Violent videogames: The effects of narrative context and reward-structure on in-game and post-game aggression.

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Abstract

The potential influence of videogame violence on real-world aggression has generated considerable public and scientific interest. Some previous research suggests that playing violent videogames can increase post-game aggression. The Generalized Aggression Model (GAM) attributes this to the generalized activation of aggressive schemata. However, it is unclear if game mechanics that contextualize and encourage/inhibit in-game violence moderate this relationship. Thus, we examined the effects of reward structures and narrative context in a violent videogame on in-game and post-game aggression. Contrary to GAM-based predictions, our manipulations differentially affected in-game and post-game aggression. Reward structures selectively affected in-game aggression, while narrative context selectively affected post-game aggression. Players who enacted in-game violence through a heroic character exhibited less post-game aggression than players who enacted comparable levels of in-game violence through an antiheroic character. Effects were not attributable to self-activation or character-identification mechanisms, but were consistent with social-cognitive context effects on the interpretation of behavior. These results contradict the GAM's assertion that violent videogames affect aggression through a generalised activation mechanism. From an applied perspective, consumer choices may be aided by considering not just game content, but the context in which content is portrayed.

The relationship between exposure to violent videogame content and post-game behavioral aggression is an issue of considerable public and scientific interest (see Anderson et al., 2010; Ferguson & Kilburn, 2010). However, although some (in the media and in the scientific community) are keen to assert the existence of a clear causal link between violent gameplay and real-world aggression, the nature of this relationship is less clear than it may seem (compare, for example, Anderson et al., 2010; Ferguson & Kilburn, 2010). When commenting on Anderson et al.'s (2010) meta-analysis, Huesmann (2010) suggested the coffin had been "nailed shut" on doubts that violent video games stimulate aggression, characterizing the meta-analysis as the "… best yet at proving beyond a reasonable doubt that exposure to video game violence increases the risk that the observer will behave more aggressively and violently in the future" (p.180). However, while exposure to violent media *may* have adverse psychological effects, this relationship is likely to be more complex than suggested by blanket claims that exposure to violent video game content *meaningfully* increases the risk of future aggression. Moreover, assuming a generalized transfer of processing from in-game environments to post-game environments is problematic (e.g., Bennerstedt, Ivarsson, & Linderoth, 2012). Along these lines, the United States Supreme Court ("Brown v EMA," 2011) recently ruled that the extant literature failed to adequately demonstrate causation in the link between videogame violence and aggression, due to a high prevalence of correlational studies and significant methodological flaws (see also Ferguson, Garza, Jerabeck, Ramos, & Galindo, 2013). Thus, researchers have begun to address limitations in our understanding of the boundary conditions for a violent gameplay-aggression relationship, and to refine theoretical frameworks for understanding the effects of violent gameplay on players' out-of-game aggression.

Considering how elements of game design – intended by their nature to affect players' experience of and immersion in the game – moderate the effects of game content on players'

behavior and cognition will further our understanding in this area (e.g., Fischer, Kastenmueller, & Greitemeyer, 2010; Happ, Melxer, & Steffgen, 2013; Yoon & Vargas, 2014). Along these lines, a quote offered in Anderson et al.'s (2010, p.151) meta-analysis identifies an important issue for videogame research:

> *You know what's really exciting about video games is you don't just interact with the game physically … you're asked to interact with the game psychologically and emotionally as well. You're not just watching the characters on screen; you're becoming those characters.*
>
> -Nina Huntemann, *Game Over*

Games encourage players to engage with, not detach themselves from, in-game protagonists. We should not assume that the interactive nature of video games makes them more powerful than other forms of media in terms of facilitating a relationship between exposure to violent content and subsequent aggression (see Sherry, 2001). However, in many games, as in other forms of media, protagonists' actions do not occur in a vacuum. Thus, because games encourage players to engage with in-game protagonists, when considering the effects of game content on players' cognition and behavior, it may be fruitful to consider not just *what* the character (and, by proxy, the player) does, but *why* they do it. Narrative and character motivation lend context to the interpretation of in-game actions, and may consequently moderate effects on players' responses to game content (see King, Delfabbro, & Griffiths, 2010, for a proposed taxonomy of psychologically-relevant game features). Importantly, character motivation is distinct from the players' intrinsic motivation for playing the game in the first place, which may also have important effects on players' responses to game content (e.g., Ryan & Deci, 2000; Ryan, Rigby, & Przybylski, 2006). Using a violent first-person shooter (FPS) game, we examined the effects of narrative context (i.e.,

information about the characters' history and current motivation) and performance-based reward mechanisms (designed to encourage or inhibit aggressive in-game behavior) on players' in-game and post-game behavioral aggression (adapting Fischer et al.'s (2010) behavioral measure of aggression). We also collected self-report measures of identification with the character and self-activation to test previously identified potential mechanisms for any context effects.

Reward and punishment

Motivation is multi-dimensional. When considering why people choose to play certain games, or why they choose to play games in certain ways, both intrinsic and extrinsic motivations are important. Gameplay may be motivated by players' enjoyment of certain types of in-game behavior, or by more material or more instrumental goals (e.g., the need to complete certain in-game actions to progress the in-game story, or to succeed in the game). Researchers applying self-determination theory (SDT, Ryan & Deci, 2000) to explain player motivation argue that players are motivated to the extent that gameplay fulfils psychological needs relating to autonomy, competence and relatedness (Ryan et al., 2006). In some cases, players even report being motivated to engage in in-game behavior they do not enjoy (i.e., find boring or repetitive) in order to obtain certain rewards or feelings of satisfaction (see King, Delfabbro, & Griffiths, 2011 for a review). Thus, players' motivation(s) can be complex, and aspects of game design can contribute to player motivation and enjoyment (see Szalma, 2014, for a broader consideration of motivational design principles for human-technology interaction). Although important, we were not concerned with individual differences in players' motivation for playing video games *per se*. Rather, we examined how a specific aspect of game design – instrumental reward structure – that extrinsically motivates players' to play the game *in a certain way* affected the relationship between in-game violence and post-game aggression.

A basic and well-established principle of both operant conditioning and modelling approaches to learning is that the likelihood of an observed or enacted behavior being reproduced varies depending on the perceived or experienced consequences of that action (Bandura, Ross, & Ross, 1961; Skinner, 1948). The importance of feedback and reward structures on motivation is well documents and, as Szalma (2014, p.1454) notes, "(t)o the extent that these factors are generally important in determining human behavior, they must also influence how humans respond to technology." According to this principle, games that reward (punish) aggressive behavior should increase (decrease) the likelihood of post-game aggression. In addition to implicit in-game reward structures – in which violent gameplay may be a core game mechanic and essential for success – many game platforms/systems (e.g., *Steam*, *Playstation 3* & *Playstation 4*, *Xbox 360* & *Xbox One*) include explicit reward systems built in to their firmware (referred to as meta-rewards, see King et al., 2010). For example, players may receive meta-rewards including trophies (*Playstation*) or points (*Steam* and Microsoft's *Gamerscore*) for accomplishing certain in-game achievements. Importantly, these achievements are usually independent of overall in-game success (i.e., they are not usually required to successfully complete the game), but the level of the reward is often contingent on the difficulty of the task, and these rewards are considered estimators of esteem within the gaming community. The tasks that players are asked to complete vary widely in scope, but can include killing a particular number of enemies, killing enemies with a particular weapon, completing a level without killing anyone, or – in one extreme example – tying a woman up with rope, placing her on a railway track and watching her get run over by a train (the *Dastardly* achievement in *Red Dead Redemption*). Given that these achievements often directly incentivize players to undertake (or, in rare cases, avoid) violent actions, understanding the effects of in-game and meta-reward structures on players' future behavior is important. Further, although it is often assumed that violent (cf. non-violent) video games

implicitly reward aggression (e.g., Anderson et al., 2010) and therefore increase post-game aggression, this prediction remains untested. However, related research offers some support for this idea.

Across four experiments, Fischer et al. (2009) examined the effects of playing racing games (cf. neutral games) on risk-taking behavior in a subsequent driving simulation. Participants played a racing game or a neutral game, and subsequently watched video footage of risky driving manoeuvres (e.g., overtaking in traffic). Participants indicated when they would abort the risky manoeuvre. Participants who took longer to abort were considered to be engaging in more risky behavior. To the extent that this task is representative of real-world risk taking in a driving context, Fischer et al. found that racing games can have negative effects on traffic safety: increasing risk-taking behavior, risk-promoting cognitions, and positive attitudes toward reckless driving. However, the picture was more nuanced than this. Specifically, Fischer et al.'s third experiment included a comparison of the effects of playing a street-racing game with the effects of playing a Formula 1 racing game. Only the street-racing game produced the aforementioned effects. Although, in both games, success required driving at high speed, the games differed in two important ways, both of which are relevant to the present research. First, as noted by the researchers, street-racing games *reward* "reckless"[1] driving whereas Formula 1 racing games do not. Thus, although antisocial aspects of gameplay may produce carry-over effects in important applied domains, these effects may vary according to implicit and explicit in-game reward mechanisms. Second, the context in which the in-game behavior took place differed. Both street-racing and Formula 1 racing games reward speed, and both require skill and precision for success. But only Formula 1 racing is socially acceptable. Post-gameplay, participants who played the street-racing (cf.

[1] Importantly, "reckless" here must be interpreted as socially irresponsible. Success in street-racing games, as in Formula 1 games, requires skill and precision.

Formula 1) game had a greater tendency to characterize themselves as reckless drivers. While demand characteristics may have influenced the relationship between playing racing games and risk-taking behavior in the subsequent simulations, the results from Experiment 3 – specifically, the *differences* between the street racing and Formula 1 conditions – may indicate context effects on participants' interpretations of the behavior, and internalization of relevant concepts.

To understand the link between violent game content and post-game aggression, we should consider not only the in-game behavior but also relevant reward mechanisms and, more broadly, the context in which this behavior takes place. In addition to testing the effects of explicit reward structures on in-game and post-game aggression, we teased apart effects relating to reward from those relating to context.

Context and character

Intuitively, context matters when interpreting media violence. The body count in the 1994 film *Natural Born Killers* (78) is lower than that in the 2005 film *The Lion, The Witch & The Wardrobe* (88). However, only the former made *Entertainment Weekly*'s 2006 list of the 25 most controversial films of all time and was banned in several countries. Context effects are pervasive and influence, among other things, object and person perception, attitude formation, and attributions of causality (Norenzayan & Schwarz, 1999; Schwarz, 2007; Smith & Semin, 2007). Thus, information that adds context to gameplay (either general narrative context or context relating specifically to the in-game protagonist's background and motivation) may influence players' perceptions of and attitudes toward the protagonist and their actions. Further, emotive reactions (e.g., arousal) to stimuli are affected not only by the physical (e.g., visual) properties of the stimuli, but by the individual's involvement in and empathy toward others in an unfolding event (Davis, Hull, Young, & Warren, 1987; Laney, Heuer, & Reisberg, 2003). Laney et al. refer to this affective response as thematically-

induced (cf. visually-induced) arousal, and argue that the distinction between these two avenues to arousal relates to the role of context. Visually-induced arousal is a response to a specific perceptual stimulus. Thematically-induced arousal is a response to the "meaning of the … event" (p.996). Thus, in addition to influencing players' perceptions of in-game protagonists and their actions, context may affect players' emotional responses to aggressive game content, and place important caveats on the perceived acceptability of in-game violence. This, in turn, may affect the extent to which in-game violence is reproduced outside gameplay.

Providing players with background information relating to in-game protagonists is one method of developing narrative context and providing a framework within which the player can interpret a protagonist's actions. Further, such information influences identification with game characters and player arousal (Schneider, Lang, Shin, & Bradley, 2004) which, in turn, affect behavioral responses following exposure to aggressive game content (Fischer et al., 2010). Fischer et al. found that personalized (cf. generic) game characters increased players' arousal, self-activation, and aggressive behavior (mediated by increased self-activation) following violent gameplay. Similarly, Verplanken, Walker, Davis, and Jurasek (2008) found that increased self-activation strengthened the association between the activation of cognitions and the performance of related behaviors. Fischer et al. argue that personalized game characters provide a clear in-game representation of the self with which players can identify. Increased identification with the character makes attacks on the character more relevant, and increases self-activation, the availability of aggression-related cognitive structures and, ultimately, post-game aggression.

However, avatars need not be personalized for their behavior to affect players' self-concepts, cognitions, and behaviors. Yoon and Vargas (2013) found that following gameplay, independent of their level of identification with their avatar, participants assigned to a heroic

avatar (Superman) engaged in more prosocial behavior (i.e., provided a fictional subsequent participant with more chocolate sauce to consume) than those assigned to a villainous (Voldemort) or neutral (geometric shape) avatar. Conversely, participants assigned to a villainous avatar engaged in more anti-social behavior (i.e., provided a fictional subsequent participant with more chilli sauce to consume) than those assigned to a heroic or neutral avatar. Similarly, Happ, Melxer and Steffgen (2013) found that, compared to playing as a villain (The Joker), playing as a heroic character (Superman) reduced hostile perception bias (i.e., the tendency to perceive neutral faces as hostile), and increased prosocial behavior (i.e., picking up and returning/delivering a lost letter).

In all these conditions (i.e., in both experiments and for both heroic and villainous avatars), gameplay was violent. However, the effects of the violent game content on post-game aggression depended on the in-game context in which the violence took place, and participants' perceptions of the in-game protagonists. These studies, though informative, leave important questions unanswered. First, although they show that character archetypes can affect post-game aggression, they did not report effects on in-game aggression. Thus, it remains unclear if (a) engaging with a heroic (cf. villainous) character decreases post-game aggression by decreasing in-game aggression (consistent with generalized activation accounts), or (b) the level of in-game aggression is unaffected but the context of the in-game aggression influences the extent to which this translates into post-game aggressive behavior. We discuss these possibilities and their theoretical rationale below.

Second, both of these experiments relied on readily accessible heroic/villainous archetypes. This potentially limits our understanding of context effects on the relationship between in-game violence and post-game aggression because many games do not feature protagonists with pre-established and highly accessible moral affiliations. Instead, context and character motivation must be provided as game-specific backstory, or developed during

gameplay. Moreover, in-game protagonists are often not simply good or evil, rather they may be *heroic* or *antiheroic*. Thus, contextual character information may typically be less salient (and effects weaker) than in the reviewed studies. It is also noteworthy that these studies manipulated contextually-relevant information by altering the players' *avatar* (i.e., the visual image representing the character), not just the characters' backstory. In fact, Yoon and Vargas' (2013) manipulation relied wholly on the clear visual identifiability of their avatars as hero or villain. This is no way undermines previous findings. It may, however, prevent the generalization of these findings to games in which players do not have a visual representation of their character (e.g., in first-person shooter games), and context must be developed through narrative. To further test the generalizability of narrative context effects, we investigated if these effects were achievable using a more subtle and ecologically valid manipulation. Specifically, we tested if the effects of violent game content on identification with the character, self-activation and post-game aggression were affected by reading a brief biographical sketch relating to the protagonist's history and motivation (cf. manipulating character appearance to reflect readily identifiable heroic and villainous archetypes).

Theoretical Perspectives: Social learning theory and the Generalized Aggression Model (GAM)

Two theoretical frameworks have been particularly influential in efforts to understand the relationship between violent game content and aggressive behavior and cognition, and helped generate predictions relating to the effects of our current manipulations. First, social learning theory holds that individuals' attitudes and behaviors are shaped through the observation of others (Bandura, 1965; Bandura, 2001). Applied to the relationship between game content and aggression, the implication seems clear: Exposure to violent game content should lead to increased aggressive behavior. However, three important caveats – one obvious and two often overlooked – are required. First, as previously mentioned, the

perceived *consequences* of the observed behavior influence the extent to which observed behavior will be modelled (Bandura, 1965). Thus, reward and punishment mechanisms related to in-game actions should influence whether in-game behaviors are modelled outside gameplay. Second, as Bandura (2001) notes: "(m)odeling is not merely a process of behavioral mimicry, as commonly misconstrued" (p.275). Instead, modelling relies on the development and application of rules that determine the appropriateness of a given behavior in a given context. This point has two attendant implications. First, more generally, behavior deemed appropriate within a video game will not necessarily be viewed as appropriate outside the game. Second, more specifically, perceiving aggressive behavior as justified, or seeing aggressive behavior rewarded, within a particular narrative context will not necessarily lead to a wholesale adoption of the view that aggressive behavior is appropriate. In this form of abstract modelling, individuals identify rules governing others' actions, and apply these rules to govern their own behavior (Bandura, 2001). Thus, if an in-game narrative provides players with a context that justifies in game violence (e.g., the character engages in violence to defend loved ones) but this context is absent outside of the game, the likelihood of violent in-game behavior translating into real world aggression should be reduced, as important contextual conditions associated with the modelled behavior are absent. In this sense, there are parallels with models of motivation that note differences in the likely transfer of intrinsically and extrinsically motivated aggression across contexts (Crick & Dodge, 1996). Conversely, if an in-game narrative glorifies violence across contexts (e.g., the character enjoys conflict) the likelihood of violent in-game behavior translating into real world aggression should increase. The third caveat is that the transfer of in-game learning to post-game contexts is a difficult and complex process (e.g., Bennerstedt et al., 2012). Thus, again, learning that a behavior is appropriate within a specific game context does not entail that the behavior will be reproduced outside gameplay.

The Generalized Aggression Model (GAM) integrates pre-existing theoretical work (including aspects of social learning theory) to predict short-term and long-term effects of videogame violence on players' cognition and behavior (Anderson & Dill, 2000). Essentially, the model proposes a number of antecedents to aggressive responses following aggressive gameplay. Central among these is the activation and constant rehearsal – and therefore increased accessibility – of aggression-related schemata (including aggressive behavioral scripts) (Anderson et al., 2010). Although the model suggests that arousal contributes to post-game aggressive outcomes, Anderson and Dill (2000) suggest that the danger of exposure to violent video games lies in "ideas they teach" rather than the "emotions they incite", and characterized violent videogames as a "…complete learning environment for aggression, with simultaneous exposure to modeling, reinforcement, and rehearsal of behaviors" (Anderson & Dill, 2000, p.788). Thus, one implication of the GAM appears to be that post-game aggression flows from in-game aggression, and the generalized activation of aggression-related cognitive systems. The attendant implication for game-related reward and punishment mechanisms appears clear: Mechanisms that reward (punish) and increase (decrease) in-game aggression should increase (decrease) post-game aggression. The implication for narrative context manipulations is less clear. Contextual information about character motivation does not (in and of itself) affect the violence of the game, and Anderson et al. assert that violent games "… by their nature, *require* the activation of aggressive thoughts" (p.155, italics in the original). Consequently, in-game aggression and the activation of aggressive schemata should be unaffected. If in-game aggression is unaffected, and aggression-related schemata are being "rehearsed constantly" (Anderson et al., 2010, p.155), post-game aggression should also be unaffected. Alternatively, contextual information may lead to the activation of different schemata. This may alter in-game aggression and, consequently, post-game aggression. Or contextual information may affect post-game aggression via effects on arousal and

identification with the character (see Fischer et al., 2010; Verplanken et al., 2008), though the activation of aggressive cognitions would still be required by the gameplay, leading to post-game aggression. Unlike social learning theory, the GAM does not permit specific predictions relating to context effects, or the mechanisms through which they may occur. However, it seems fair to say that the GAM can explain how a variable that affects in-game aggression also affects post-game aggression. It is more difficult for the GAM to explain how a variable that has no effect on in-game aggression could affect post-game aggression, without the inclusion of additional assumptions. Therefore, according the GAM, the effects of narrative context on post-game aggression should depend on the effects of the manipulation on in-game aggression.

Recently, theoretical critiques of the GAM have argued that the model fails to fully account for the affective and motivational components of aggression and assumes, despite evidence to the contrary, that aggression is a largely (if not entirely) automatic process (Ferguson & Dyck, 2012). Recent empirical work has also contradicted GAM-based predictions: finding no relationship between playing violent videogames and prosocial behaviour (Tear & Nielsen, 2013), and no increase in aggression following exposure to a violent videogame, when game-controls were matched for difficulty, creating equivalence in player competence (Przybylski, Deci, Rigby, & Ryan, 2014). Although the GAM builds on social learning theory (Ferguson & Dyck, 2012), many of the more nuanced elements of social learning theory are absent. For example, the GAM fails to explicitly consider the context in which aggressive behaviour is modeled and generally ignores effects relating to the motivation underpinning aggressive behaviors. Moreover, research into aggression has identified different forms of aggressive behaviour, based on underlying motivation. For example, *instrumental aggression* is enacted to achieve a particular goal whereas *hostile aggression* is enacted with the purpose of inflicting harm (Baker, Raine, Liu, & Jacobson,

2008; Tuvblad, Raine, Zheng, & Baker, 2009). While theories of motivation such as SDT suggest that the type of motivation underlying aggressive in-game behavior may have important implications for the transfer of in-game aggression to post-game contexts (e.g., extrinsically or instrumentally motivated in-game aggression may not transfer to contexts where extrinsic or instrumental motivation is absent; Ryan & Deci, 2000), the GAM draws no such distinction (Ferguson & Dyck, 2012).

Summary

Both social learning theory and the GAM are consistent with the idea that the relationship between violent game content and post-game aggression may be moderated by factors associated with the perceived appropriateness of in-game violence. Thus, narrative and reward mechanisms that constrain the perceived legitimacy of and/or inhibit in-game aggression should similarly reduce post-game aggression. However, the GAM would also predict that these factors should have *corresponding* effects on in-game and post-game behavior. In contrast, Bandura's (2001) modelling theory allows in-game dynamics like narrative context to affect post-game aggression independent of any effect on in-game aggression by qualifying the context in which the in-game aggression is endorsed. Similarly, more nuanced theories of motivation suggest that reward mechanisms that encourage instrumental aggression may not lead to increased post-game aggression where the extrinsic motivation is removed (Ryan & Deci, 2000). We specifically tested these predictions by comparing the effects of narrative context and performance-related reward manipulations on players' in-game and post-game aggression, character identification and self-activation. Prior to playing a violent FPS, participants read a brief character biography that included information about the character's motivation for engaging in the present conflict. Characters were portrayed as either a heroic (pro-social, nobly-motivated) or antiheroic (anti-social, selfishly-motivated). The reward manipulation was intended to encourage (inhibit) in-game

aggression by informing players that their "performance score" would be positively (negatively) affected by the number of people they killed during gameplay. We included a control condition (providing no guidance relating to in-game aggression) to establish participants' default approach to the game, and elucidate the effects of the reward manipulation.

Method

Participants and design

155 participants (98 females), with ages ranging from 18 to 53 (*M*= 23 years, *SD*= 7 years), took part in this experiment. Most participants (N = 108) were first year undergraduate students, others were community members. In terms of gaming experience, 73 participants reported never playing video games and the sample average for time spent gaming per week was 3 hours (*SD* = 5.53). 137 participants were unfamiliar with *Counter Strike: Source* (Valve, 2004) and 18 participants reported being familiar with the game. Analyses revealed no significant differences between conditions on any participant gaming demographics (*p's* > .07, *f's* < 0.19).

We used a 2 (narrative context: heroic vs. antiheroic protagonist) x 3 (reward instructions: reward aggression, punish aggression, neutral instructions) between-subjects design. Participants were randomly assigned to one of the six experimental conditions, with a minimum of twenty-five in each condition (see Table 1 for a breakdown of participant demographics).

Materials

The game. Participants played the first-person shooter game *Counter Strike: Source* (Valve, 2004) on a PC. We selected this game because it allowed us to set the game time limit (i.e., 15 mins), keep track of a behavioral measure of in-game aggression (i.e., bullets fired), and because the processing requirements were not prohibitive for our lab computers.

Biographical sketches. We developed two biographical sketches of the participants' character to manipulate narrative context (i.e., the motives of the character within the game). The biographical sketches described either a pro-social, non-aggressive character who was proud to serve his country in war, but did not enjoy combat (heroic archetype), or an anti-social, aggressive character who enjoyed combat and had negative relationships with his peers (antiheroic archetype). The complete biographical sketches are available as online supplemental materials.

Instructions. Two sets of instructions were created to encourage or inhibit aggressive gameplay. Participants in both the reward- and punish-aggression conditions were told that they would be rewarded (with chocolate) based on their gameplay performance (indexed by a 'performance score'). Both groups were told their 'performance score' would be based on the number of times they died and the number of people they killed during their 15 minutes of gameplay. Participants in the reward-aggression condition were told "*The more times you die, the lower your performance score. However, the more people you kill the higher your performance score. Thus, to maximise your reward, you must try to die as few times as possible but kill as many people as possible*." Participants in the punish-aggression condition were told "*The more times you die, the lower your performance score. Additionally, the more people you kill the lower your performance score. Thus, to maximise your reward, you must try to die as few times as possible and kill as few people as possible.*" Participants in the control condition were given no instructions relating reward or punishment for killing other characters. All participants received chocolate, regardless of performance.

Questionnaire measures. A post-game questionnaire was used to collect basic demographic information about participants (including experience playing video games, and prior experience with *Counter Strike: Source*). This questionnaire also collected information relating to participants' ability to identify with their character and self-activation.

Behavioral measure of post-game aggression: Wasabi paste. As a behavioral measure of post-game aggression, participants completed an ostensibly unrelated 'Wasabi task'. This task was an adapted version of Fischer et al.'s (2010) 'chilli sauce task' (see also Yoon & Vargas, 2014). After completing their gameplay session, and the associated questionnaire, participants were thanked and invited to take part in a second, ostensibly unrelated study in exchange for chocolate. All participants agreed. Participants were told this second study was a piece of marketing research investigating peoples' perceptions of wasabi paste (based on characteristics of the packaging, sauce colour, etc.). As per Fischer et al.'s instructions, participants were told that, in order to ensure the experimenter remained blind to the condition, it was their task to administer an undetermined amount of wasabi paste to be consumed by a subsequent participant, and that the subsequent participant would have to consume all of the dispensed wasabi paste. As in Fischer et al.'s research, there was no other participant. Participants were asked to dispense the wasabi paste into a paper cup, and reminded that the amount dispensed was entirely up to them. Prior to completing this task, participants viewed a short video clip from a Japanese game show that showed an individual eating a large amount of wasabi paste. This clip was designed to ensure that participants understood that consuming large amounts of wasabi paste was an unpleasant experience. Two questions then tested participants' familiarity with, and perceived hotness of, wasabi paste. The amount of wasabi paste was weighed and acted as a behavioral index of aggression.

Mood restoration. Following the wasabi task, participants viewed a short clip called *The Diner Scene* from the film *Benny & Joon* (Chechick, 1993) in order to counter any negative effects of participation on mood (Schaefer, Nils, Sanchez, & Philippot, 2010).

Procedure

The study took place in two cubicles on university premises. Participants were given information about the first part of the study, and told that the research was concerned with

general perceptions of shooting games. Information about the second part of the study (the marketing task) was concealed until the completion of the first part. Prior to commencing gameplay, all participants had a two-minute practice trial to familiarize themselves with the game controls and the difficulty of the game. After the trial period, participants were given a short biographical sketch of the character they were playing. Participants were asked to put themselves into their character's position. The narratives were followed by instructions that players would either be rewarded for aggressive behavior, punished for aggressive behavior, or by neutral instructions that neither encouraged nor discouraged aggressive behavior. In the neutral instructions condition, participants were told that there are two ways of playing this game: either try to kill their enemy targets or attempt to avoid/hide from them. The decision about how they wanted to play the game was left entirely up to the participant. After playing the game, participants completed a short questionnaire about their perceptions of the game and character, how they currently felt, and their previous gaming experience. Participants were then invited to take part in the second part of the study (the wasabi task). Participants who agreed (100%) were taken into another room, were instructed about the ostensible nature of the research, viewed the short video clip of someone consuming wasabi paste, and answered the questions relating to their familiarity with and perceptions of wasabi paste. Participants then administered as much wasabi paste as they wished into a paper cup. Finally, participants viewed the mood restoration clip, were thanked and debriefed, and rewarded with chocolate. During individual debriefings following the study, no participants expressed suspicion about a link between the two parts of the study.

Results

Data Screening

Prior to running analyses, in-game and post-game aggression data were screened for the presence of outliers. Outliers were defined as scores greater/less than 3.29 standard

deviations from the mean (Tabachnick & Fidell, 2007). No outliers were identified in the in-game aggression data, but two outliers were identified and removed from the wasabi task data. The data from this experiment are available online at https://opensciencefframework.org.

In-Game Aggression

A 2 (narrative context: heroic vs. antiheroic protagonist) x 3 (reward instruction: reward aggression, punish aggression, neutral instructions) between-subjects ANOVA on mean number of bullets fired during the gameplay session tested the effects on manipulations on in-game aggression. The moderate effect of reward instructions, $F(2, 149) = 8.03$, $p < .001$, $f = 0.33$, together with follow-up simple effects analysis indicated that, as shown in Figure 1, players in the punish aggression condition fired fewer bullets than those in the reward aggression, $t(102) = 3.32$, $p = .001$, $d = 0.66$ [0.25, 1.05], and control conditions, $t(101) = 3.57$, $p = .001$, $d = 0.71$ [0.30, 1.11], but that there was no significant difference in bullets fired between the reward aggression and control conditions, $t(101) = 0.21$, $p = .836$, $d = 0.04$ [-0.35, 0.43]. All other effects were non-significant and failed to reach the cut-off for a small effect, $F < 0.57$, $p > .566$, $f < 0.09$. The difference between the punish aggression condition and control condition in the measure of in-game aggression, together with the absence of any difference between the control and reward aggression conditions[2], suggests that participants in the control condition were predominantly playing the game in an aggressive fashion.

Post-Game Aggression

A 2 (narrative context: heroic vs. antiheroic protagonist) x 3 (reward instruction: reward aggression, punish aggression, neutral instructions) between-subjects ANOVA on

[2] Bayes factor analysis, indexing the relative support for the null and alternative hypotheses provided by the obtained data, indicated that the data were over four times more likely under the null than the alternative hypothesis, JZS $BF_{01} = 4.71$. According to Jeffreys' (1961) criteria, this represents substantial evidence in favor of the null hypothesis. Further, a median split analysis on control participants' data show no relationship between in-game violence and post-game aggression.

mean amount of wasabi (g.) administered revealed a small-to-moderate main effect of narrative context, $F(1, 147) = 4.43$, $p = .037$, $f = 0.17$[3]. As seen in Figure 2, participants who read the heroic protagonist narrative administered less wasabi than those who read the antiheroic protagonist. All other effects were non-significant, $F < 1.24$, $p > .293$, $f < 0.13$. Importantly, the non-significant but non-trivial effect of reward instruction on post-game aggression, $F = 1.24$, $p = .293$, $f = 0.12$, indicated that, if anything, the neutral instruction condition ($M = 0.12$ [0.08, 0.16]) was associated with lower post-game aggression than the punish aggression ($M = 0.16$ [0.11, 0.22]) or reward aggression ($M = 0.18$ [0.13, 0.22]) conditions, $d = 0.27$ and $d = 0.39$, respectively. Thus, contrary to GAM-based predictions, the effects of reward manipulation on in-game aggression did not generalize to post-game aggression.

Identification with Character and Self-Activation

We tested if our narrative context effects were operating through mechanisms relating to increased character identification or self-activation. Participants who played as the heroic protagonist reported greater identification with their character ($M = 2.60$ [2.24, 2.96]) than those who played as the antiheroic protagonist ($M = 2.04$ [1.67, 2.41]), $t(153) = 2.14$, $p = .034$, $d = 0.35$ [0.02, 0.66]. Notably, although narrative context affected participants' reported identification with the character, the condition producing increased identification with the heroic (cf. antiheroic) character also reduced post-game aggressive behavior (despite similar levels of in-game aggression).

However, narrative context did not affect participants' self-activation, $t(153) = 0.10$, $p = .924$, $d = 0.02$ [-0.30, 0.33]. Increased post-game aggression was not attributable to increased identification with the character and/or self-activation during violent gameplay (cf.

[3] When outliers were included in the analysis, the general pattern of results was similar, but the main effect of narrative context was smaller, and non-significant, $F(1, 149) = 1.17$, $p = .281$, $f = 0.09$. Descriptive statistics for this analysis were ($M = 4.22$, $SD = 5.89$ [2.91, 5.52]) and ($M = 5.24$, $SD = 5.90$ [3.92, 6.56]) for the heroic and antiheroic conditions, respectively.

Fischer et al., 2010; Rosenberg, Baughman, & Bailenson, 2013; Verplanken et al., 2008). Thus, our character-context effects were not dependent on previously identified mechanisms, but were consistent with previous findings relating to manipulations of avatars' moral affiliations (Happ et al., 2013; Yoon & Vargas, 2014).

Discussion

We investigated the effects of narrative context and in-game rewards in violent videogames on in-game and post-game aggression. Reward structure significantly affected in-game aggression. Specifically, participants exposed to a reward structure that punished violent acts fired fewer bullets in-game than those who were rewarded for in-game violence, or those who received no explicit reward/punishment instructions. The reward structure of the game did not, however, affect post-game aggression as indexed by the administration of wasabi paste to an ostensibly real person. Conversely, narrative context selectively affected post-game aggression. Specifically, compared to those assigned an antiheroic narrative, participants assigned a heroic narrative prior to engaging in the game administered less wasabi to a fictional counterpart (a behavioral index of aggression). Narrative context did not affect in-game violence.

Our key findings can be summarized as follows. First, increasing in-game violence does not necessarily increase post-game aggression. Second, game mechanics (e.g., relating to context) can increase or decrease post-game aggression without affecting in-game violence. Third, the observed effects on post-game aggression did not operate through previously identified mechanisms relating to identification with the character or self-activation.

Our results are consistent with the application of social learning theory to mass media (Bandura, 1965; Bandura, 2001), and more broadly with established social-cognitive effects of context on person perception, attitude formation, and attributions of causality (e.g.,

Norenzayan & Schwarz, 1999; Schwarz, 2007; Smith & Semin, 2007). Although reward structures affected in-game behavior, context affected the generalisation of in-game violence to post-game aggression. Further, as mentioned, the effects of our narrative context manipulation on post-game aggression did not operate through character-identification or self-activation pathways (cf. Fischer et al., 2010). Increased identification with aggressive game characters has previously been shown to increase self-activation and post-game aggression. However, we found no effects of our manipulations on self-activation, and the relationship between character identification went in the opposite-to-expected direction: Our heroic (cf. anti-heroic) context increased identification with the aggressive protagonist but decreased post-game aggressive behavior. Thus, the contextual information may have affected the interpretation (cf. self-relevance, Fischer et al., 2010) of the in-game violence and, subsequently, the internalization of relevant concepts (see also Fischer et al., 2009). These findings support Bandura's (2001) assertion that modelling of behavior involves complex, abstract reasoning that allows people to take into account the context in which an action occurs, and thus only engage in similar actions in *appropriate*ly *similar* contexts. Conversely, our results offer a strong challenge to the Generalized Aggression Model (GAM). In particular, Anderson et al. (2010) claim that violent game content requires the activation and constant rehearsal of aggression-related cognitive structures and behavioral scripts. Given that the proposed link between in-game and post-game aggression rests on the generalized activation of these structures, it is unclear how, according to the GAM, the context manipulation can decrease post-game aggression without affecting in-game aggression (and the activation of the relevant aggressive schemata). Reward structure did not significantly affect post-game aggression, despite affecting in-game aggression (and therefore presumably affecting the activation and rehearsal of aggression-related schemata). This is also difficult for the GAM to account for. Potentially, goal-differences between the in-game

and post-game contexts may affect the relevance of activated schemata and inhibit the transfer of in-game violence to post-game contexts. Alternatively, our reward manipulation may not have affected post-game aggression because it induced *instrumental* aggression, rather than aggression based on anger or provocation, and the post-game context provided no extrinsic motivation to aggress. However, such distinctions are not currently clearly articulated in the GAM. The GAM proposes a generalized activation mechanism, but the actual mechanism underlying any link between in-game violence and post-game aggression may be nuanced, and include the purpose for the in-game (and post-game) aggressive behavior. Our results support recent work suggesting that the GAM should be retired in favour of theories that allow for more subtle, contextual effects (e.g., Ferguson & Dyck, 2012).

Fischer et al. (2009) demonstrated that racing games that reward reckless driving can increase risk-taking in driving simulators, and participants' endorsements of self-characterizations relating to risk-taking behavior. However, in addition to the reward mechanism proposed by Fischer et al., their manipulation included a difference in the context in which in-game behavior took place. Thus, in addition to testing the generalizability of Fischer et al.'s findings to games that reward (cf. punish) aggressive video-game content, we aimed to tease apart the contributions of reward structures and context. We found that videogame reward structures can be effective at limiting (or increasing) in-game aggression, but are likely to have little-to-no effect on players' post-game aggression. Indeed, our results indicated that even players who experienced a reward structure encouraging in-game violence engaged in similar levels of post-game aggression to those who experienced a punish-violence or neutral in-game reward structure. Thus, we found no evidence that games that incentivize in-game violence through in-game or meta-rewards are likely to invoke post-game aggression at higher rates than games that do not. However, these conclusions require

three caveats. First, we manipulated extrinsic motivation, and induced an instrumental form of aggression (cf. aggression based on anger). In the absence of similar, instrumental mechanisms outside gameplay *instrumental* aggression may be unlikely to transfer to post-game contexts. Recent research has demonstrated that game mechanics that affect intrinsic motivation (e.g., by thwarting the psychological need for competence) can increase post-game aggression (Przybylski et al., 2014), but further research is required to determine whether instrumental in-game reward mechanisms increase the risk of aggression in post-game contexts where similar instrumental reward mechanisms are present (cf. Deci, Koestner, & Ryan, 1999). Second, because our participants' motivation for playing the game was extrinsic and our sample included individuals who are not regular gamers, the generalizability of our findings to regular gamers, who are likely to have different (implicit) motivations for gameplay, requires further investigation (cf. Haridakis & Rubin, 2003). Finally, as is often the case in gaming contexts, in this study reward structures were inherently linked to task goals. Thus, these results reflect the interplay between the effects of task goals *and* corresponding reward structures that incentivize violence (cf. the rewards *per se*).

From an applied perspective, our results offer an important perspective for videogame classification. Presently, videogame ratings (e.g., Everyone, Adults Only) are based primarily upon the amount, type and graphicness of the violence depicted (ESRB, nd.). Little (if any) consideration is given to the context in which that violence occurs. Our findings indicate that the context in which videogame violence occurs may influence the amount of post-game aggression exhibited by players. One of the less controversial points advocated by the APA's 2005 *Resolution on Violence in Video Games and Interactive Media* (American

Psychological Association, 2005; currently being reviewed)[4] was for the "development and dissemination of a content based rating system that accurately reflects the content of video games and interactive media" and "the distribution of and use of the rating system by the industry, the public, parents, caregivers and educational organizations." Along these lines, we argue that when considering violent game content, ratings systems should also consider the context in which the content occurs. Consumer choices may benefit from information relating to violent content being augmented with information relating to the context in which this content occurs.

Our aim was never to dispute, nor offer a wholesale endorsement for, a relationship between exposure to videogame violence and post-game aggression. Instead, we aimed to contribute to a better understanding of what is almost certainly a complex relationship. We found that in-game aggression was, predictably, affected by game reward structures, while post-game aggression was selectively affected by the context in which the in-game violence took place. These results challenge the GAM to better account for the mechanisms through which exposure to in-game violence increases post-game aggression. Specifically, the model needs to clarify the role of context in moderating either the generalized activation of aggression-related cognitive structures, or the relationship between this activation and subsequent aggressive behavior.

[4] In response to a petition signed by over 220 experts in the field, and expressing concerns that the conclusions drawn in the statement were not supported by the available literature, the APA's 2005 policy statement on violence in video games and interactive media is currently being reviewed (see http://www.christopherjferguson.com/APA%20Task%20Force%20Comment1.pdf)

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Table 1. *Participant Demographic Information According to Condition*

Condition		Participant Demographics				
Narrative	Reward Instructions	N	Age[a]	Sex[b]	Gaming (hrs/week)[a]	*CSS*[c] familiarity[a]
Heroic	Control	26	23.08 [20.20, 25.96]	12:14	1.96 [0.64, 3.29]	2.69 [2.43, 2.95]
	Punish Aggression	26	22.31 [19.62, 24.99]	9:17	2.27 [0.53, 4.01]	2.92 [2.82, 3.03]
	Reward Aggression	26	23.35 [19.65, 27.04]	10:16	4.62 [1.27, 7.96]	2.96 [2.89, 3.04]
Antiheroic	Control	25	22.44 [20.43, 24.45]	8:17	4.04 [1.55, 6.53]	2.84 [2.65, 3.03]
	Punish Aggression	26	23.50 [20.67, 26.33]	9:17	3.31 [1.4, 5.22]	2.69 [2.41, 2.98]
	Reward Aggression	26	21.19 [19.33, 23.05]	9:17	1.90 [0.68, 3.13]	2.85 [2.67, 3.02]

[a] Values in brackets indicate 95% CIs
[b] M:F ratio.
[c] *Counter Strike: Source*

Figure captions

Figure 1. Mean number of shots fired according to reward instructions. Error bars indicate 95% CIs.

Figure 2. Mean amount of wasabi paste (g.) administered according to narrative context. Error bars indicate 95% CIs.

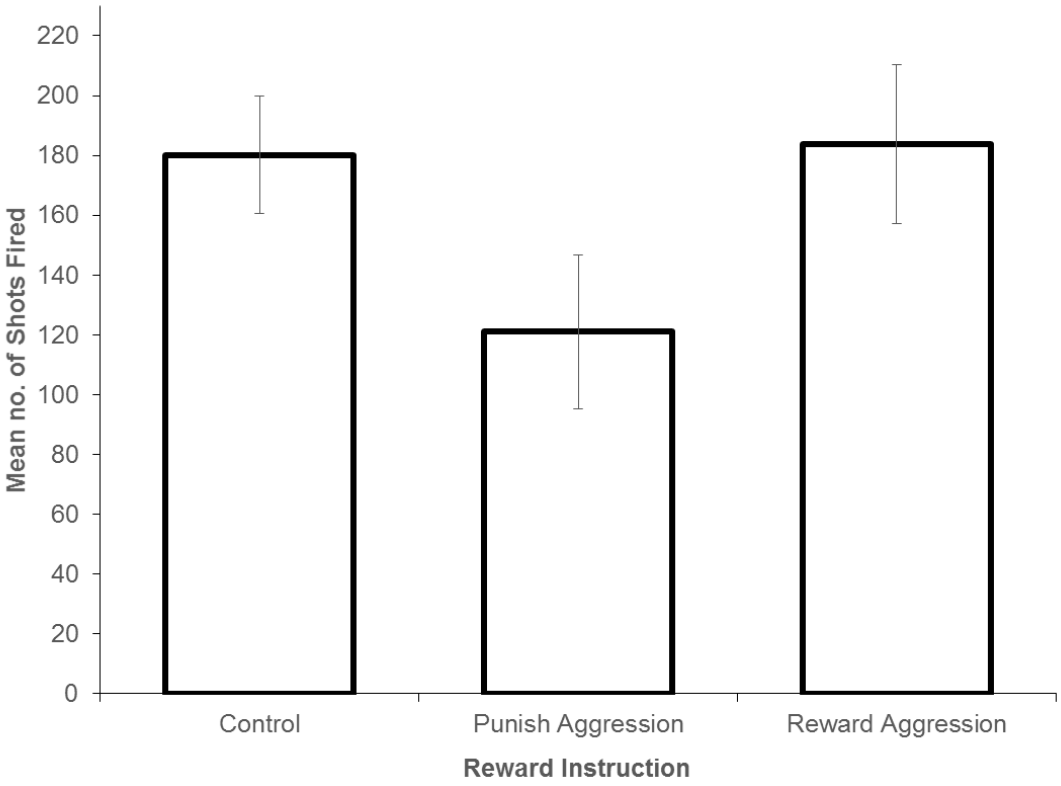

Figure 1. Mean number of shots fired according to reward instructions. Error bars indicate 95% CIs.

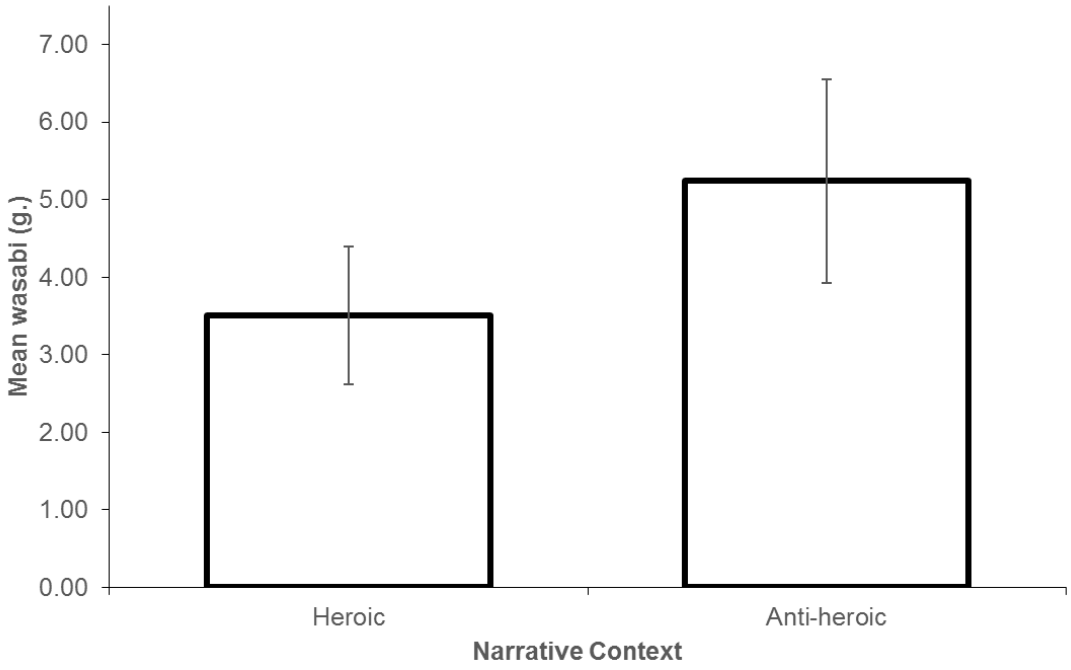

Figure 2. Mean amount of wasabi paste (g.) administered according to narrative context. Error bars indicate 95% CIs.