



Behavioural realism and the activation of aggressive concepts in violent video games



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A B S T R A C T

A common argument in the violent video game (VVG) literature is that the greater the realism of a game, the more it activates aggressive concepts, and the greater antisocial effects it will have on its players.

Several experiments have therefore looked into whether the graphical realism of VVGs might influence their effects. These experiments have returned mixed results. However, there are other ways that a VVG can be realistic besides looking like the real world. More specifically, things in VVGs can not only look realistic, they can also behave realistically. It may be the case that this kind of realism leads to increases in the activation of aggressive concepts, rather than increases in graphical realism.

In this paper, we therefore present two large-scale online experiments ($n = 898$ and $n = 1880$) which investigate the effects of two different manipulations of behavioural realism on the activation of aggressive concepts in VVGs. In neither experiment did increasing realism increase the activation of aggressive concepts.

Realism is often described as increasing the effects of VVGs. These results contradict this perspective, and instead suggest that realism may not lead to increases in aggression-related variables.

1. Introduction

Realism is a game's ability "to mimic things that exist, or events that have happened in real life" [38]. Since the early 1970s, researchers have argued that the more 'real' on-screen violence in television and film seems, the more aggressive viewers themselves are likely to become (e.g. [26]). This link between realism and aggressive behaviour has extended into accounts of the potential effects of VVGs. For instance [9] links the increased realism of modern VVGs to potentially increased effects, writing that "theoretically, violent video game graphics quality could be related to aggression-related variables, as they are more graphically enhanced to depict violent acts and blood in great detail and quality." This view, that greater realism may lead to more aggressive behaviour, is echoed throughout the VVG literature (e.g. [37]).

Despite this theoretical rationale, experimental evidence for a link between realism and VVG effects has thus far proved weak. Several experiments have attempted to clarify the effects of realism on the players of VVGs. These experiments have produced mixed or otherwise inconclusive results. However, it is important to note that previous research has largely focused on the effects of graphical realism in VVGs (e.g. [33,47]). Graphical realism refers to the ability of video games to visually resemble real people, places and things. This is not the only

way that video games can be realistic. By contrast, behavioural realism refers to the ability of things in a video game to *behave like* things in the real world [17]. The effects of behavioural realism on aggression-related variables have not yet been investigated in an experimental context. The experiments presented here address this important gap in the literature.

Experiment 1 investigated whether making in-game enemies behave realistically via the use of ragdoll physics increased the activation of aggressive concepts in players. A bespoke first-person shooter (FPS) game was made, and then manipulated so that it formed two different experimental conditions. In one of these conditions, the implementation of ragdoll physics gave enemies dynamic and physically realistic death behaviours. In the other condition, these deaths were instead animated via less realistic (and non-dynamic) pre-recorded animation sequences. The results of a large online experiment ($n = 898$) indicated that the use of ragdoll physics did not increase the activation of aggressive concepts.

Experiment 2 investigated the effects of a different form of behavioural realism. This experiment looked at the effects of realistic non-player character (NPC) tactics on the activation of aggressive concepts in VVGs. In this game, two versions of a bespoke FPS game were again created. In one condition NPC enemies behaved according to realistic

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squad-based tactics, whilst in the other condition they used less realistic, simpler behaviours. Results of a large online experiment ($n = 1880$) indicated that more realistic NPC tactics may lead to marginally less activation of aggressive concepts in VVGs, but they certainly do not lead to *more*.

When taken together, these experiments suggest that greater behavioural realism does not necessarily lead to greater amounts of the activation of aggressive concepts in VVGs. This provides further evidence that increases to the realism of VVGs may not necessarily lead to similar increases in their antisocial effects.

2. Background

2.1. Graphical realism and behavioural realism

Realism refers to a game's ability to imitate the real world. This term is often used to describe the quality of a game's graphics. A variety of technological innovations in modern VVGs can be used to make these games look more like their real world counterparts. For instance, the increasing processing power of modern computers allows them to render 3D models which use ever larger numbers of polygons. This has allowed the transition of objects in VVGs from simple geometric shapes to "more realistic or organic" [44] forms.

However, it is important to note that changes in the dimensions of texture maps and the number of polygons in 3D models are not the only factors which are relevant to the realism of video games. When discussing the realism of a game, it does not "suffice to observe what is visible on the computer or television screen", but "in addition, one must look at the program rules that govern the pace of the game" [38] as well. In other words, when it comes to realism in video games the way things *behave* as well as how they *look* matters. This idea that a game's realism is also to do with how closely its "objects and characters act in comparison to the same object in the real world" [17] is sometimes referred to as that game's 'behavioural realism' or 'simulational realism' [41] as opposed to its 'graphical realism'.

2.1.1. Ragdoll physics

Just as there are a variety of ways that VVGs can be made more graphically realistic, there are several different methods that can be used to make them more *behaviourally* realistic. One key way that behavioural realism can be increased is through the use of ragdoll physics. Physics is thought to play an important role in "conveying realistic fictional worlds" [44] in video games. Therefore, a common way to make in-game characters "realistically interact" [43] with each other is through the use of ragdoll physics. In this approach, game developers build a physical simulation of each of a game's characters as a collection of jointed bodies joined together into a skeleton. They then simulate the reaction of this 'ragdoll' to whatever force killed them, and animate the character accordingly. When ragdoll physics is used, in-game characters therefore react to collisions in a way which is in keeping with how they would behave in the real world. This technique is commonly used in VVGs to animate the deaths of in-game characters in physically realistic ways [29].

2.1.2. NPC tactics

By contrast, a very different way to add behavioural realism to a VVG is through the tactics which non-player characters (NPC) use. VVGs such as *Far Cry* feature NPC characters who are deliberately programmed to act in ways which realistically reflect how combatants behave in real-life combat situations. For instance, in 1998s *Half Life*, one early reviewer noted that "the infantry squads will split up, trying to hit you from several sides while one guy keeps you pinned or lobs grenades" [12].

Similarly, in the recent VVG *The Last of Us*, enemy characters used 'flanking' tactics on the player [40]. In this tactic, one group of NPCs 'pins down' the player with bursts of continuous fire, whilst a second

group "maneuvers around to their flank and then cuts across from the side to finish them off" [40].

This is not the only way that NPC tactics in VVGs can mimic the way that real-world combatants fight. As game designer Ernest Adams points out in [2], there are a plethora of tactics which can influence the behavioural realism of a VVG:

"Depending on the degree of realism offered, tactics can include flanking maneuvers, sneak attacks, creating diversions, cutting off enemy supply lines, killing the superior officers to leave the troops without leadership, taking advantage of the effects of bad weather, and so on."

2.2. The effects of playing VVGs

A fierce debate rages over the potential effects of violent video games (VVGs). Some academics passionately argue that these games lead to antisocial behaviour (e.g. [4]). By contrast, others claim that the proposed effects of VVGs are unsupported by empirical evidence (e.g. [20,35]).

The most prominent explanation of why playing VVGs might lead to antisocial behaviour is the GAM, or General Aggression Model. As its name suggests, the General Aggression Model (GAM) specifies how a variety of factors lead to "relatively automatic" [5] aggressive behaviour, both in the short-term and also over longer periods of time. The idea of "priming effects" [14] are integral to this model. Under the GAM, when players are exposed to depictions of aggression in video games, concepts which are related to aggression are activated in players' memories. This activation also spreads to associated violence-related "knowledge structures" [5] such as scripts, schema, and beliefs. This leads to players being temporarily more likely to commit acts of violence themselves [3].

Additionally, the authors of the GAM argue that activation of aggressive concepts can lead to long-term changes in personality through processes of reinforcement. Reinforcement refers to the idea that repeatedly activating a concept or knowledge structure will lead to that same concept or knowledge structure becoming easier to activate again, not over short periods of time, but over long periods of time. In fact, the GAM predicts that this effect will occur to the point where these knowledge structures "eventually become part of the person's personality" [8]. Knowledge structures which may become reinforced under the GAM include aggressive beliefs and attitudes, perceptual and expectation schemata, and behavioural scripts [3].

2.2.1. Debate over the validity of VVG effects

Numerous studies have seemingly demonstrated that playing VVGs, indeed, leads to the activation of aggression-related concepts. For instance, in [7] participants were exposed to either a violent game or a non-violent game. Players of non-violent games completed a subsequent word fragment completion task with significantly fewer aggression-related words. Similarly, in [13], participants who had played a violent video game recognised aggression-related words more quickly in a LDT than those who had played a non-violent video game.

However, recent scholarship has challenged both the validity of experiments like these and the generalizability of the effects which they demonstrate. As noted in [1], experimental research into the effects of VVGs is often conducted using a setup in which each experimental condition is represented by a different commercial off the shelf (COTS) video game, without any attempt to "equate the violent and non-violent games on other dimensions that may be related to aggression". An issue with this methodology, in which experiments are conducted "between video games" [10], is that it may lead to false positives. As [45] put it, "the first limitation with experimental research [into the effects of VVGs] is the failure of many studies to adequately equate video game conditions on confounding variables such as competitiveness, difficulty, and pace of action".

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