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Violent and Nonviolent Video Games Differentially Affect Physical Aggression for Individuals High Vs. Low in Dispositional Anger

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Although numerous experiments have shown that exposure to violent video games (VVG) causes increases in aggression, relatively few studies have investigated the extent to which this effect differs as a function of theoretically relevant individual difference factors. This study investigated whether video game content differentially influences aggression as a function of individual differences in trait anger. Participants were randomly assigned to play a violent or nonviolent video game before completing a task in which they could behave aggressively. Results showed that participants high in trait anger were the most aggressive, but only if they first played a VVG. This relationship held while statistically controlling for dimensions other than violent content on which game conditions differed (e.g. frustration, arousal). Implications of these findings for models explaining the effects of video games on behavior are discussed. Aggr. Behav. 37:539–546, 2011.

Keywords: violent video games; aggression; individual differences; trait anger; violence

Considerable evidence indicates that violent video games (VVGs) cause increases in aggression. Meta-analytic reviews demonstrate that exposure to VVGs increases aggressive behavior, with the average effect size ranging from .15 to .24 [Anderson, 2004; Anderson and Bushman, 2001; Anderson et al., 2010; Sherry, 2001]. The most recent meta-analysis [Anderson et al., 2010] of more than 380 studies and 130,000 participants "nails the coffin shut on doubts that VVGs stimulate aggression" [Huesmann, 2010], yet these increases in aggressive behavior may be best modeled as a function of the gamer's predisposition [see Huesmann, 1998]. In other words, exposure to the same VVG may dramatically increase aggressive behavior among certain individuals while seemingly unaffecting others.

Social psychological theories have long emphasized the importance of such person/situation interactions [see, e.g. Allport, 1937; Lewin, 1951]. In recent years, attempts to explain behavior have purportedly moved beyond the simple "person-situation debate" [see Kenrick and Funder, 1988] in favor of an interactionist perspective, in which dispositional variables and situations jointly interact to determine behavior [Funder, 2006]. Funder [2006] referred to this interactionist perspective as the *personality triad*, or the ability to predict behavior (outcome) if the inputs (traits and situations) of a system are known. According to Lewin [1951] and Funder [2006], if one had absolute knowledge of both a person and the respective situation that person was in, it should then be possible to predict how that person will behave.

Recent cognitive theoretical models investigating the impact of exposure to violent media (e.g. VVGs) on aggressive behavior not only explain *why* exposure to such media increases aggressive behavior but also explicate how the effects of media violence are moderated and mitigated by certain dispositions. Models such as these are typically referred to as social-cognitive information

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processing models [see, e.g. Anderson and Bushman, 2002; Crick and Dodge, 1994; Huesmann, 1988, 1998; Huesmann and Kirwil, 2007] because they focus on how individuals perceive, think, learn, and behave as a function of the social environment, as well as on how particular individuals evaluate the immediate situation, retrieve scripts and then evaluate these candidate scripts until one is selected to guide behavior [Huesmann and Kirwil, 2007]. For example, Huesmann's model [1998] suggests four important individual differences to consider in social problem solving: emotional predispositions (emotion-related tendencies), world schemas (sources from which individuals make attributions about the intentions of others), social scripts (learned patterns of behavior accessed to manage situations), and normative beliefs (cognitions regarding the appropriateness of aggressive behavior). Each of these predispositions is hypothesized to interact with situational variables to produce aggressive behavior. For example, Huesmann argues that certain individuals are equipped with particular emotional predispositions to behave aggressively, such as individuals high in trait anger, and that these individuals may be especially likely to rely on aggressive scripts following exposure to VVGs.

Trait anger is one important individual difference to consider in the expression of aggressive behavior [see Berkowitz, 1990; Huesmann and Kirwil, 2007]. According to Buss and Perry [1992], trait anger generally is understood in terms of an emotional preparation for aggressive responding, or thought to reflect behavioral impulsivity [e.g. Dickman, 1990]. The experience of anger is theorized to stem from global negative affect [Berkowitz, 1983, 1989, 1990] and is presumed to produce aggressive behavioral tendencies [Berkowitz, 1990]. Berkowitz's cognitive–neoassocianistic model of anger formation elucidates the relationship between anger and aggressive behavior via associative memory networks. Berkowitz assumes the experience of anger is linked with both cognitions related to anger (aggressive thoughts) and action tendencies (aggressive behavior), such that the activation of any one part of the network concomitantly activates the other two.

We propose that the effect of brief exposure to VVGs on aggressive behavior should be more pronounced among individuals high in trait anger. Information processing models account for these increases by suggesting that VVGs prime the retrieval of social scripts involving aggression previously acquired by the gamer [see Huesmann, 1998]. Priming refers to the temporary accessibility of ideas activated by environmental stimuli [Fiske and Taylor, 1984]. For example, exposure to VVGs may activate various associative networks associated with aggressive emotions, which, in turn, should jointly activate aggressive cognitions and increase the probability of aggressive behavior. The ease with which these scripts are retrieved as a result of brief exposure to VVGs should be higher among individuals high in trait anger. However, this is not to say that VVGs will have no effect on low trait anger individuals, only that VVGs will have the greater impact on dispositionally angry individuals [Huesmann and Kirwil, 2007]. Partial support for this hypothesis was found in an experiment showing the greatest increase in aggressive cognitions among individuals high in trait anger exposed to VVGs [Giumetti and Markey, 2007]. Participants in that experiment were randomly assigned to play a violent or nonviolent video game before completing ambiguous story stems to assess the accessibility of aggressive cognitions. Results showed that angry individuals were the most affected by VVGs, as they completed the story stems most aggressively. Therefore, because aggressive cognitions are increased among high trait anger individuals who play VVGs, increases in aggressive action tendencies should also be expected (i.e. aggressive behavior) [Berkowitz, 1990]. It should be noted that anger is but one individual difference hypothesized to moderate the relationship between VVGs and aggressive behavior. For example, previous research has shown that individuals with aggressive personalities and high levels of exposure to violent games predicted aggressive behavior [Anderson and Dill, 2000, study 1]. Additionally, wishful identification with VVG characters predicts subsequent aggressive behavior following brief exposure to VVGs [Konijn et al., 2007].

To date, the extent to which dispositional anger and acute exposure to VVGs interact to produce physical aggression has not been investigated. In the current experiment, we tested this possibility by randomly assigning participants to a violent or nonviolent video game condition, followed by an opportunity to aggress against an ostensible opponent. In line with the interactionist perspectives, we predicted that exposure to video game violence would increase physical aggression primarily for participants high (vs. low) in trait anger.

METHOD

Participants

Eighty-three participants (21 women) ranging in age from 18 to 22 years ($M = 19.0$; SD = 1.0) at the

University of Missouri completed the experiment in exchange for partial course credit. Gender was balanced across game conditions.

Measures

Video games. All video games were played on the Playstation 3 console system. The VVGs included *Mortal Kombat vs. DC Universe*, *Resident Evil 5*, *Killzone 2*, *F.E.A.R. 2: Project Origin*, and *Call of Duty: Modern Warfare 2*. The nonviolent games included *MotorStorm*, *NCAA Basketball: 2009*, *Sid Meier's Civilization Revolution*, *Little Big Planet*, and *Ferrari Challenge*.

Trait anger. Trait-level anger was measured with the anger subscale from the Aggression Questionnaire [Buss and Perry, 1992]. Participants responded using a 7-point Likert scale ranging from 1 (*extremely uncharacteristic of me*) to 7 (*extremely characteristic of me*). An example item included "Sometimes I fly off the handle for no good reason." Internal consistency of the anger subscale was adequate in this study ($\alpha = .79$).

Game ratings. Participants rated their experiences with the video games they played along several dimensions on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). These items were included as a manipulation check to ensure that the assigned video games only differed on the amount of violence. An example item included "I felt *excited* while playing the video game." Mean ratings for participants in the two video game conditions are presented in Table I.

Aggression. Aggression was measured using a variant of the competitive reaction time (CRT) paradigm [Taylor, 1967]. In a typical CRT paradigm, participants are told that they will compete against another participant (e.g. by quickly reacting to stimuli) over the course of several trials. Participants are generally informed that the "loser" of each trial will receive some type of punishment (usually in the form of noxious noise blasts), the intensity of which is ostensibly set by the participant prior to an experimental trial. The CRT version used here included only one experimental trial, thus eliminating potential tit-for-tat strategies [Axelrod, 1984; Gouldner, 1960] and freeing participants from concerns over retribution on subsequent trials. The measure of aggression used here was the intensity of the noise blasts participants set for their ostensible opponent.

TABLE I. Game Rating Means as a Function of Game Condition

Question	Nonviolent	Violent
To what extent were you *frustrated* by the video game you just played?	2.8^{a}	3.7^{b}
I felt *excited* while playing the video game	4.2^{a}	5.0^{b}
I felt *engaged* while playing the video game	4.9^{a}	5.5^{a}
I found the game I played to be *interesting*	4.2^{a}	4.9^{a}
I found the video game I played to be *arousing*	2.8^{a}	3.7^{b}
I found the game I played to feature a great amount of violence	1.2^{a}	5.5^{b}

Note: Questionnaire items with different superscripts are significantly different between game conditions ($P < .05$).

Procedure

Before arrival, all participants were randomly assigned to a specific nonviolent or VVG within-game condition. Upon arrival, participants gave consent and were informed that at some point during the experiment they would engage in a brief competition against another participant, but that the bulk of the experiment would be completed individually.

Once participants completed the trait anger measure, the ostensible "opponent" (matched for gender of participant) always arrived. To convince participants that there was indeed someone competing against them, a purported live video connection was established where communication from the real experimenter and participant with the "other" experimenter and participant appeared to unfold in real time. For example, after a timing cue in the video, the real experimenter asked the other experimenter "hey, can you see us now?" to which the other experimenter replied "yeah, we can see you guys now." Following this interaction, all participants were instructed how to play their randomly assigned video game (e.g. explaining how the controller interacted with the gaming environment). Participants then played the video game, without interruption, for a period of 20 min. Next, all participants completed the CRT, which was described to them as a competitive interaction game. Specifically, participants were told that they would win or lose the game based on three criteria: (a) how quickly they responded to a visual stimulus by pressing one of two buttons, (b) how accurately they categorized the color of the stimulus, and (c) a final criterion that would be revealed immediately prior to the start of the experimental trial (CRT competition). Participants were shown that the noise intensity levels were noxious (the experimenter demonstrated low, medium, and high noise levels) and informed that this portion of the experiment included only one trial. If the participant had no questions, the experimenter exited the room and appeared to communicate with both participants simultaneously via intercom, asking whether each participant was "ready." Once participants said they were ready, they were then informed that the final criterion for determining victory in the interaction game was how quickly they set the noise levels, after which the experimenter immediately announced, "3, 2, 1, go!" Following the CRT, participants completed a questionnaire asking them to rate their assigned game along several dimensions (e.g. excitement, violence). All participants were then debriefed, during which several questions were asked to probe for suspicion concerning the ostensible opponent during the CRT. Specifically, participants were asked to indicate how it felt to compete with another person, and whether any aspects of the experiment appeared to be deceptive or somehow contrived. Participants responded using a number ranging from 0% (nothing seemed deceptive; the cover story was completely believable) to 100% (definitely thought the competition was fake; did not believe the cover story at all) indicating their level of suspicion concerning the experiment. Following debriefing, participants were thanked and dismissed.

RESULTS

Game Ratings

Analysis of these postgame items indicated that the exciting, engaging, interesting, and arousing items were reliable within each game condition (αs > .73). Therefore, a composite score of these variables was created separately for the nonviolent and violent game conditions. These composites did not differ as a function of the game played within either condition (Fs < 1.0, Ps > .45), suggesting that the selected video games were representative of the respective game type.

Further analysis of these questions, however, revealed differences between game conditions on several dimensions (Table I). As expected, the violent games were perceived to contain more violence than nonviolent games ($t = 16.8$; $P < .0001$). In addition, the violent games also were perceived to be more frustrating, exciting, and arousing (ts > 2.1; Ps < .04). However, the games did not differ on level of engagement or interest (ts < 2.0, Ps > .05). Further analyses showed no within-game differences on any game rating question among the nonviolent (ts < 1.4, Ps > .17) or violent (ts < 1.3, Ps > .20) games.

Anderson [2004] suggested nine "best practices" when designing studies aiming to investigate the relationship between VVGs and outcomes of interest (e.g. aggression). Of these practices, a major concern should arise when it is apparent that the video games differ in systematic ways that contaminate experimental conditions such as, for example, when the nonviolent games are less frustrating than the violent games. Since the VVGs in this study were perceived be more frustrating, exciting, and arousing than the nonviolent games, these game ratings were entered as covariates to control for potentially confounding influences on the aggressive behavior dependent variable. Gender also was included as a factor in the model because studies on aggression sometimes report that males act more aggressively than females following acute exposure to VVGs [see Bartholow and Anderson, 2002].

Main Analysis

Before analyses, the main effect of Condition was effect coded, the main effect of Gender was dummy

TABLE II. Hierarchical Regression Model Predicting Noise Intensity

Variable	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Condition	**−.01**	*−.02*	*−.03*	*−.11*	*−.12*	*−.10*
Gender		**.27***(.06)	*.26**	*.32***	*.25**	*.25**
Trait anger			**.10** (0)	*.05*	*.19*	*.19*
Frustration				**.23**† (0)	*.16*	*.15*
Excitement				**.10**	*.13*	*.14*
Arousal				**−.01**	*.01*	*.00*
Gender × trait anger					**−.20** (.13)	*−.20*
Condition × gender					**.05**	*.03*
Condition × trait anger					**.38****	*.45**
Condition × trait anger × gender						**−.09** (−.01)

Note: Condition = game played in the lab (violent or nonviolent). Higher level steps include all variables from previous steps in the regression model (e.g. step 5 controls for steps 1–4). Standardized regression coefficients (βs) are shown in bold for each predictor within the respective step it was added to the model. Numbers in italics represent standardized regression coefficients when a newer step was added to the model. Numbers in parentheses represent Δ in Adj. R^2 (i.e. change in adjusted R^2 by adding the step). †$P < .1$. *$P < .05$. **$P < .001$.

coded, the main effects of Trait anger and all covariates (continuous predictors) were centered, and all possible interaction terms between Condition, Trait anger, and Gender were created. Participants reporting a high level of suspicion that the other participant was not present during the experiment ($n = 4$) were dropped from analyses. Participants with studentized deleted residuals >2.5 in absolute value on the noise intensity variable were dropped from regression models ($n = 2$; one from each game condition), one extremely conservative criterion for removing outliers from statistical models. Therefore, the final sample used for this analysis consisted of 77 participants (36 in the nonviolent game condition). Because mean noise intensity levels also did not differ as a function of the specific game played within game conditions (Fs < 1), subsequent analyses collapsed across this factor.

To test our hypothesis that exposure to violent games differentially affects aggressive responses for participants high vs. low in dispositional anger, a hierarchical regression model was created with the main effect of Condition entered on step 1, Gender entered on step 2, Trait anger entered on step 3, the covariates (Frustration, Excitement, Arousal) entered on step 4, all two-way interactions between Condition, Trait anger and Gender entered on step 5, and the 3-way Condition × Trait anger × Gender interaction entered on step 6 predicting noise intensity levels. Only significant results from the model are discussed.

As seen in Table II, a significant main effect of Gender was observed on step 2. Inspection of the means showed that men set higher noise intensity levels ($M = 5.3$) than women ($M = 3.8$). None of the game ratings covariates accounted for significant variability in noise intensity (though the Frustration effect was marginal; $P = .08$). As predicted, however, a significant Condition × Trait anger interaction emerged on step 5. The form of this interaction is graphically depicted in Figure 1. The source of this interaction was probed in two separate ways. First, we explored the interaction by testing the simple slope of trait anger on noise intensity separately for the violent and nonviolent game conditions. Results indicated that trait anger tended to negatively predict noise intensity levels in the nonviolent game condition ($\beta = -.32$, $P = .06$), whereas trait anger positively predicted noise intensity levels in the violent game condition ($\beta = .49$, $P < .01$), suggesting that individuals high in dispositional anger set higher noise intensity levels, but only if they first played a VVG. To further explore this interaction, a median split was conducted on Trait anger scores. Mean noise intensity levels as a function of game condition and trait anger (low and high) may be seen in Table III. Simple mean comparisons showed that among participants assigned to play a violent game, participants high in trait anger were marginally more aggressive than those low in trait anger ($t = 1.72$, $P = .09$). All other mean comparisons were nonsignificant (ts > 1.28, Ps $> .20$).

DISCUSSION

According to the interactionist perspective, situational variables associated with aggression, such as exposure to VVGs, should elicit differential outcomes depending upon any number of "person-level," individual difference factors. In support of this prediction, the current experiment demonstrated

TABLE III. Mean Noise Intensity Levels for Those Low and High in Trait Anger by Video Game Condition

	Nonviolent	Violent
Low trait anger	5.2 (2.7)[ab]	4.3 (2.5)[a]
High trait anger	4.6 (2.2)[ab]	5.7 (2.4)[b]

Note: Means with different superscripts are marginally significant ($P = .09$). All other mean comparisons are nonsignificant ($Ps > .20$). Standard deviations of the mean are shown in parentheses.

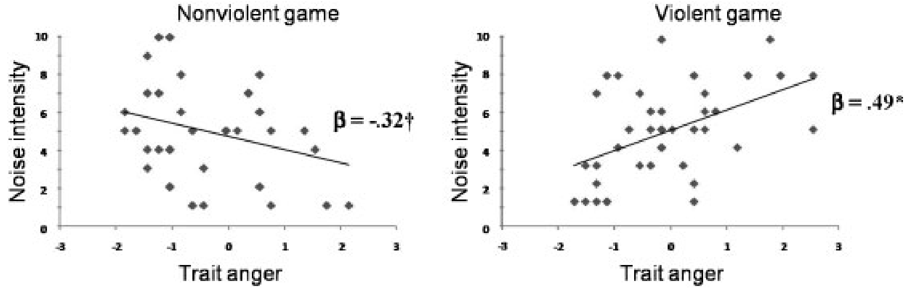

Fig. 1. Noise blast intensity as a function of game condition and trait anger (standardized). More positive trait anger scores reflect greater anger. †$P = .06$; *$P < .01$.

that the effects of acute video game exposure on aggressive responding were moderated by individual differences in dispositional anger. Whereas violent game exposure tended to elicit increased noise intensity as a function of increasing levels of trait anger, exposure to nonviolent games actually tended to decrease noise intensity settings as a function of increasing trait anger levels, though this effect did not reach statistical significance.

The results of this study are consistent with and extend the findings of other, similar work showing that acute exposure to VVGs differentially increases the accessibility of aggressive thoughts as a function of dispositional anger levels [Giumetti and Markey, 2007]. Those findings, coupled with the current results, support the predictions of interactionist models that situational factors and person variables interact to influence the expression of relevant behaviors (aggressive behavior) [see also Huesmann, 1998]. Importantly, whereas some studies show no effects of person-level factors moderating the relationship between exposure to violent games and aggressive behavior [Anderson and Dill, 2000, study 2; Anderson et al., 2004; Anderson and Carnagey, 2009], this study is consistent with other data showing that particular individuals are more susceptible to the effects of VVGs [see, e.g. Anderson and Dill, 2000; Markey and Markey, 2010], thus adding to our understanding of when VVGs might exert influences on aggressive behavior.

Though not significant (either in simple slope analyses or mean comparisons across conditions), the fact that exposure to nonviolent games appeared to decrease aggressive responding to some extent as a function of increasing levels of trait anger warrants consideration. One potential explanation for this finding might be that individuals high (vs. low) in trait anger are more susceptible to the content of video games, including those with nonviolent themes. If so, one might expect to see a relationship between anger and other constructs thought to reflect fluctuations in emotion brought about by situational manipulations. One such construct is trait arousability [see Mehrabian, 1996; Mehrabian and O'Reilly, 1980], or the extent to which individuals process—and are influenced by—high information environmental stimuli. Because the authors hypothesized that individuals high in trait anger possess arousable dispositions, studies manipulating situational variables associated with aggression should have a greater impact on individuals higher in trait anger, as was the case here (i.e. mean noise intensity levels were lower among high trait anger individuals than low trait anger individuals in the nonviolent game condition).

Empirical support for this line of reasoning is shown, for example, in a study in which the investigators asked participants varying in levels of trait anger to aggress against an ostensible "other" following the consumption of alcoholic or nonalcoholic beverages [Parrott and Zeichner, 2002]. Results of this study showed that participants with higher levels of trait anger behaved more aggressively following alcohol consumption relative to the consumption of a nonalcohol beverage. Additionally, within the alcohol condition, participants higher in trait anger behaved more aggressively than those lower in trait anger. Studies investigating trait anger and other situational variables (e.g. provocation) have reached similar conclusions [Bushman et al., 2001; Pihl et al., 1997; van Goozen et al., 1994a,b]. More pertinent to the current finding in the nonviolent game condition, however, is the idea that video games could differentially prime constructs congruent with game content for angry (arousable) individuals, which then could serve as the basis for differences in aggressive behavior. Toward this end, Giumetti and Markey [2007] also reported that trait anger moderated the effect of video game content on aggressive cognitions [see Figure 1 in Giumetti and Markey, 2007]. Consistent with the current experiment, their findings appeared to be largely driven by individuals high in trait anger, such that angry individuals who play a VVG appear to be the most aggressive, whereas angry individuals who play a nonviolent game appear to be the least aggressive. Because we did not measure aggressive cognitions in the current experiment, underlying mechanisms for our findings are speculative, but there does appear to be preliminary evidence supporting the idea that both nonviolent and VVGs might differentially affect individuals high in trait anger, perhaps by aligning cognitions with the game content. However, because the observed aggression-reducing effects of nonviolent games among those high in trait anger have not been well documented, a replication of these results is warranted.

The current experiment yielded no main effect of video game condition. This result was surprising, especially considered in light of dozens of other experiments showing an effect of VVGs on aggressive behavior (but see Graybill et al., 1987]. However, even reliable laboratory-based phenomena do not necessarily occur in each and every experiment, a fact underscored by meta-analytic reviews of the VVG and aggression literature (e.g.

Anderson et al., 2010). One possibility for this null finding in the current study is that the aggression task was completed several minutes following the gaming session. Specifically, before the participant completed the CRT task, the experimenter asked for the controller, shut off the Playstation, explained the CRT task, and finally returned to the experimental room to communicate with the "other" participant and commence the countdown, all which lasted approximately 10 min. Notably, research manipulating the delay (e.g. 0 vs. 15 min) between game exposure and assessment of aggression has shown similar null effects following a delay [see Sestir and Bartholow, 2010]. This study is consistent with the idea that researchers should exercise caution when designing a study on brief exposure to VVGs, as the window to observe increases in aggressive behavior may be less than 10 min. Moreover, even after the 10-min delay, participants high in trait anger still exhibited increases in aggressive behavior. This finding perhaps suggests that although the accessibility of aggressive action tendencies [Berkowitz, 1990] may not be accessible for all individuals following a delay between VVG exposure and aggression measurement, accessibility may remain high for longer periods of time for individuals high in trait anger. Thus, one future research endeavor might be to examine the accessibility of aggressive cognitions and action tendencies following brief exposure to VVGs as a function of time delay and individual predispositions.

An important challenge for researchers investigating the effects of video game violence on aggression is isolating the effect of game content—and game content only—on aggressive behavior. Unfortunately, violent and nonviolent games often differ along dimensions other than violent content. For example, Bartholow and Anderson [2002] compared *Mortal Kombat* (violent) with *PGA Tournament Golf*, games that certainly differ in terms of violent content, but also differ on other dimensions (e.g. arousal level, the number of objects that must be tracked simultaneously, etc.). The games used in this study indeed differed in terms of frustration, excitement, and arousal in addition to violence. However, the predicted interaction was observed even while statistically controlling for these differences, suggesting that the findings of this study cannot simply be explained by differences in frustration, excitement, or arousal between conditions. The use of multiple games per condition in the current design also was advantageous in terms of reaping the benefits of stimulus sampling [Wells and Windschitl, 1999], thereby ensuring that differences between conditions cannot be attributed to idiosyncrasies of particular games (as can happen in studies using only one violent and one nonviolent game).

Besides statistically controlling for game effects other than violent content, another option to isolate effects of game content would be to engineer games in such a way that the very same game can be played with or without violence [see Anderson and Carnagey, 2009; Barlett et al., 2008]. Such comparisons are important for theoretical reasons, but comparisons based on such games tend to lack external validity (i.e. people typically do not play such engineered games). In our opinion, using games that exist in the marketplace has advantages in terms of understanding how people are affected by available games.

CONCLUSIONS

In sum, the results of this study provide the first evidence that exposure to video game violence produces differential effects on aggressive behavior as a function of individual differences in trait anger. Future research addressing how VVG and nonviolent video games differentially affect behavior as a function of additional individual difference variables is needed. Additionally, more work is needed to understand the emerging pattern of nonviolent (but not specifically prosocial) games seeming to reduce aggressive tendencies [see also Sestir and Bartholow, 2010]. The findings of this study suggest that such an effect might be particularly likely for individuals high in trait anger. It could be that individuals with similar personality traits (e.g. high in trait irritability or Psychoticism) may reap similar benefits from such games. The results of this study are promising and perhaps suggest potential remedial measures for individuals exhibiting emotional and behavioral problems stemming from violent game exposure.

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