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# Does playing video games with violent content temporarily increase aggressive inclinations? A pre-registered experimental study

Randy J. McCarthy [a,*], Sarah L. Coley [b], Michael F. Wagner [b], Bettina Zengel [b], Ariel Basham [a]

[a] Center for the Study of Family Violence and Sexual Assault, Northern Illinois University, USA
[b] Department of Psychology, Northern Illinois University, USA

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ABSTRACT

The current study tested whether participants who played a violent video game (VVG) would exhibit increased aggressive inclinations relative to those who played a non-violent video game (NVG). Participants ($N = 386$) were randomly assigned to play a VVG or a NVG prior to presumably interacting with another (non-existent) participant. We then measured participants' aggressive inclinations: Participants reported how many pins they would like to stick into a "voodoo doll" representing their interaction partner, and participants reported how likely they would be to actually harm their interaction partner. We did not detect any differences between conditions for several outcomes: the amount of aggressive inclinations displayed during the interaction, the number of pins participants chose to stick into a representation of their interaction partner, and participants' self-reported likelihood they would harm their interaction partner. Thus, the hypothesis that playing a VVG would increase aggressive inclinations was not supported in this study. Exploratory analyses revealed associations between (1) participants' self-reported likelihood to aggress and perceptions of the game as frustrating or difficult, (2) gender and higher levels of pin selection, and (3) participants' self-identification as a gamer and lower levels of pin selection.



The research examining whether playing video games with violent content (referred to as violent video games [i.e., VVGs] herein) causes subsequent aggression is heavily debated among social scientists. Despite variations in individual studies and despite the possible presence of moderators, meta-analyses have shown that there is an association between playing VVGs and subsequent increases in aggressive cognitions, emotions, and behaviors (e.g., Anderson et al., 2010, Ferguson, 2007a, Greitemeyer & Mügge, 2014, Sherry, 2001). This has led some to conclude that the evidence that playing VVGs increases subsequent aggression is strong (Huesmann, 2010). However, some disagree about the strength of this conclusion. Some argue that commonly-used measures of aggression are poor indicators of "real" aggressive behaviors, studies that failed to observe a relationship between VVGs and aggression are downplayed or ignored within some discussions of the extant research, and meta-analytic effect size estimates are inappropriately interpreted as evidence for the consistency of an effect (e.g., Elson & Ferguson, 2014; Ferguson, 2013; however, see Anderson, DeLisi, & Groves, 2013 for counter-arguments).

The goal of the current study was to test, in a straightforward manner, the hypothesis that those who played a VVG would exhibit greater aggressive inclinations than those who played a video game without violent content (referred to as non-violent video games [i.e., NVGs] herein). The present study did so by randomly assigning participants to play either a VVG or a NVG prior to measuring their subsequent aggressive inclinations. Further, we pre-registered our methods and planned analyses, used relatively face valid measures of aggressive inclinations, and made our stimuli and data freely available.

## 1. Theoretical underpinnings of how VVGs might affect aggressive inclinations

The hypothesis that exposure to VVGs increases aggression is best derived from social-cognitive theories of aggression, the best known of which is the General Aggression Model (GAM; e.g., Bushman & Anderson, 2002). The GAM proposes that situational factors (e.g., the presence of aggressive stimuli, hot temperatures) and person factors (e.g., biological factors, personality factors) serve as inputs that affect an individual's thoughts, feelings, and physiological arousal which, in turn, may incite an inclination to aggress. A final response selection and monitoring stage determines whether these aggressive inclinations become expressed as aggressive behaviors or are instead suppressed. Within VVG research, playing VVGs is considered as a situational factor that may temporarily increase aggressive inclinations.

* Corresponding author at: Center for the Study of Family Violence and Sexual Assault, 125 President's Blvd, Northern Illinois University, DeKalb, IL 60115, USA.
*E-mail address:* rmccarthy3@niu.edu (R.J. McCarthy).

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The GAM provides several explanations for how the effects of VVGs may produce aggression. One common explanation is that playing VVGs increases the accessibility of aggressive knowledge structures, which, in turn, increases aggressive inclinations, which, in turn, increases the likelihood of aggressive behaviors (e.g., Anderson & Dill, 2000, Carnagey & Anderson, 2005, Giumetti & Markey, 2007, Greitemeyer & McLatchie, 2011). The cognitive mechanism typically invoked to explain this effect is the spreading activation of nodes within a semantic network of cognitive representations, which potentially includes aggressive behavioral scripts (however, other cognitive mechanisms have been proposed; e.g., Engelhardt & Bartholow, 2013; Hasan, Bègue, & Bushman, 2012). Other GAM-derived hypotheses would be that playing VVGs increases physiological arousal, induces aggressive effect, or desensitizes perceivers to violence (e.g., Barlett, Harris, & Bruey, 2008, Bartholow, Bushman, & Sestir, 2006, Carnagey & Anderson, 2005, Saleem, Anderson, & Gentile, 2012, Sestir & Bartholow, 2010). Theoretically, changes in one or more of these internal states increase the likelihood of an aggressive, rather than a non-aggressive, behavioral response.

Although several moderators between playing VVGs and aggression have been demonstrated (e.g., Bartholow & Anderson, 2002, Konijn, Nije Bijvank, & Bushman, 2007, Sestir & Bartholow, 2010), and additional moderators undoubtedly exist, there is a clear precedent for predicting that playing VVGs, relative to NVGs, would be associated with increased aggressive inclinations (e.g., Anderson et al., 2010, Greitemeyer & Mügge, 2014). However, several individual studies have failed to observe that playing VVGs increases aggressive behaviors and cognitions (e.g., Adachi & Willoughby, 2011, Engelhardt, Mazurek, Hilgard, Rouder, & Bartholow, in press). Additionally, several researchers have raised concerns about the strength of evidence within the existing body of research that supposedly has observed a VVG-aggression effect (e.g., Consortium of Scholars, 2013, Elson & Ferguson, 2014, Ferguson, 2007b, 2013). These concerns have additional credence given the recent skepticism for behavioral priming effects that were previously believed to be robust (e.g., Doyen, Klein, Pichon, & Cleeremans, 2012). Thus, within specific circumstances, the association between playing VVGs and subsequent aggressive inclinations might be small or zero.

There are two competing hypotheses. On the one hand, playing VVGs may increase aggressive inclinations. Thus, one hypothesis is that those who played a VVG would exhibit more aggressive inclinations than those who played a NVG. On the other hand, playing VVGs may not increase aggressive inclinations at all or at least not in all circumstances. Thus, a competing hypothesis is that those who played a VVG may exhibit similar levels of aggressive inclinations as those who played a NVG.

## 2. Study overview

The current study was designed to test the hypothesis that playing VVGs is causally associated with increased aggressive inclinations relative to playing NVGs. Specifically, we randomly assigned participants to play either a VVG or a NVG. Then, participants were given an opportunity (a) to aggress during a brief interaction with another person, (b) to symbolically inflict harm by choosing to stick pins into a representation of their interaction partner (e.g., DeWall et al., 2013), and (c) to report how likely they would be to harm their interaction partner.

We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the current study (Simmons, Nelson, & Simonsohn, 2011, 2012). All hypotheses and analyses were specified prior to data collection, and the experiment program and data can be acquired from the first author or from the project's Open Science Framework page (https://osf.io/2y638/?view_only=6678d630023a48028e8e41566a178776). Finally, the current research was approved by Northern Illinois University's human subjects review board prior to data collection.

## 3. Methods

### 3.1. Sample size selection

For the VVG-aggression association, both Anderson et al. (2010) and Greitemeyer and Mügge (2014) estimated point estimates of the population effect size to be about $r = .20$, which is equivalent to $d = 0.41$. Using a Type 1 error rate of .05, we estimated that we needed a minimum sample of 190 participants to detect an effect of $d = 0.41$ with power of .80.

### 3.2. Sample selection and description

Three hundred eighty-six participants completed the study. During the funneled debriefing, 66 participants expressed suspicion about whether they were interacting with another person and another seven participants were flagged as somewhat or potentially suspicious (see methods below). The final 312 participants did not indicate suspicion and constituted our sample of "naïve" participants. These 312 participants were evenly split between the NVG condition ($n = 156$) and the VVG condition ($n = 156$).

The full sample was nearly split evenly between males (51%) and females (48%; 1% missing). The total sample mostly identified as white/Caucasian (42%) or black/African-American (33%; Latino/a 16%; Asian/Asian-American 5%; Hawaiian/Pacific Islander 1%; Native American 1%; missing 1%). Most (44%) were Freshman (Sophomore 36%; Junior 16%; Senior 4%; missing 1%) and had a mean age of 19.42 years ($SD = 2.24$; *Range* 18 to 40 years).

### 3.3. Video game selection

When comparing the effects of VVGs to NVGs, researchers must try to determine whether between-game effects are due to the "violent content" of the games or to other game characteristics. A common approach is to ask a pretest sample of participants to rate the VVG(s) and the NVG(s) on several characteristics (e.g., "How fast is the game?", "How violent are the game graphics?"; e.g., Anderson & Carnagey, 2009). Ideally, within the pretest sample, the VVG(s) and the NVG(s) would be rated similarly on non-violent characteristics and the VVG would be rated as more violent than the NVG. Researchers could then attribute between-game effects to the violent content of the games and not to other characteristics that were rated during the pretest. Although this approach allows researchers to ascertain, on average, how pretest participants perceived the VVG(s) and the NVG(s), and to assume these perceptions also would generalize to the study participants, we used a different approach in the current study.

For the current study we selected two games: Left 4 Dead 2 (2009; i.e., our VVG) and Portal (2007; i.e., our NVG). These games were chosen because they had some features in common: both involved shooting behaviors, and players of both games had first-person perspectives of the game characters. Also, after playing their respective game, participants rated their game using the "Video Game Rating Scale" (e.g., Anderson & Dill, 2000). Participants' ratings of the non-violent game characteristics were then available to use as covariates in our analyses, which allowed us to statistically account for individuals' perceptions of their game.

### 3.4. Procedures

All participants were recruited from the Northern Illinois University Department of Psychology and were compensated with course credit. Participants were told they would play a video game prior to interacting with another participant. Participants also were told that we were experiencing issues with the interaction component of the study, which was done to minimize suspicion for a later event. Participants then were randomly assigned to play either Left 4 Dead 2 (i.e., the