhelming. Trait aggression, as well as self-reported, peer-reported and teacher-reported aggressive behaviour correlates with exposure to violent television shows and video games (Anderson & Dill, 2000; Singer & Singer, 1983, 1986; Singer, Singer, & Rapaczynski, 1984). Experimental studies demonstrate that watching violent television and movie scenes and playing violent video games increases aggressive behaviours like delivering electric shocks and blasts of noise to another person (Anderson & Dill, 2000; Anderson, &

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Murphy, in press; Bartholow & Anderson, 2002; Bushman, 1998; Bushman & Huesmann, 2001; Wood, Wong, & Chachere, 1991), increases hostile expectations for others' behaviours (Bushman & Anderson, 2002), and reduces helping behaviour (Anderson & Bushman, 2001). Longitudinal studies have shown that watching violent television is among the best predictors of later violent behaviours, including criminal behaviour (Huesmann, Eron, Lefkowitzb, & Walder, 1973; Johnson, Cohen, Smailes, Kasen, & Brook, 2002). Studies comparing communities into which television has been recently introduced to similar communities that remain without TV find that the introduction of television increases violent crimes, including assault and murder (Joy, Kimball, & Zabrack, 1986; Centerwall, 1989). Increases in violent crime also follow in the wake of aggressive sporting events and television news coverage of suicides, accidents, crimes and other self-destructive and violent behaviours (Berkowitz, 1970; Phillips, 1979; Phillips, 1983). Meta-analytic reviews of the literature (Anderson & Bushman, 2001, 2002a; Bushman & Anderson, 2001; Paik & Comstock, 1994; Sherry, 2001; Wood et al., 1991) have, without exception, concluded that exposure to violent media increases aggression, and moreover has effects comparable in size to those of cigarette smoking on cancer and exposure to lead paint on children's IQ scores (Anderson & Bushman, 2001; Bushman & Anderson, 2001).

Less well understood, however, are the mechanisms by which exposure to violent media increases aggressive behaviour. In addition to relatively deliberative influences, such as the learning of aggressive values (Bandura, 1978; Bandura, Ross, & Ross, 1963), current models (Huesmann, 1986; Berkowitz, 1990; Bushman, 1998; Anderson & Bushman, 2002b) assume that the mechanisms underlying the effects of violent media are often automatic (i.e. spontaneous and unintentional) in nature. For example, Berkowitz (1990) proposes that violent media automatically prime aggressive thoughts and feelings, which subsequently prime aggressive action tendencies (see also Anderson, Benjamin, & Bartholow, 1998; Todorov & Bargh, 2002). In support of this view, researchers find that watching violent movie clips (Bushman, 1998) and playing violent video games (Anderson & Dill, 2000) increases the automatic accessibility of aggressive traits and actions in memory. In addition, Anderson and Dill (2000) found that the increased accessibility of aggressive concepts in memory partly mediated the effects of playing a violent video game on subsequent aggressive behaviour (delivering noxious blasts of noise to another student). Repeated exposure to violent media may make aggressive thoughts and actions chronically accessible, increasing the likelihood that the person will behave in an aggressive manner, especially when provoked or frustrated (Anderson & Dill, 2000; Berkowitz, 1990; Bushman, 1998; Todorov & Bargh, 2002).

Exposure to violent media may also exert an influence on automatic associations with the self (Greenwald & Banaji, 1995; Greenwald, McGhee, & Schwartz, 1998; Todorov & Bargh, 2002). Research in the area of automatic social cognition (Bargh & Chartrand, 1999; Greenwald & Banaji, 1995; Todorov & Bargh, 2002) suggests that people's cognitive associations with the self and other attitude objects may mediate the relationship between their environments and their behaviours. Unobtrusive measures of these associations (Fazio, Jackson, Dunton, & Williams, 1995; Greenwald et al., 1998) are robust predictors of relevant judgments and behaviours, including actions that discriminate against members of social outgroups (Bessenoff & Sherman, 2000; Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997; Fazio et al., 1995; Gawronski, Ehrenberg, Banse, Zukova, & Klaur, 2003; McConnell & Leibold, 2001; Rudman & Glick, 2001) and psychological abuse of one's spouse (Zayas & Shoda, 1999). These findings suggest that one

way in which exposure to violent media may exert an influence on behaviour is via changes in a person's automatic self-concept (i.e. the extent to which one spontaneously associates the self with aggressive traits and actions). No research to date has explored this possibility.

The present study examined the relationship between exposure to violent media and the automatic self-concept on two levels. First, can exposure to violent media—in this case, playing the violent video game Doom in the laboratory—temporarily change the extent to which people associate the self with aggression? Second, does the extent to which a person plays violent video games in their own life predict their automatic self-concept with regard to aggression, above and beyond self-reported aggressiveness? Both short and long-term effects of exposure to violent video games on the automatic self-concept seem likely. Violent video games, because of their interactive nature and because they lead the player to assume a violent role, may be even more likely than violent television and movies to lead to the learning of aggressive scripts, attitudes and self-views (Anderson, 2002). This investigation focuses attention on the possibility that such learning can occur not only deliberatively but unintentionally and automatically as well.

Method

Participants

One hundred and twenty-one introductory psychology students (54 male, 65 female, 2 no answer) volunteered for the experiment in return for course credit. While our participants were all 18 years or slightly older, current definitions of adolescence include not only the late teens but in some cases even the early 1920s, in part because aspects of brain development (e.g. in the frontal lobe) are not yet complete at that point (Feldman & Elliott, 1990; Papalia, Olds, & Feldman, 1998). Thus, while the sample used may be older than is typical for research of this kind, the study seems relevant to understanding the effects of video game play among adolescents.

Materials

Violent game

Doom, a popular 3D shoot-'em-up game was selected as the violent game. Players maneuver through a maze battling soldier-zombies, demons and other monsters. Because pre-testing indicated that naïve participants could not master the controls or mazes in Doom without extensive practice, 5 new Doom levels that were designed to be easy to navigate were created specifically for this experiment. In addition, the controls were simplified so that participants could complete each level using only the mouse and arrow keys.[1]

Non-violent game

The non-violent game selected was "Mahjongg: Clicks", an absorbing puzzle game. Participants attempt to clear their computer screen by clicking on adjacent tiles that match each other in color and design.

[1] These customized Doom levels are available from the first author.

Implicit Association Test

Automatic aggressive self-concept was measured using the Implicit Association Test (IAT) developed by Greenwald et al. (1998). The IAT assumes that performing tasks that oblige people to sort well-associated categories together is easier than performing tasks in which the categories to be grouped together are not associated. The aggressive self-concept IAT involves four categories: two contrasted target concept categories (Self and Other) and two contrasted attribute categories (Aggressive and Peaceful). In the critical blocks of the IAT, participants perform two combined categorization tasks that map the four categories of stimuli onto two response keys. In one critical task (Self = Aggressive), participants are instructed to rapidly press one key for both Self and Aggressive stimuli and to press another key for both Other and Peaceful stimuli. In the second critical task (Self = Peaceful), both Self and Peaceful get one response and both Other and Aggressive get the alternative response. (Order of the two critical tasks is counterbalanced across participants.) The IAT effect is the difference between the latencies for the two IAT critical blocks. For participants with an automatically aggressive self-concept, the Self = Aggressive IAT task is expected to be performed substantially more rapidly than the Self = Peaceful IAT task. Error trials (those trials in which participants accidentally miscategorize a word, for example categorizing "gentle" as an "Aggressive" word) tend to show a similar but weaker pattern of effects, and are usually not analysed in research using the IAT (Greenwald et al., 1998; Greenwald & Nosek, 2001). A considerable body of research attests to the reliability and predictive validity of latency based IAT measures of attitude and self-concept (see Greenwald & Nosek, 2001; Fazio & Olson, 2003, for reviews).

Following standard procedure for the IAT (Greenwald et al., 1998), the IAT measure of aggressive self-concept used in this study consisted of seven categorization tasks, the two IAT critical blocks along with five practice blocks. In the first practice task, participants were asked to categorize words (using the "d" key for left and the "k" key for right) as either representative of Self (e.g. I, me) or Other (e.g. others, them). In the second practice task, they categorized words as either representative of Aggressive (e.g. aggressive, combat) or of Peaceful (e.g. peaceful, gentle). In the third practice block, these tasks were combined, such that participants pressed the "d" key for either words representative of Aggressive *or* of the Self, and the "k" key for words representative of Peaceful *or* of Other. These pairings were the same in the fourth, critical IAT block. In the fifth block, participants again categorized only Peaceful and Aggressive words, except that participants were now asked to press "d" for Peaceful and "k" for Aggressive. The sixth block combined this with the Self vs. Other task such that participants pressed "d" for words representative of either "Peaceful" or "Self" and "k" for words representative of either "Aggressive" or "Self". These pairings were the same for the seventh, critical IAT block. The critical IAT blocks consisted of 32 trials and the practice blocks of 20 trials.

Feeling thermometers

Participants completed two feeling thermometer measures. On the first, they rated themselves on a scale from 0 (not at all aggressive) to 100 (extremely aggressive). On the second, they rated "other people" on the same scale.

Semantic differentials

Participants also rated themselves and other people on three semantic differential scales ranging from –3 to +3. The scale anchors were "aggressive-peaceful", "fighter-quiet" and "combative-gentle".

Buss and Perry aggression questionnaire

Participants also completed the Buss and Perry (1992) Aggression Questionnaire, a self-report measure of trait aggression. Participants responded on Likert-type scales ranging from 1 (strongly disagree) to 5 (strongly agree), to items such as "If a person hits me, I hit them back".

Previous game exposure

Participants were also asked how often they played video games, on a scale ranging from 0 (I do not play video games) to 6 (I play more than 1 h per day). They were also asked to estimate amount of their time playing video games that was devoted to games with aggressive or violent content, on a scale from 0 (zero) to 10 (100%).

Procedure

Participants first played either Doom or Mahjongg for 10 min. Afterwards, they completed the IAT, feeling thermometers, semantic differentials, Buss and Perry questionnaire and the previous game exposure questionnaire in fixed order.

Results

Implicit Association Test

The two data collection blocks of each IAT were retained and practice blocks discarded. Additionally, the first two trials from each data collection block were deleted because response latencies were typically longer. To correct for anticipatory responses and momentary inattention, latencies less than 300 ms. and greater than 3000 ms were recoded as 300 and 3000 ms, respectively. Finally, participants with unacceptably high error rates (less than 70% accuracy) or overly long average latencies (greater than 1000 ms) were omitted from analysis. The data were then log-transformed to normalize the distribution. This procedure mirrored that of Greenwald et al. (1998).

Participants' IAT effects were calculated by subtracting their mean latency on the Self = Peaceful critical IAT block from their mean latency on the Self = Aggressive critical IAT block. Overall, participants associated themselves more with "Peaceful" than with "Aggressive" on the IAT ($M_{\text{IAT effect}} = -166$ ms, S.D. = 185 ms), $t(113) = -9.6$, $p < 0.001$. The more positive (or less negative, since most participants had negative scores) a person's IAT score, the greater their association of Aggression with Self.

We expected that playing Doom, relative to playing Mahjongg, would lead participants to automatically associate themselves with aggression to a greater extent. To investigate the effects of game play on the IAT while also taking into account participant gender, we carried out a 2 (game condition: violent vs. non-violent) × 2(gender) ANOVA on participants' IAT scores. Fig. 1 shows

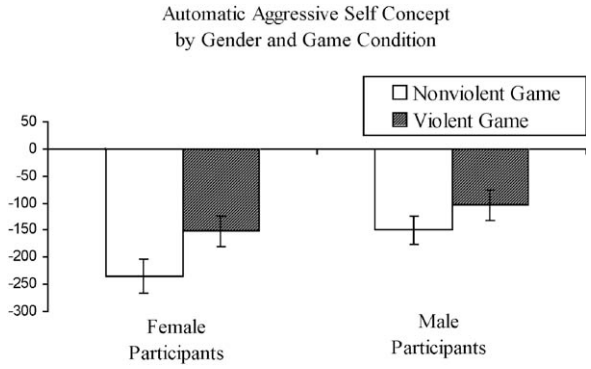

Fig. 1. IAT effects of female and male participants in the non-violent and violent game conditions. The *Y*-axis represents participants' IAT effects in milliseconds. Error bars represent the standard error. Relatively more positive IAT effects reflect a stronger automatic association between the self and aggression.

the IAT scores of male and female participants in the violent and non-violent game conditions. As expected, participants in the Doom condition were more likely to automatically associate themselves with aggression ($M = -130$ ms, S.D. = 153 ms) than participants in the Mahjongg condition ($M = -201$ ms, S.D. = 204 ms), a difference that was statistically significant, $F(1,110) = 4.50$, $p = 0.036$. There was also a main effect of gender on IAT scores, $F(1,110) = 5.35$, $p = 0.023$, with men ($M = -126$ ms) scoring as more automatically aggressive than women ($M = -198$ ms). However, there was no interaction between participant gender and game condition ($F < 1$). Thus it appears that playing the violent game did, as hypothesized, increase automatic aggressiveness, and that this effect was equally likely to occur for male and female players.[2]

Self-reported aggressiveness

To create self-report measures that were directly comparable to the IAT difference score, the "self" ratings on the feeling thermometer and semantic differential measures were subtracted from the ratings for "other people". As on the IAT, negative scores reflect a view of oneself as less aggressive than other people, whereas positive scores reflect a view of oneself as more aggressive than other people. Participants saw themselves as less aggressive than other people on both the feeling thermometer ($M_{\text{difference}} = -24$, S.D. = 33), $t(114) = -7.5$, $p < 0.001$, and semantic differential measures ($M_{\text{difference}} = -0.77$, S.D. = 0.79), $t(115) = -10.6$, $p < 0.001$.

Participants also reported a relatively low level of aggressiveness on the Buss and Perry measure, scoring significantly below the scale midpoint of 87 ($M = 68$, S.D. = 16.1),

[2] One concern we had was that previously playing Doom could have simply made participants more effective at computerized tasks like the IAT, for example by making their responses faster. One way of looking at this was to examine whether playing Doom led to greater speed on the two single-dimension practice blocks of the IAT. On the first practice block (categorizing words as Self or Other related), there was no significant difference between the Doom ($M = 738$, S.D. = 296) and Mahjongg ($M = 716$, S.D. = 215) conditions, $t(116) = -0.48$, $p = 0.63$. On the second practice block (categorizing words as Aggressive or Peaceful), there was also no significant difference between Doom ($M = 683$, S.D. = 192) and Mahjongg $M = (709$, S.D. = 161) conditions, $t(116) = 0.80$, $p = 0.43$.

$t(115) = -12.5$, $p < 0.001$. Because splitting the Buss and Perry scale into its component subscales had no significant or substantive impact on our results (e.g. in terms of correlations with other measures, effects of game condition, or moderating the effects of the manipulation), only results with the total score are reported here.

Our main interest was whether playing Doom changed participants' self-reported aggressive self-concept. We carried out a 2 (game condition: violent vs. non-violent) × 2(gender) ANOVA on participants' scores on the 3 self-reported aggressiveness measures. This revealed no significant effects of game condition on the feeling thermometer measure ($F < 1$), semantic differential measure ($F < 1$) or Buss and Perry scale ($F(1,111) = 3.00$, $p = 0.09$). There were no main effects of gender on the feeling thermometer ($F < 1$) or semantic differentials ($F(1,111) = 2.77$, $p = 0.10$), but a significant gender difference emerged on the Buss and Perry scale, with men scoring as more aggressive ($M = 73$) than women ($M = 64$), $F(1,111) = 9.73$, $p = 0.002$. There were no significant interactions between participant gender and game condition on either the feeling thermometer ($F(1,111) = 1.18$, $p = 0.28$) semantic differentials ($F < 1$) or Buss and Perry scale ($F(1,111) = 1.81$, $p = 0.18$). Overall, our results suggest that exposure to the violent game did not significantly influence the self-reported aggressiveness of either male or female participants.

Prior game exposure

On average, participants reported playing video games relatively infrequently ($M = 1.7$, S.D. = 1.6 on a scale of 0–6), and splitting their time about evenly between violent ($M = 43\%$, S.D. = 29%) and non-violent ($M = 57\%$, S.D. = 29%) games. A measure of prior exposure to violent video games was calculated by taking each participant's time spent playing video games and multiplying it by the amount of that time they spent on video games with aggressive or violent content ($M = 20$, S.D. = 17).[3] An analogous measure of prior exposure to non-violent video games was calculated by taking each participant's time spent playing video games and multiplying it by the amount of that time they spent on non-violent games ($M = 22$, S.D. = 14).

Men were more likely than women to play video games (M's = 2.4 vs. 1.0; $t(114) = 5.8$, $p < 0.001$), spent a greater percentage of their time on violent games (M's = 54% vs. 32%; $t(114) = 4.2$, $p < 0.001$), and had greater total exposure than women to violent video games (M's = 29 vs. 12; $t(114) = 6.02$, $p < 0.001$). Men and women did not differ in their exposure to non-violent games (M's = 24 vs. 21), $t(114) = 1.3$, $p < 0.19$).

We expected that playing violent games in the past would predict participants' degree of automatic and self-reported aggressiveness. Consistent with this, both the IAT and the Buss and

[3] We obtained an unexpected condition difference in self-reported prior exposure to violent games, such that participants in the Doom condition reported playing *less* violent games than participants in the Mahjongg condition (M's = 21 and 18, respectively), $F(1,112) = 4.10$, $p = 0.045$. (This effect appeared to be driven by male participants, $F(1,112) = 10.14$, $p = 0.002$). While a failure of random assignment is possible, we think it most likely that playing Doom led participants to set a higher threshold for what they considered to be a violent game (i.e. something as graphic as Doom, as opposed to a moderately aggressive racing game), leading them to self-report less prior exposure to violent games. Regardless, non-random assignment could only have *hurt* our hypothesis of greater aggressiveness in the violent game condition, since participants in the Mahjongg condition reported *greater* prior exposure to violent games (which is associated with a higher degree of automatic aggressiveness). Controlling for self-reported prior exposure to violent games only made the effects of violent game play on IAT scores slightly more significant, $F(1,107) = 6.78$, $p = 0.011$.

Table 1
Correlations between automatic aggressiveness, self-reported aggressiveness, and video game exposure

	1	2	3	4	5
1. Implicit Association Test					
2. Aggression questionnaire	0.17 (112)				
3. Feeling thermometer	0.10 (111)	0.49*** (115)			
4. Semantic differential	0.05 (112)	0.12 (116)	0.52*** (115)		
5. Exposure to violent games	0.28** (112)	0.33*** (116)	0.13 (115)	−0.10 (116)	
6. Exposure to non-violent games	−0.10 (112)	0.03 (116)	−0.13 (115)	−0.13 (116)	−0.04 (116)

Note. $^{*}p<0.05$, $^{**}p<0.01$, $^{***}p<0.001$.

Perry Scale were positively correlated with self-reported prior exposure to violent video games and neither correlated with prior exposure to non-violent games (see Table 1). The relationship between the IAT and prior exposure to violent games remained significant in partial correlations controlling for game condition (partial $r(112)=0.32$, $p<0.001$), scores on the three self-reported aggressiveness measures (partial $r(111)=0.28$, $p<0.01$), participant gender (partial $r(112)=0.22$, $p=0.02$) and game condition, gender and self-reported aggressiveness simultaneously (partial $r(111)=0.23$, $p=0.018$). Likewise, the relationship between scores on the Buss and Perry scale and prior exposure to violent games remained significant after controlling for game condition (partial $r(116)=0.35$, $p<0.001$), automatic aggressiveness (partial $r(112)=0.29$, $p=0.003$), participant gender (partial $r(116)=0.23$, $p=0.02$) and game condition, gender and IAT scores simultaneously (partial $r(112)=0.25$, $p=0.009$). This suggests that long-term exposure to violent video games makes largely independent contributions to automatic and self-reported aggressiveness.

Discussion

While most video game enthusiasts insist that the games they play have no effect on them, their exposure to scenes of virtual violence may influence them automatically and unintentionally (Bargh & Chartrand, 1999; Greenwald & Banaji, 1995; see also Nisbett & Wilson, 1977; Todorov & Bargh, 2002).[4] In this study, participants who had played the bloody and violent video game Doom for 10 min subsequently associated the self more with aggressive traits and actions on an IAT, but did not associate self with aggressive traits on a variety of self-report measures. These findings suggest that the short-term effects of game exposure on the self-concept, at least in this study, were strongest at an automatic level.[5]

[4] Interestingly, although most people deny that exposure to violent media has any effect on them personally, they do believe that other people are affected (Innes & Zeitz, 1988).

[5] We recognize that the measures of self-reported trait aggression used in this study are less likely to be affected by an experimental manipulation than measures of more transient states, such as anger or hostile expectations (see Bushman & Anderson, 2002). As a result, the absence of an experimental effect cannot be taken to indicate that there was no effect of violent game play on consciously endorsed aggressiveness. However, that significant effects were found on the automatic (but not the self-report) measures of aggressive self-concept does suggest that changes in self-views that resulted from playing the violent game were strongest at an automatic level.

By what mechanism does a single exposure to a violent video game lead to temporary changes in the automatic self-concept? It is easy to imagine how playing a violent video game could temporarily increase the accessibility of aggressive concepts, feelings, and thoughts through priming or spreading activation (Anderson & Dill, 2000; Berkowitz, 1990; Bushman, 1998). But how does it create a tighter cognitive association between the self and aggression? It may be that the repeated pairing of self and aggression related concepts classically conditions new or stronger associations between them (Olson & Fazio, 2001). Another possibility is that exposure to violent games temporarily primes alternative, more aggressive self-representations. According to social cognitive models, the self is a knowledge structure, organized as a network of associations (Greenwald et al., 2002). Contained within this architecture are multiple "possible selves" (Markus & Nurius, 1986), some of which are more chronically accessible than others. A priming episode may temporarily increase the automatic accessibility of a possible self that is otherwise nascent (Wheeler & Petty, 2001; see also Blair, Ma, & Lenton, 2001). Over time, repeated priming of a more aggressive possible self may make it the actual self, as it becomes the most chronically accessible self-representation.

Supporting the hypothesis that exposure to violent video games also has long-term effects on the automatic self-concept, participants who reported playing video games with aggressive content associated the self more with aggression on the IAT. Moreover, this relationship persisted after controlling for participants' self-reported aggressiveness. Automatic and self-reported aggressiveness were each significantly and independently predicted by game exposure suggesting that violent media may exert their influence through multiple routes, some more amenable to conscious assent than others.

These findings are consistent with models proposing that the effects of aggressive media are often exerted via associative networks in memory (Anderson & Bushman, 2002b; Berkowitz, 1990; Bushman, 1998; Huesmann, 1986). For example, Berkowitz (1990) emphasized the role of environmental priming in his cognitive-neoassociationistic model of aggression. Violent media are replete with aggressive stimuli, which can automatically prime aggressive thoughts, emotions and ultimately behaviours (Anderson & Dill, 2000; Berkowitz, 1970; Bushman, 1998). Huesmann's script-based model (Huesmann, 1986) assumes that associative processing often underlies aggression, for example the automatic links that build up between situations and sequences of behaviours. Anderson and Bushman's (2002b) general aggression model (GAM) incorporates major elements of these and other models, and likewise assumes that automatic associations between situations, emotions, attitudes, beliefs and behaviours play a major role in human aggression.

The automatic self-concept with regards to aggression constitutes a part of this larger network of associations, consisting of the automatic link in a person's mind between the self and aggressive traits and actions. Such automatic associations may be central to how we process information about ourselves and our social world (Greenwald et al., 2002). For example, they may guide how we interpret ambiguous behaviours by others, respond to obvious provocations, and even the environments we decide to exposure ourselves to (Anderson & Bushman, 2002b).

Concluding comment

Despite the misleading debate in the news media over whether exposure to violent television, movies and video games leads to an increase in aggressive behaviour, the empirical evidence that it

does so has become overwhelming. Decades of correlational, experimental, longitudinal and demographic studies converge in indicating that exposure to violent media is a cause of aggressive behaviour (Bushman & Anderson, 2001; Singer & Singer, 1983). The current task for researchers is to better understand the mechanisms via which violent media exert their effects. One important way is the deliberative learning of aggressive values (Bandura, 1978). Another is the priming of aggressive thoughts and actions (Anderson & Dill, 2000; Berkowitz, 1990; Bushman, 1998). The results of this study provide initial evidence that violent media may also exert their effects through changes in automatic associations with the self.

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