Prescriptions for a More Informative, Less Controversial Study of Video Games: I. Game Genres, Game Features, and Violent Content

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**Abstract**

Decades of violent media research have found modest but consistent associations between violent game use and aggressive behavior. However, definitional, methodological, and theoretical issues impede precise predictions about the effects of specific video games and the boundary conditions of violent video game effects. These limitations are caused by the present definitions of “violent game,” which are broad and inconsistent, thereby impairing construct validity, obscuring potentially-important differences, and stifling effective communication of research findings. Definitions of “violent game content” should instead be informed by psychological theories of aggression and violence. Furthermore, previous conceptualizations of game content are limited in scope and fail to consider the entirety of the gameplay experience. We present a unified model that combines theories from psychology, communications, and game studies to better model the content, mechanisms, and outcomes of violent and nonviolent games. New theoretical considerations and practices are suggested here to promote greater theoretical clarity, more precise methodology, and more justifiable applications to public policy.

*Keywords*: violent video games, aggression, ludology

Video games are among the most popular and profitable of all entertainment industries, with more than half of Americans playing games in what has become a multi-billion dollar enterprise (Entertainment Software Association, 2013; Siwek, 2010). Of these games, many involve violent content, and some of the most violent games are the most popular – *Grand Theft Auto V* earned more than $800 million in its first day of sales, setting new records for the entertainment industry (Nayak, 2013). Researchers, parents, legislators, and members of the media have expressed concerns that violent game content promotes and trains aggressive and violent behavior. This concern has been sharpened by an extant, albeit divided, literature of negative effects of violent traditional media such as television (Eron, Huesmann, Lefkowitz, & Walder, 1972; Huesmann, Moise-Titus, Podolski, & Eron, 2003; but see Freedman, 1984; Savage, 2004). At their peak, these worries have speculated that violent video games are a potential cause of public massacres (Jaccarino, 2013; McGraw, 2007).

To date, two decades of research reveal a consistent causal association between “violent video games” (VVGs) and aggressive behavior. A series of meta-analyses of experimental studies have generally estimated the effect at a modest yet robust *r* = .21, 95% CI: [.17, .25] (Anderson, 2004; Anderson & Bushman, 2001; Anderson et al., 2010; Greitemeyer & Mügge, 2014; but see Ferguson & Kilburn, 2010 for a contrasting perspective). Moreover, meta-analysis of longitudinal research finds similar, albeit smaller, effects (*r* = .20, 95% CI: [.18, .23], partial *r* = .08, 95% CI: [.05, .10], Anderson et al., 2010; *r* = .10, 95% CI: [.04, .16], Greitemeyer & Mügge, 2014).

Given the evidence, some experts consider the question of whether VVGs cause increases in aggression to be wholly resolved (“The coffin [has been] nailed shut on doubts,” Huesmann, 2010), though other scholars are less convinced (e.g., see Adachi et al., 2013; Adachi & Willoughby, 2011a; Elson & Ferguson, 2013; Ferguson, 2014). One criticism preventing consensus is that experimental studies often lack appropriate control conditions. For example, Adachi and Willoughby (2011a, 2011b) propose that violent games used in most studies are generally more competitive than the nonviolent games, thereby confounding competitiveness with violent content, and that the confounded competitive content may be partly or wholly responsible for the observed effects. There is also some evidence that nonviolent games may serve to decrease aggression relative to baseline, causing comparisons between violent and nonviolent games to overestimate the increases caused by violent games (Sestir & Bartholow, 2010). Others have suggested that research theory and methodology require finer attention to specific game features beyond violent content, such as the rules and controls of play. “[It is inappropriate to make] claims about what ‘games’ or ‘violent games’ do to people without accounting for the content of game play,” argued Williams and Skoric (2005, p. 230).

Although these concerns are worth addressing, meta-analysis makes it clear that there is *some effect* of *some games* through *some mechanisms* on aggressive behavior. The goal of the current review is to outline theoretical and methodological considerations with which to improve the theoretical understanding of *which games* cause *which effects* and *why*. These considerations will be useful whether one is ready to begin searching for mediators and moderators of game effects or is yet skeptical of the overall causal relationship. We accept the strength and reliability of results found in meta-analysis, and so the criticisms presented here are not meant to discredit the extant research, but rather to suggest more precise methods and theories with which to understand the extant findings and to guide future investigations in a more systematic way.

There are several ways in which the current review promises to advance theory and research on VVGs and aggressive thoughts and behaviors. First, we examine how current definitions of “violent content” are inadequate and inconsistent, complicating meta-analytic practice, confounding violent content with other game content, and obscuring theoretically important moderators. Moreover, this “violent media” definition involves quantitative assumptions (i.e., that all amounts of nonzero media violence are equally harmful) with very limited empirical support. This problem is remedied by offering new definitions for what is and is not a violent game, informed by psychological definitions of aggression and violence. Furthermore, we propose a new system of content analysis by drawing upon the literature of game studies. Through this analysis, researchers can consider the full extent of game contents in their research in order to better consider and account for alternative causal pathways. These considerations are systematically integrated into a conceptual model (the Gaming Active Interpretation Model; GAIM) that combines theories across the literatures of game studies, communication, and psychology. This model explicates the conditions under which interactions between the player and the game should cause, mediate, and moderate aggression-related outcomes. Testable and falsifiable model predictions are then discussed to stimulate research that will advance theory and improve scientific rigor in this field over the next several years.

**Problems in Defining “Violent Game Content”**

Accurate and precise definitions are crucial for construct validity, theory development, experimental design, and effective communication of research findings. While social psychology has established clear and reasonable definitions of aggression and violence, media psychology has eschewed these psychological definitions and distinctions in defining violent game content. We review the construction of the current definition of game violence, its inconsistent application across research teams and within research methodologies, and recommend improved definitions for video game violence for researchers to adopt in future research.

**Psychological Definitions of Aggressive and Violent Behavior**

In psychology, aggressive behavior is typically defined as “behavior intended to harm another individual motivated to avoid that harm”(Anderson & Bushman, 2001, p. 354). This definition is specific in several ways. First, aggression requires intent, not success. Throwing a punch is an act of aggression, even if the intended victim successfully avoids the blow. On the other hand, an automobile accident is not aggression even if someone is harmed, since the driver of the offending vehicle did not intend to harm. Second, aggression involves *harm*. Kicking a rock is not considered to be aggression, since the rock cannot experience harm. The extent to which nonhuman creatures can experience harm, however, is not obvious, as demonstrated by debates regarding the ethical treatment of animals (see, e.g., Cohen & Regan, 2001). Whether one thinks it is unethical to put a live lobster in a vat of boiling water depends heavily on whether the lobster is perceived as having the mental faculties to experience harm, and thus, whether the lobster is deserving of moral treatment, a status known as moral patiency (Gray, Gray, & Wegner, 2007; McPherson, 1984). Finally, the victim of aggression must be motivated to avoid the harm. Voluntary participation in piercings, tattoos, orthodontic surgery, and acts of sadomasochism therefore do not constitute aggression.

Careful not to overstate their experimental evidence, aggression researchers are usually quick to specify the difference between “aggressive behavior” and “violent behavior.” The distinction between aggressive behavior and violent behavior is both quantitative and qualitative. Quantitatively, violence is of a higher degree than aggression. An aggressive pinch may inflict harm, but it is certainly less extreme than a gunshot wound. Qualitatively, violence involves the intent of serious *physical* harm. A man who steals another man’s life savings has committed a more extreme act of aggression than has a man who steals another man’s couch change, but neither has committed violence. Degree, then, is a necessary but not sufficient condition for violence (relative to aggression). Therefore, violence implies the intersection of both a severe degree of aggression and the intent to cause serious physical harm or bodily injury. Although all violent acts imply severe aggression, some violent acts are more extreme than others: knocking someone over with a shove is less violent than shooting someone to death. Thus, violence is a continuous construct, and instances of violence can range from relatively mild to profoundly terrible.

Ethical and practical concerns prevent the study of violent behaviors in laboratory experiments. Obviously, an experiment using inter-participant shootings or stabbings as the dependent variable would violate the tenets of ethical research. Violence is also rare enough that hundreds of experimental sessions could be conducted without observing a single violent action. We are unaware of any experimental study addressing whether violent games cause increases in violent behavior. Aggression researchers recognize this and are quick to caution readers that their work provides experimental evidence of increased *aggressive*, not violent, behavior.

Laboratory investigations are therefore limited to the study of *aggressive* behavior. Such behavior has been operationalized in a number of ways, including subjecting another individual to noxious noise bursts (Taylor, 1967), near-freezing water (Berkowitz, 1993), or unpleasantly spicy food (Lieberman, Solomon, Greenberg, & McGregor, 1999). By definition, these laboratory paradigms represent the construct of aggression because participants believe: 1) they can inflict physical discomfort or even pain to their target, and 2) the target is motivated to avoid that harm. However, they do not represent violence, as the target does not experience serious bodily injury or death (although one noise-blast paradigm claimed to dispense sufficient noise to cause permanent hearing damage at the upper extreme of the scale; see Konijn, Nije, Bijvank, & Bushman, 2007). A fourth measure allows participants to give an unfavorable evaluation of a research assistant applying for a job, which represents harm as a form of goal-frustration rather than physical pain (Pedersen, Gonzales, & Miller, 2000).

**Definitions of Violent Video Games**

Although the psychological definitions of aggression and violence are clear and reasonable, they are not well-represented in media research. Media research is complicated by ambiguities in the interpretation of behavior towards abstract and cartoon characters. For example, Thompson and Haniger (2001) define video game violence as “an aggressor intending to cause physical injury or death to another character.” This definition is difficult to apply because of the question of what constitutes physical injury or death in video games – Thompson and Haniger’s declaration that *Pac-Man* was 62% violent and involved 2.8 deaths per minute was met with considerable skepticism and derision from laypeople (e.g. Miller, 2006), who generally do not perceive all instances of the elimination of game characters as “violence” or even “harm.”

Furthermore, definitions of media violence often lack specificity. A broad definition is offered by Anderson and Bushman (2001, p. 354), who define violent media as “depict[ing] intentional attempts by individuals to inflict harm on others. An ‘individual’ can be a nonhuman cartoon character, a real person, or anything in between.” This definition does not attempt to maintain the theoretical differences between aggressive and violent behavior, but it does offer the convenience of not trying to categorize whether being caught by a ghost in *Pac-Man* constitutes minor harm, bodily injury, or death. This is the current definition used in meta-analysis (e.g. Anderson et al., 2010), and so is perhaps the most important contemporary definition of media violence.

These scholars insist that this loose definition is preferable to the lay definition of media violence, which, they argue, does not appropriately measure the construct:

The general public typically define ‘violent media’ as only those television shows, films, and video games that include graphic images of blood and gore, but media violence researchers also include products without such images. Violent media are those that depict characters intentionally harming other characters who presumably wish to avoid being harmed. Thus, even children’s video games that lack depictions of blood and gore can, and frequently do, include violence. (Anderson et al., 2008, p. e1068)

This idea is worth consideration, but has only limited empirical support. In a later section, we review the evidence that supports this definition and suggest an alternative interpretation.

Other diverse informal definitions exist and influence experimental design. For example, some researchers classify violent and nonviolent video games by their ratings from regulatory associations such as the Entertainment Software Rating Board (ESRB) or the Pan European Game Information Committee (PEGI) (Engelhardt, Bartholow, Kerr, & Bushman, 2011; Engelhardt, Bartholow, & Saults, 2011; Whitaker & Bushman, 2012). Other researchers use games which are perceived by subjects as being more or less violent (Konijn et al., 2007) which implicitly embraces laypeople’s perceptions of media violence. Lay perceptions of media violence seem to be chiefly reliant upon the explicitness or graphicness of violent acts (Potter & Tomasello, 2003), a definition often deliberately rejected by other violent media researchers, as above.

**Problems caused by the imprecise definition.** Clear and consistent definitions of aggressive behavior, violent behavior, and media violence are important because they inform study design and meta-analytic criteria. Insufficient and inconsistent definitions can instead complicate and research progress. One such complication is found in recent meta-analytic work, in which some studies using E-for-Everyone-rated games in nonviolent game control conditions (*Sonic the Hedgehog, Moto Racer, Croc, Crash Bandicoot;* Brooks, 2000; Funk, Buchman, Jenks, & Bechtoldt, 2003; Polman, de Castro, & van Aken, 2008; Staude-Müller, Bliesener, & Luthman, 2008) have been excluded from “best-practices” studies (Anderson et al., 2010), under the argument that these games contain considerable media violence and are not an appropriate control condition. Even in the case that these games are considered to contain aggression or even mild violence, this practice of dichotomization assumes that E-rated games involving character-to-character attempted harm are as harmful as M-for-Mature-rated violent games, a bold claim that would seem to require firm empirical support.

This current definition of media violence is so broad that it is difficult for even its own authors to consistently apply it. A study by Carnagey, Anderson, and Bushman (2007) included in their nonviolent game condition *3D Munch Man*, an imitation of the game *Pac-Man,* which meets their own definition of a violent game (Thompson & Haniger, 2001). This study was included in the “best-practices” meta-analysis, as was a study by Konijn et al. (2007), which used games that would be considered “violent” by the current definition. On the other hand, a study which used *Moto Racer,* a motorcycle racing game,in its control condition (Brooks, 2000) was said to have a control game which contained violence and was excluded from this analysis (Anderson et al., 2010, online supplement). We have watched a considerable amount of *Moto Racer* footage and could not find violent content by any definition – at most, it is possible to collide with another motocross cyclist and fall of one’s motorbike, a mistake which punishes the player by costing time but inflicts no physical harm to either cyclist.[[1]](#footnote-2) In another instance, a study was included as “best-practices” despite comparing two as-defined “violent” games (*Centipede, Zaxxon*) against a no-game control condition, failing to include a non-violent game condition (Anderson & Ford, 1986). These criticisms are not intended to discredit the findings of the meta-analysis, whose results would not be influenced much by the inclusion or exclusion of a few studies, but rather to highlight the ambiguity and challenge of maintaining consistent and clear evaluations of game content given the present unrefined definition. Coding studies for meta-analysis is difficult enough under the best of circumstances – poor definitions exacerbate these difficulties.

This broad definition also has elicited the complaint that “*almost all video games are [currently defined as] violent video games*” (Ferguson, 2014, p. 4, emphasis original; see also the brief of amici curiae in support of the respondents in Schwarzenegger v. Entertainment Merchants Association, 2010), which can make it difficult to separate effects of video game use in general from effects of violent media exposure. The current definition of media violence certainly seems to lack resolution and precision. It makes it very challenging to find control conditions which are considered “nonviolent.” As mentioned previously, *Sonic the Hedgehog* has been considered by meta-analysts to be a violent game, even though the player character never harms anyone – at most, he jumps on the heads of robots, which breaks them, freeing the cute forest animals that were trapped inside. Given these definitions, even Chess, with its anthropomorphic pieces that battle and capture each other, could be considered a violent game, and would be expected to cause increased aggression, greater aggressive affect, and reduced prosocial behavior. Because of this difficulty, nonviolent game conditions have been restricted chiefly to puzzle, sports, and driving games. These games may have features and effects of their own which limit the validity of conclusions drawn from contrasting violent games against these nonviolent games.

Adding to the confusion, the distinction between the lay definition and the academic definition of *violent media* is not maintained in research practice. Despite the categorical distinction made by the Anderson & Bushman (2001) violent media definition and Anderson et al. (2010) best-practices criteria, measures of previous violent game exposure in longitudinal and experimental often treat game violence as a continuous construct which can be measured through participants’ subjective ratings (e.g. Anderson & Dill, 2000), and then sometimes dichotomized (e.g. Busching et al., 2013). For example, one common approach is to ask participants to list their three favorite games, subjectively rate how violent they are, and indicate how frequently each game is played. Violent game exposure is then measured by multiplying the subjective violent content rating by the frequency of play. Application of this measure has become “the standard procedure” (Anderson et al., 2008, p. e1069) despite theoretical perspectives that lay definitions of media violence do not match the research construct (Anderson et al., 2008, p. e1068). If lay definitions of violence are not an appropriate measure of the research construct, then the subjective rating measure should not be the standard procedure in measuring violent media exposure.

Instead, subjective ratings seem to perform as well or better in research. A recent study of the validity of measurement methods reveals larger cross-sectional and longitudinal effect size estimates when participants subjectively rated the violent content of their games (original response range 1-4, later made categorical, with 1 scored as “nonviolent” and scores 2-4 scored as “violent”) as compared to when an expert rated the games’ violent contents (original response range 1-9, later made categorical, with 1 scored as “nonviolent” and scores 2-9 scored as “violent”) (Busching et al., 2013, Table 4, reprinted in this manuscript as Table 1). If a stronger observed effect is to be considered as evidence for greater predictive validity (as argued in Busching et al., 2013, p. 12), it is possible that the lay definition of violent media is just as valid as the definitions presented above, if not more valid.

This issue is further complicated by an unfortunate tradition in the introduction sections of violent game studies. While most research manuscripts test effects of the categorical presence of game violence, the introductions of these manuscripts often lament that violent game content is becoming increasingly photorealistic, explicit, and extreme (e.g. Anderson & Bushman, 2001; Engelhardt et al., 2011; see also concerns in APA Task Force statement, 2005). However, to speak of violent content as continuous in the introduction while treating it as categorical in methodology and meta-analysis leads to unnecessary confusion. Two studies have investigated whether technological advancement enhances the effects of violent games (Barlett, Rodeheffer, Baldassaro, Hinkin, & Harris, 2008; Ivory & Kalyanaraman, 2007); neither study found significant moderation (although sample sizes were modest). We are not aware of any studies which have found evidence for an effect of graphical fidelity. Researchers should be careful to say exactly what they mean when referring to “violent media content,” which, by present definitions, has little to do with graphical precision, cinematic presentation, or sophisticated computer technology. To do otherwise confuses other researchers and misinforms the public.

**Lack of support for existing definitions.** As outlined above, the current definitions of “violent game content” seem arbitrary and imprecise, as they do not respect the psychological distinction between violence and mere aggression. By dichotomizing games into violent and nonviolent games, it is also assumed that any nonzero amount of violence causes equivalent effects on aggressive behavior, thereby treating *Sonic the Hedgehog* as equivalent in violence to *Call of Duty*.

The definition of “violent game content” would seem to be an unwarranted extrapolation from the current evidence. Experimental research typically compares nonviolent games against only the most extreme and graphically violent games; comparisons between nonviolent and mildly-violent games such as *Sonic the Hedgehog* are rare. Thus, this definition does not fit the available evidence. Two studies are claimed to have demonstrated that less-violent games have effects equal to more-violent games. However, the evidence is slight at best, and open to alternative interpretation.

In one study (Anderson & Ford, 1986), had 60 subjects played either *Zaxxon, Centipede,* or no game. These early arcade-action video games involved piloting a spaceship and shooting aggressive insects (*Centipede)* or other spacecraft (*Zaxxon*). At this time in video game development, games did not yet have sophisticated graphics or depictions of gore, but *Zaxxon* was considered to be more violent than *Centipede* based on pilot testing. Contrasts found that participants who played either *Zaxxon* or *Centipede* had elevated levels of hostile affect compared to those who played no game (*r* ≈ .35, [.09, .54]), which was taken as evidence that as-defined violent content can increase aggression even in the absence of explicit harm or gore. However, *Zaxxon* did not increase hostile affect relative to *Centipede* (r = .18, [-.15, 46]), and no non-violent game was tested. We suggest that effects on aggressive arousal are likely caused by the games’ exciting, challenging, and conflict-based gameplay, rather than violent content alone.

In another study (Anderson, Gentile, & Buckley, 2007), 161 children ages 9-12 and 354 college students played an E-rated nonviolent game (*Oh no! More Lemmings*), an E-rated cartoon violent game (*Captain Bumper* or *Otto Matic*), or a T-for-Teen-rated violent game (*Future Cop: LAPD* or an unspecified *Street Fighter* game). The E-rated cartoon violent games were found to elicit greater aggressive behavior than did the E-rated nonviolent games, while the T-rated violent games did not differ significantly from either the E-rated violent or nonviolent games. It was argued that children’s E-rated violent games are sufficient to cause increased aggressive behavior equivalent to that of T-rated violent games, and furthermore, that the ESRB ratings are flawed.

The results of this study are open to alternative interpretation. The nonviolent game, *Oh No! More Lemmings* is a puzzle game, while the remainder are all action games. Thus, differences in controls, strategy, or other game content may be partly or fully responsible for the observed effects, if any. Research also suggests that, as a nonviolent and prosocial game, *Oh No! More Lemmings* may significantly *decrease* aggressive behavior (Sestir & Bartholow, 2010), causing the other games to appear to have increased aggressive behavior. Furthermore, the differences in aggressive behavior were small, *r* = 0.12 [.03, .20]. This is only slight evidence that the conditions produced different levels of aggression.

Finally, the authors note that the T-rated violent games did not elicit greater aggression from the participants than did the E-rated violent games (mean # of high-intensity blasts = 6.1 and 5.43 for E-rated and T-rated games, respectively). The authors say that this finding should only come as a surprise to “those who place a lot of faith in the video game industry’s rating system” and that “the violent children’s games involve almost continuous violent behavior, just as in the T-rated violent games selected for this experiment” (Anderson et al., 2007, p. 69). This conclusion stands at odds with the manipulation checks, which rated the E-rated violent games (*M* = -.85, -1.04 for old and young participants, respectively) as less violent than the T-rated violent games (*M* = 1.24). The authors further point out that the children’s games were rated below the midpoint on a -3 to 3 Likert scale, and that “only the T-[rated] violent games were rated as having any appreciable amount of violence” (p. 69). Indeed, the T-rated violent games did not elicit significantly greater aggression than did the nonviolent game (*Oh No! More Lemmings)*, t(293) = 1.39, *p* = .17, *r* = .09 [-.03, .19],[[2]](#footnote-3) indicating that the effect of T-rated violence in this experiment was quite small and not significantly different from zero. One would expect that more extreme violent content should yield effects at least as strong as, if not stronger than, the effects of less violent content, so it seems unlikely that the observed effects are due to the effects of violent content alone.

In summary, contrary to the authors’ argument, these results do not seem to support their model of violent media effects. First, the observed changes in aggressive behavior in this study are slight. Second, the effect seems most closely related to whether participants played a *puzzle game* (*Oh No! More* *Lemmings*) or an *action game* (all other games in the study). It seems likely that the effects, if any, are most related to the gameplay style of these games, not their violent content. As a puzzle game with a prosocial theme, *Lemmings* also may cause decreases in aggressive behavior, overestimating the effects of the other games relative to it (Greitemeyer & Osswald, 2010; Sestir & Bartholow, 2010). Finally, it seems counterproductive to argue against one’s own manipulation check – one would need strong reasons to expect that the participants are wrong about their own experience. Such an argument would seem inconsistent with other recent research on this issue, which indicates that participants are generally capable of recognizing effective violent content (Busching et al., 2013). It seems more reasonable to conclude that the definition of “violent game” as often employed in research is lacking construct validity and could benefit from refinement.

**Definitions and effects of prosocial video games.** Research is now beginning to consider the possible effects of prosocial video game use, describing these as generally salubrious (e.g. Gentile et al., 2009). It would certainly seem possible that games can prime and train many concepts, not just violence. However, prosocial and violent content are frequently overlapping in the games examined in experimental and longitudinal research. For example, one study (Greitemeyer & Osswald, 2010) demonstrated that players of *Lemmings* were more helpful than participants assigned to play a superficially similar game, *Lamers*. It should be noted that *Lemmings* contains currently-defined media violence, as the titular lemmings are often killed by environmental hazards such as blades and deep water, and the player often must sentence particular lemmings to blow themselves up in order to solve the puzzle. Prosocial and violent content also co-occur in many other games; in many violent games, the player-character is typically acting to help or rescue someone. For example, even in *Call of Duty: Modern Warfare 4*, a game that scholars and laypeople can agree contains violence, the player takes the role of a military serviceman trying to stop a nuclear missile strike on the U.S. – a prosocial goal, even if it is achieved through violent means.

If prosocial messages encourage prosocial behavior, and most violent games include a prosocial message, why does previous research indicate that violent games reduce prosocial behavior (Anderson et al., 2010; but see also Tear & Nielsen, 2013)? When prosocial roles are offered by the game, players generaly seem to embrace them, even in violent games. For example, research suggests that players attempt to make prosocial (59%), or at least pragmatic (39%), moral choices in games that offer choices between good and evil. Players who do make evil choices may be doing so in an attempt to experience all the game’s content, as choosing evil was more likely during a second playthrough (20%) than in the first (5%) (Lange, 2013). This suggests that most players have prosocial goals even when playing violent games, and thus, that prosocial goals in video games may not be so unusual. Further research is necessary to determine whether the effects of prosocial and violent game content each have separable effects, and if so, whether those effects are additive or interactive.

**Summary of Definitional Problems**

Contemporary definitions of media violence do not parallel the psychological definitions of aggressive and violent behavior. The current definition requires the arbitrary dichotomization of what is likely a continuous underlying construct. The evidence which is claimed to support this practice and definition does not; instead, it indicates that the construct is not being measured validly and that other between-game differences apart from violent content may be responsible for the effects on aggressive behavior. The current definitions muddle experimental design and meta-analytic practice. Media violence currently has little to do with whether a person is experiencing harm, and has nothing to do with explicit content, which some readers may not realize.

**Defining violent game content**

This research area needs clearer and more accurate definitions of violent game content. However, in order to define violent game content, we must first clarify the definitions of “game content” and “violent content” in turn. We propose a novel form of game content analysis informed by theories of game studies as well as definitions of violent content informed by psychological definitions. Each suggestion’s value is supported by available data, if any.

**Defining Game Content**

Research hopes to identify the effects of violent game content, but how should researchers define game content? At present, “game content” in media psychology has been a nebulous construct, never rigorously defined. Present conceptualizations of game content are often limited and focus on what graphical representation is displayed on the television screen at any particular moment. However, video games are not simply television – they are also *games,* much like traditional board games or sports. As other contemporary scholars are beginning to realize, “[video games] are more than stories with buttons” (Elson, Breuer, Ivory, & Quandt, 2014). Malliet (2006) also notes, “It can be argued that these studies have investigated elements of representation rather than elements of simulation, and consequently, that a number of characteristics that are essential to the game play experience have been overlooked.” Attention to the unique attributes of games provides greater insight as to their contents and potential effects.

Decades of game studies have previously debated how to define games and game content. These debates were generally held between two camps: narratologists and ludologists. Narratologists argued that games could be analyzed as a novel form of narrative, and that the meanings and experiences made through them were the result of narrative (e.g. Murray, 1997). Ludologists, by contrast, argued that games must be understood on new terms emphasizing their abstract and formal rule-based systems. Aarseth (2001, section 3) writes, “Games are not a kind of cinema, or literature, but colonizing attempts from both these fields have already happened […] the extensive media differences within the field of computer games makes a traditional medium perspective almost useless.” This latter camp often regarded the representational elements of games, such as graphics and stories, as incidental (e.g. “It’s no wonder gaming mechanisms are suffering […] as they are constantly and intentionally confused with narrative or dramatic or cinematic mechanisms,” Eskelinen, 2001, section 8). Naturally, this dichotomy has been overstated (Frasca, 2003), as video games involve both narrative and rule-based experiences, and so neither a strict narratological nor a strict ludological perspective is likely to capture the full nature of games. However, an awareness of these distinctions often proves useful when attempting to dissect a game into its active ingredients.

To explicate the various types of game content, we can discern three levels of content corresponding to different facets of game content: physical content, fictional content, and ludological content. Although they may not have received equal attention in the literature, it is likely that the other facets are theoretically important and also constitute “game content,” as explained below.

**Physical content.**The first facet is the physical content. In the physical content, the player provides inputs that alter the present game state in pursuit of a preferred game state. In board games, these inputs consist of placing and moving wooden pieces on the board; in real-life sports, these inputs are physical movements of one’s body; in video games, digital buttons or analog joysticks are the inputs. The game state is stored and represented by the arrangement of pieces on the board, players on the field, or the values of numbers held in a computer’s memory. This game state encodes the scenarios and tactical positions which range from victory to defeat and everything in between (Juul, 2003). Content involved at this level involves the controller (which may be anything from a traditional mouse and keyboard or console controller to unusual input devices such as the Wiimote or Kinect motion detectors, or, as in sports, even the player’s body), control mappings (the player’s mental representations of which button or input has which effect), responsiveness of the system to inputs, and the means by which the system stores the game state. To use *Mortal Kombat* as an example, the physical content is the system which connects the player’s intentions to a joystick and buttons which alter values stored in computer memory.

**Fictional content.**The fictional content creates the metaphor and meaning through which the game state is interpreted. This game content involves graphics, sound, plot, and setting. This layer is the one most typically studied because it is the most readily apparent to an outside observer. Returning to the example of *Mortal Kombat*, the fictional level covers the entire metaphor of play: players are combatants using punches and kicks to injure each other until one is dead. This fictional level, then, provides the metaphor of violence. Without this fictional layer, players would be pressing buttons at particular times in an attempt to reduce a particular number in the game’s software to zero. The fictional layer seems to be most closely tied to violent content, as psychological theory and research has not made it clear whether a system of rules can be violent media in the absence of any fictional content.

**Ludological content.**Finally, the ludological content is composed of the rule-based systems which give structure to gameplay. The ludological layer, therefore, consists of the players’ interactions with the system and with each other via the system, most frequently in pursuit of a goal. The ludological layer thereby governs concepts such as strategy, skill, and competition. The elements of these ludological systems are often referred to as “game mechanics” or “game mechanisms,” which define the building blocks of the rule system (Björk & Holopainen, 2004). This rule system, in turn, creates the strategy and dynamics of *gameplay*. In *Mortal* Kombat, game mechanics of timing, health bars, projectiles, and feints create a rule system about managing resources, rhythm, area control, and attempting to predict an opponent’s next action.

**Separation.** These three layers of game content can be manipulated independently of each other. Consider the game of Chess. Chess is played through many different physical media which govern the physical content. For example, when played on a board, players’ inputs are entered, and the game state maintained, through physical movements of the wooden pieces. However, when playing via cellular phone, inputs are provided via touchscreen interface, and the game state is maintained in computer memory. In either case, the rules of the game, and thus its ludological content, are preserved. Chess is sometimes given different fictional content through the design of the pieces. For example, one chess set may present the opposing sides abstractly as White and Black, while another chess set may portray them as warring factions from Tolkein’s *Lord of the Rings* trilogy. Again, this adjustment to the fiction would not change the physical or ludological content of the game. Finally, one could alter the ludological content of Chess by adjusting its rules. If one added a dice-rolling game mechanic such that a player had to roll a die to determine how many squares a piece could move, it would be a very different game indeed, relying far less on strategic planning and tactical decision-making.

**Integration.** While it is possible to manipulate the facets of content independently, they are also often interconnected. For example, changes to the controls can influence the fictional and ludological facets: if the controls are made less responsive, the fictional avatar may seem less metaphorically agile and skilled, and strategic changes will be necessary to compensate for the ineffective controls. All three facets influence the players’ experience, but in our view, it is chiefly the fiction that provides the violent content.

**Game Genre as Conflation of Fictional and Ludological Content**

Games are often grouped into genres according to their major ludological features. For example, “shooter” games often require rapid aim, the use of cover to avoid detection or enemy fire, and navigation of a 3D environment inhabited by numerous opponents and allies. By contrast, “fighting” games pit the player against a single opponent in a simple environment requiring no navigation. Players instead must use quick reactions and psychology to predict their opponent’s next action, as well as dexterity and practice to perform fluid, effective attacks. “Strategy” games generally favor strategic and tactical decision-making over manual dexterity or speed of reactions, and are further subdivided into “real-time” or “turn-based” depending on whether play is divided into turns or unfolds continuously in real time.

Genre, therefore, is often descriptive of both fictional and ludological conventions in video games. While certain genres tend to involve more violent content than do others, they also tend to differ considerably in the rules and structure of play and the required cognitive processes. It is open to discussion as to whether this represents a confound or a meaningful part of the violent game construct.

**Conflation of game violence and game genre.** A theoretical consideration which has been often overlooked in the literature is whether game genre (and thus, its ludological features) should be considered as something distinct from violent game content. Often, game manipulations in experimental research also involve an inadvertent manipulation of genre.

For example, one common violent game manipulation was established by Anderson et al (2004): participants in one condition play *Marathon 2*, a first-person shooter game, and participants in the other condition play *Glider Pro 4*, a simple action game. These games differ dramatically in their fictional content, as intended: in one, the player shoots aliens to death before they can kill him, and in the other, the player pilots a paper airplane past obstacles and through a house. However, the two games also differ substantially in their physical and ludological systems. *Marathon 2* involves the use of both mouse and keyboard to orient and move the player, select and use weapons, check the map, and use switches and computer consoles in the game environment. By comparison, *Glider Pro 4* is relatively simple, as players use one key to move forward and one key to move backwards. The strategies involved are also very different. In *Marathon 2*, the player has reserves of health and ammunition which must be managed in combat and exploration. If enemies detect the player, they will pursue him. In *Glider Pro*, the player loses a glider instantly when the glider hits an obstacle, and must navigate from one air vent to the next, using reflexes and timing to avoid hazards. The hazards remain in place – the player just has to navigate around them when ready.

The confounding of violent content and genre is common in experimental studies. Other studies tend to test first-person shooter games (e.g. *Call of Duty*) or fighting games (e.g. *Mortal Kombat*) against racing games (e.g. *Dirt 2*) or sports games (e.g. *Top Spin Tennis*) (e.g. Bastian, Jetten, & Radke, 2012; Hasan, Bègue, Scharkow, & Bushman, 2013). To date, there are very few studies which have examined the effects of violent content on aggressive behavior without also manipulating genre or gameplay (but see Anderson & Carnagey, 2009; Anderson et al., 2004, experiment 3; Barlett, Harris, & Bruey, 2008; Elson, Breuer, Van Looy, Kneer, & Quandt, in press; Mohseni, 2013; and Przybylski, Deci, Rigby, & Ryan, 2014; these studies manipulate violence while attempting to keep content as a constant, with varying degrees of success.)

Indeed, research often *deliberately confounds* game genre and game violence. For example, longitudinal research by Willoughby, Adachi, and Good (2012) treated game genre as a proxy for violent content. Players indicated which genres of game they played at each annual wave. Use of action (e.g. *God of War*) or fighting (e.g. *Mortal Kombat*) games was coded as violent game use; use of puzzle, art, building model worlds (e.g. *The Sims*), and quiz games were coded as nonviolent game use. While violent games were found to significantly increase later aggressive behavior, it is not entirely clear whether these effects were due to the violent or aggressive content of these games or their ludological features as a genre. Similarly, two samples in a cross-sectional study by Anderson et al (2008) measured violent game exposure as the use of any “fighting,” “action,” “action role-playing,” “shooting,” or “adventure” games.

Even when genre is not deliberately used as a proxy for violent content, the two often overlap. For example, researchers often collect continuous ratings of violent content and dichotomize them into binary categories with a very low threshold, categorizing any game with even minimal violent content as a violent game (e.g. Busching et al., 2013). This is likely to convolve genre and violent content, as even the tamest action-platform game will likely involve at least slight aggressive content (e.g. jumping on enemies).

To determine whether genre ratings were more or less valid as a measure of violent game content, Busching et al. (2013) compared multiple methods of measuring violent game use across three different samples. In an American sample, game violence was rated by the participants, by expert raters, and by the ESRB. In a Singaporean sample, game violence was rated by participants’ reports of how frequently creatures and players were killed, as well as by ESRB ratings. Finally, in a German sample, game violence was measured by the use of particular game genres, *perfectly convolving* game violence and game genre.[[3]](#footnote-4) Cross-sectional and longitudinal relationships with aggressive behavior were largest in this last sample. This measure also yielded more pronounced decreases in aggressive behavior associated with non-violent games (Table 1). It is possible that confounds of genre systematically overestimate actual effect sizes. Given that some popular puzzle games still involve violence and aggression (e.g. *Portal* features robotic turrets which impede the player by trying to shoot her to death, and *Might & Magic: Clash of Heroes* anthropomorphizes puzzle blocks as warring armies), as do world-building games (*Minecraft* features zombies, spiders, and other monsters which will attack the player) and some simulations (the simulation genre includes both *Sim-City* and *Digital Combat Simulator: A-10C Warthog*), it is unlikely that this increase in effect size is due to enhanced validity of measurement.

These confounds have also been present in research on the effects of prosocial video games. For example, it was demonstrated that playing the prosocial game *Lemmings* caused more prosocial behavior relative to playing the violent game *Lamers*, a superficially similar game (Greitemeyer & Osswald, 2010; although see also Tear & Nielsen, 2013 for a failure to replicate, albeit with modest sample size). Despite their graphical similarities, the two games are also very different in the rules and structure of play: *Lemmings* is a puzzle game requiring strategic thinking and planning, while *Lamers* is a crude action parody of *Lemmings* involving a lot of frantic clicking to shoot the targets. Since the structure and rules of play are so different, it cannot be determined whether subsequent changes in prosocial behavior are due to the games’ prosocial or antisocial fictional contents or their vast differences in ludological content.

**Possible mechanisms of physical and ludological confounds in causing aggressive behavior**. As described in a previous section, games contain several forms of content, of which fiction and graphics are just one. There is some evidence that this confounding of physical and fictional content may be partly responsible for the observed effects of violent video games. Przybylski et al. (2014) noticed that violent games generally involved more complex controls than did nonviolent games. Since more complex controls were more likely to thwart feelings of competency, the researchers hypothesized that the complexity and difficulty of controls may mediate and confound the effect of violent games on aggressive behavior. In a first study, these researchers found no significant effect of game type (*Marathon 2* vs *Glider Pro 4*) on aggressive affect, *r* =.00, 95% CI [-.19, .20].[[4]](#footnote-5) By comparison, effect sizes through an indirect mediational path were larger: the violent game was associated with poorer mastery-of-controls, and poorer mastery of controls was associated with increased aggressive feelings, *r* = .31, 95% CI [.11, .47]. A subsequent study used violent and non-violent modified versions of the first-person-shooter game *Half-Life 2*. Violent content didn’t cause changes in aggressive feelings (*r* = .08, 95% CI [-.11, .27]), but participants who had poorer mastery-of-controls increased in aggressive feelings (*r* = .19, 95% CI [.01, .37]). It is probably no surprise to aggression researchers that frustration can cause aggression (Dollard, Miller, Doob, Mowrer, & Sears, 1939; Berkowitz, 1989), but this does highlight the role of physical game content in affecting aggressive outcomes (see also Williams, 2013). This is not to invalidate the experimental results found using the *Marathon 2* & *Glider Pro 4* manipulation, but rather, to illustrate one weakness of this experimental approach which has sometimes drawn criticism (e.g. Williams & Skoric, 2005).

The ludological content of certain genres may also influence aggressive outcomes. Adachi & Willoughby (2011a) have proposed that violent games are generally more competitive, and that this competitive behavior may influence subsequent outcomes (see also Adachi & Willoughby, 2011b, 2013 for empirical demonstrations). The genres which involve violent content also frequently involve gameplay concepts such as scarcity of resources, adversity of opposing forces, and the attrition of resources such as ammunition and health. The priming of any of these concepts may cause participants to become more self-interested, less helpful, and more aggressive. Consider also the interpersonal circumplex (Wiggins, 1982): most violent game genres are likely to involve hostile and dominant interpersonal situations, while nonviolent games are likely to involve more friendly and submissive interpersonal situations. These interpersonal situations may also be partly responsible for the priming and activation of aggressive behaviors. (Consider a video game in which players were scientists competing over very limited resources of job offers and grant funding – it could be expected to make players aggressive and hostile even in the absence of violent content!) A careful consideration of all these factors will allow for a more precise estimate of the effect of each factor on aggressive behavior.

We note that some researchers of other topics have already begun to consider game genre as a moderator of game effects. For example, researchers of pathological game use (i.e. “game addiction”) find that game genre is an important moderator. Metcalf and Pammer (2014) found different patterns of change in heart rate and blood pressure in pathological gamers depending on whether they favored first-person shooters or online role-playing games. Another study by Bailey, West, and Kuffel (2013) found that pathological players of first-person shooters were more impulsive in self-report and a delayed discounting task. Addicts of this genre also took excessive risks in an Iowa Gambling task. By comparison, pathological players of strategy games were less impulsive and learned faster from negative feedback. Since game genre is a representation of a variety of related ludological features, these findings highlight the importance of ludological content in shaping behavior and cognitions through play, with effects possibly distinct from any effects of media violence.

In summary, gameplay teaches, shapes, and rewards behavior. In some research, it is possible that the fiction of violent gameplay has reinforced and trained aggressive behavior. However, research tends to confound violence with other gameplay features, leaving it uncertain as to what game content is responsible for the observed effects. For greater theoretical resolution and predictive ability, researchers ought to consider the entirety of game content: physical, fictional, and ludological. Only once game content is fully described, controlled, and understood does it become possible to estimate the causal effects of violent content.

Even once we have defined game content, there is yet the challenge of defining violence *within that* game content. It is without question that a fictional representation of a bareknuckle brawl or a military war zone is violent fictional content. However, is bouncing on enemies’ heads violence? Furthermore, can a system of rules be violent? And how can harm be defined within the scope of a game, where in-game outcomes do not have real-life consequences?

**Defining Violent and Aggressive Game Content**

Recall the definition of aggressive behavior: “behavior intended to do harm to another individual who is motivated to avoid that harm” (Anderson & Bushman, 2001, p. 354). Current definitions of video game violence often diverge from this definition in ways that may be empirically relevant. The conditions that define in-game violent behavior are likely to be of theoretical importance in moderating the presence and magnitude of violent game effects. To better examine the definition of aggressive behavior in the context of video games, we consider the games *Grand Theft Auto* and *Super Mario Bros,* juxtaposing these two games for the sake of illustration.

First, aggression requires an attempt to harm. In many as-defined violent games, particularly games featuring cartoon violence, it is not clear that harm is intended or inflicted upon other game characters by the user. When Super Mario jumps on a goomba (a little mushroom-shaped enemy), the goomba is squashed and disappears. To call this “harming” or “killing” the goomba may be an exaggeration, as the goomba does not betray signs of suffering. In contrast, enemies and innocents in *Grand Theft Auto* are subject to realistic attacks with vehicles, fists, and firearms which unambiguously cause injury, bloodshed, and death.

Second, aggression involves an individual capable of experiencing harm – a moral patient. It is not aggression to kick a rock or to chop firewood, as these objects lack moral patiency. Unlike people in *Grand Theft Auto,* who are human beings, it is not clear that a goomba is an individual. A goomba could be understood as an animal lacking both sentience and the capacity to experience harm, as one might consider a lobster that is boiled for dinner without moral compunction. Thus, there is ambiguity in whether participants perceive a game as actually containing violence. One player might see goomba-stomping as harming a living, thinking creature, while another player might experience it as the harmless removal of an unthinking obstacle. It would be interesting to model and consider this ambiguity of interpretation, which also could provide improved model prediction.

Finally, aggression requires that the victim is motivated to avoid harm. The goomba does not attempt to avoid harm, as its programming permits it only to walk forward until it encounters an obstacle. In certain cases, goombas will routinely walk off platforms and into bottomless pits, as their deterministic programming demands. By comparison, people in *Grand Theft Auto* will flee and hide from gunfire, or at least attempt to shoot the player-character before he can shoot them.

The current definition of “violent game” is insufficient: it is exceedingly broad, lacks theoretical resolution, and needlessly conflates violence, aggression, and even behaviors which are neither violent nor aggressive. Considering that the player-character is often the only thinking, feeling character, it is entirely possible that the only harm in many games is that experienced by the player-character in a perilous environment! When this is the case, theories proposing the role of the rehearsal of aggressive behaviors and schema (e.g. the General Aggression Model’s pathways through aggressive cognitions, Lindsay & Anderson, 2000) may not be applicable.

*Considering harm*. In considering the above multifaceted nature of game behaviors and cognition (physical, fictional, ludological), we must also consider that “harm” may also consist of separable substrates. For example, harm can be physical, causing physical pain, bodily injury, or death. Harm can also be emotional, causing hurt feelings. We would like to highlight a third variety of harm often experienced in games which has received relatively little attention: ludological harm, harm that thwarts players’ in-game goals.

In many games, particularly multiplayer games, it is possible to “aggress” against other players in a strictly ludological sense not involving any graphical or fictional physical harm. Consider the 1959 board game *Diplomacy*, in which up to 7 players represent European nations at the turn of the 20th century. The player’s goal is to control Europe, whether alone or as part of an alliance with other players. Players have armies and navies which can move about the board, but rather than fight, these units dislodge each other from territories, retreating when outnumbered. The real strategy of the game comes not from combat, but in negotiating with other players, who can be told truth or lies, cooperated with or betrayed. Within the game, betraying another player to steal his territories is an act of profound interpersonal aggression despite the absence of fictional bloodshed. Anecdotally, this ludological aggression has dramatic effects on players even in the absence of any fictional violence, earning *Diplomacy* the title of “the game that ended a thousand friendships” (Grabar, 2013).

Of course, physical, emotional, and ludological harm are often intertwined. For example, an American football tackle is intended to inflict ludological harm (e.g. the opponent’s run is halted), but may incidentally cause physical or emotional harm. In some cases, a player may deliberately attempt to inflict excessive physical harm in order to remove a rival from the game, causing the rival’s team further ludological harm and improving the player’s chances of victory. Such a scheme was investigated in 2011, when the New Orleans Saints football team were found to be paying players cash bonuses for injuring opponents and removing them from games (Battista, 2012). These unsporting tactics are usually punished in order to preserve player health and fair play, but this example highlights how physical harm can coincide with ludological harm.

Aggression in violent video games is often similarly multifaceted. In a first-person shooter game like *Call of Duty 4: Modern Warfare*, being shot by another player is a fictional representation of physical harm. At the same time, it also represents ludological harm in that the player is unable to score points for several seconds while dead, while his opponent has gained a point from a successful kill. If the opponent is rude, he may choose to also inflict emotional harm upon the player by mocking or berating the player after a kill. Research may wish to consider these multiple facets of harm found in games and consider carefully which ones are manipulated in experiments and relevant to theory, as they may represent important mechanisms and moderators of effects. For example, researchers could make a game in which shooting an opponent scores a point but does not cause the victim to lose time being “dead,” preserving the fictional physical harm while eliminating the ludological harm. Alternatively, researchers could replace the game’s weapons with nonweapon tools which delay opponents (e.g. a giant bubble holds the opponent in place for several seconds), preserving the ludological harm while eliminating the fictional physical harm.

**Summary of Considerations in Defining “Violent Game Content”**

The inconsistent and insufficient definitions of violent game content make it difficult to tell whether a particular game contains violence. These definitions do not maintain the qualitative and quantitative differences between aggression and violence. We also note that harm can also take many forms, not all of them physical, and that the recipient of aggression or violence must be capable of experiencing harm. In many games, it is not clear that harm is delivered or experienced. These considerations require more careful attention in research, as they inform research design and meta-analytic practice.

Researchers must also consider that video games are not just an extension of television, but rather, the newest form of *games*, a medium thousands of years old. Games are composed not only of fictional narrative and representational content, but also systems of interaction and strategy. The loose definitions used to describe “game violence” confound violent game content with other game contents, which may be partly or wholly responsible for observed patterns of results. Thus, the current definition of violent game content is in need of revision. We attempt to remedy this problem by proposing a new definition that disambiguates violent from aggressive game content.

**Solution: New Definitions of Violent Games**

Considering the above definitions of aggressive and violent behavior, as well as the multifaceted nature of game content, we suggest novel definitions for describing games’ potentially-harmful fictional content – ones which distinguish aggressive content from violent content. A *violent game* should be one involving realistic and harmful depictions of thinking, animate beings experiencing serious bodily injury or death, not just any form of abstract harm. Games involving M-rated violence and gore such as *Call of Duty* or *Grand Theft Auto* would still fall under this definition, while *Sonic the Hedgehog* would not (cf. Anderson et al., 2010).

By contrast, games involving inter-character acts of aggression not involving bodily injury or death should be categorized as *aggressive games* or *games involving conflict*. These games would include emotional and ludological harm, but not serious physical harm. Furthermore, games in which characters are “hurt” or “die” in abstract or unrealistic ways should be classified as *aggressive games* due to the ambiguity of whether actual harm is inflicted on a thinking, feeling individual. *Super Mario* may jump on goombas, pelt them with fireballs, or throw turtle shells at them, but it is unlikely that the characters experience bodily harm or injury in being removed from the game environment. Similarly, *Pac-Man* may lose a life when touched by a ghost, but this loss of life is too abstract to be considered as bodily harm. Indeed, it is quite possible that the ludological harm to the player in losing a life has stronger effects than the fictional violence of Pac-Man’s “death,” much like the previous example of the board game *Diplomacy*, in which ludological harm strained friendships. This may well be the case for many E-rated games involving violence as presently defined. Conflict and challenge are crucial to game design, so it is unusual to have games without some manner of enemy. The experience of these conflicts and challenges may have effects on affect, cognitions, and behavior in their own right – effects distinct from those of media violence. Thus, the vast majority of games are likely to be at least somewhat aggressive, or to involve some amount of conflict, but not necessarily be violent video games. In ideal practice, research would disentangle the effects of conflict from the effects of violence and be capable of making predictions about the effects of each.

These definitions would also help to more accurately present the existing body of violent game research. It is generally accepted that games involving extreme portrayals of M-rated violence and death can cause increases in aggressive behavior, and the empirical literature supports this claim (albeit with some potential confounds). However, it has yet to be convincingly demonstrated that merely-aggressive games such as *Super Mario* or *Pac-Man* have similar effects. Again, this represents a bold assumption and a substantial extrapolation from the extant data, in exchange for which researchers gain only an unusually broad definition of “violent media.” The proposed definitions for violent and aggressive games would be more intuitively communicated to laypeople and less likely to be rejected out of hand as preposterous.

We also recommend that researchers investigate the effects of *continuous* measures of game violence. Like conducting a median split on a continuous variable in a regression analysis, it is often a bad idea to turn a continuous measure into a categorical measure. In this case, research practice has made the assumption that all nonzero amounts of game violence have the same effect. As explained above, the evidence which is claimed to support this assumption would seem to suggest instead that game features other than violence are responsible for the changes in aggressive behavior, if any (Anderson et al., 2007). Through reporting models and plots of both continuous and categorical measures of game violence, researchers can provide evidence for whether violent content should be conceptualized as continuous or categorical. Determining the shape of the functional relationship between media violence and aggressive behavior also will help to inform grand theories of aggressive behavior. For example, this shape would indicate whether the strength of content is important, or whether priming with comparatively mild violent content is sufficient to cause greater aggression. By comparison, dichotomizing the variables without ever inspecting the relationship of the continuous parameter loses information and fails to harvest important knowledge.

**Manipulating Only Violent Fictional Content**

To test more precisely the specific effects of violent and aggressive game content without confounds, we urge researchers to examine, understand, and control the ludological content of their manipulations. One laudable effort is found in Anderson and Carnagey (2009), in which participants played baseball (*MLB Slugfest*, *MVP Baseball 2004*) or football games (*NFL Blitz, Madden*) differing in their violent content. As a result of their different developers (EA Games vs Midway) and rule sets (e.g. in the violent baseball game the base runner could punch the baseman to continue running, thus yielding play that was *more violent, more surprising,* and *faster-paced*), the games differed in several post-test ratings, which were addressed through the use of ANCOVA, which is not ideal (see Adachi & Willoughby, 2011a; Miller & Chapman, 2001). Still, this experiment provided a different variety of experimental control by keeping genre constant, improving the overall triangulation of the hypothesized effect.

An even more precise way to stage manipulations is to create modified game versions using in-game options menus or software modification tools. One of the earliest forms of this method was demonstrated by Anderson et al. (2004), who modified the first-person shooter game *Marathon II* to have either human or alien enemies to fight the player. A third condition further modified the game to have no enemies, instead having to find a path through the level and to resources within a time limit. Both game versions featuring enemies caused greater aggression in players than did the version without fighting. In another experiment, Carnagey and Anderson (2005) had participants play versions of *Carmageddon II* in which players were either rewarded or punished for hitting pedestrians and other cars. (A third condition removed pedestrians from the game, obviating the question of punishment or reward.) When violence was rewarded, rather than punished, players committed more in-game violence, and subsequently demonstrated greater aggressive cognition and behavior. This experiment also afforded the possibility of mediational analysis to determine whether punishment or reward of violence might have had effects above and beyond shaping participants’ in-game behaviors, although this opportunity was not pursued. This study highlights how a single change to a game’s ludological content (e.g. rules) can have sweeping effects on both in-game behaviors and post-play outcomes. A similar manipulation was used to adjust the amount of bloodshed in *Mortal Kombat: Deadly Alliance,* finding evidence of increased aggressive cognition when gameplay involved graphic animated blood (Barlett et al., 2008).

An especially sophisticated approach to experimental design is to use software tools to make modified versions of a single game (Elson & Quandt, in press). A handful of researchers have attempted to make closely-matched violent and nonviolent games of the same genre. For example, Elson et al. (2013), Engelhardt, Hilgard, and Bartholow (under revision), Przybylski et al (2009), and Staude-Müller et al. (2008) each used manipulations in which participants played first person shooters which differed only by their fictional and graphical violent content. Both conditions were constructed from the same game, keeping intact the controls, enemy behavior, and game design. In the violent condition, the player had guns which shot bullets and killed opponents, while in the nonviolent condition, the player had a nonweapon tool which harmlessly froze opponents in place or teleported them away. One such manipulation is hosted on Open Science Framework for others to use in experiments at https://osf.io/3cb9m/ (Hilgard, 2013). Since manipulations such as these create games which are identical save for a single manipulated feature, any observed differences between groups must be due to the manipulation and not confounding factors.

While the question of whether genre is construct or confound is up to debate, and we welcome the future dialogue in this area, we recommend that researchers consider genre to be *distinct* from graphical violence, as it represents a constellation of physical and ludological content which can be separated from violent fictional content. This consideration will help research to examine ludological features as potentially having effects separate from their fictional and graphical presentation. This would help to alleviate concerns that comparisons between violent and non-violent games are “apples and oranges,” incorporating effects of changes beyond violent content. This attention to detail will help to predict exactly which games will cause which outcomes and why.

**Does censorship work?** An important application of this research would be to determine whether expurgated versions of games are less harmful than their uncensored versions. For example, a number of commercial games have used software modification in an attempt to create more family-friendly alternative versions of classic first-person shooters (e.g. *Noah’s Ark 3D* compared to *Wolfenstein 3D*, *Chex Quest* compared to *Doom*).[[5]](#footnote-6) These games typically change the fictional layer of game content to reduce the perceived violence. For example, *Chex Quest* is a modified version of the popular first-person shooter game *Doom*. In the original *Doom*, the player navigates 3D levels, searching for bullets, guns, health, and armor, while fighting zombies and demons. The player shoots his enemies with real-world and science fiction guns, causing them to die in bloody ways, and the monsters attack the player with guns, teeth, and fireballs in an attempt to kill him. In *Chex Quest*, the fictional layer (graphics, sound, setting, plot) was adjusted to make a version of the same physical and ludological content that would be considered safe enough to include in cereal boxes for children. This was accomplished by replacing the character’s weapons with “zorchers,” devices resembling remote controls that sent the aliens back harmlessly to their home planet. The zombies and demons were replaced with silly-looking slime creatures, whose attacks were replaced by flying boogers and slime balls. These boogers were said to immobilize, rather than kill, the player character, forcing him to start over.

In a similar way, games have sometimes been censored to meet national restrictions on violent games. For example, Germany and Australia had a prolonged period in which there was no 18+ ratings category for video games, and so violent games were often modified to be appropriate for players of age 15+, the highest ratings category available at the time. This was often achieved by the removal of animated blood or gore, and sometimes through changes to the plot or setting. For example, the original version of *Team Fortress 2* represents players as human characters who bleed when shot or even explode into bloody giblets when defeated by explosives. In the censored version, players were represented as robots that “bled” oil or exploded into cogs and springs when destroyed. Similar modifications, which replaced human characters with robots, were made to *Command and Conquer: Generals* to get a lower violent content rating.

In both cases, perceptions of the in-game violence were altered by affecting whether game characters experienced harm, in accordance with typical definitions of “violent behavior.” These adjustments were sufficient to satisfy legislators and censors. However, the expurgated version of the game would still be defined as a “violent game” by some researchers, perhaps not inaccurately. To date, there is little evidence that one version of the game is any more or less hazardous than the other. The definition of “aggressive behavior” outlined above would suggests that changing the fictional animacy and sensitivity of one’s opponents leads to the absence of violence, as robots purportedly are not individuals and cannot experience harm. It would be a fruitful avenue of future research to examine whether these changes to fictional content actually moderate the consequences of game use. Rather than attempt to discredit ratings board systems, research in this area could instead help to inform scientifically accurate and helpful systems of video game content ratings.

Even more importantly, if it were discovered that game genre and rules of play had their own effects on cognition and behavior, this could provide exciting new causal pathways to existing theories of aggression. Effects of violent video games are often explained through processes of socialization, such that others are perceived as more hostile or violence more acceptable, or processes of priming, such that aggressive thoughts and schema are more accessible and thus more likely to be used. If the rules of play can also affect social cognitions through socialization or priming, theory will need to consider the role of the entire gameplay experience, not just the fictional contents.

Furthermore, as in traditional media like books and movies, player interpretations and construal of the artistic intent, ideal strategy, and interpreted meaning may vary wildly. Some players may interpret jumping on goombas as gleeful violence, while others may interpret it as navigating the game’s obstacles. A new theory is necessary to explicate the entirety of game content, how the player and game content interact, and how these interactions might be expected to influence the player’s cognitions and behaviors.

**A New Model of Video Game Effects – The Gaming Active Interpretation Model (GAIM)**

We use the above considerations and critiques to develop a theoretical model of game effects. This model is an interdisciplinary integration of theories of psychology, communications, and game studies. To emphasize the role of the unique attributes of gameplay and the user’s active role as player and interpreter, we call it the Gaming Active Interpretation Model (GAIM). GAIM specifies active substrates of both the game and the player that interact to yield changes in affect, cognitions, and behaviors (Figure 1). It further separates causal mechanisms into pathways of both universal effects that are expected to influence all players (e.g. priming) and specific effects that are dependent upon qualities of the player (e.g interpretation, identification, and integration).

First, there is the game. As outlined above, a game consists of physical, fictional, and ludological contents which represent, compose, and deliver the game’s message. While much of game research has focused solely on the fictional contents, the physical and ludological contents of a game are also important to consider, as these may have meanings and effects of their own. As argued above, this understanding of the full content and structure of games should be informed by game studies (e.g. Juul, 2003).

Next, there is the player, who is an active participant in attending to, interpreting, storing, and retrieving the game’s message through the experience of play. Players are actively thinking, feeling individuals with pre-existing attitudes and personalities. While some media effects may be universal, contemporary communication theories are aware of the importance of the properties of the receiver. Thus, GAIM maintains that the player’s attitudes, believes, and desires partly determine the outcomes of game use in ways that can be predicted through application of theories of communication. GAIM also models the interaction between player and game, as the player’s in-game choices and actions determine what facets of the game’s content are experienced. Attributes of the player are therefore doubly important, as they determine both the game content experienced and the player’s experience of that game content.

Finally, there are the consequences of use experienced by the player. In most video game research, the consequences of interest are aggressive arousal, accessibility of aggressive cognitions, aggressive behaviors, and hostile expectations. Some other research investigates effects of game use on prosocial behaviors (e.g. Greitemeyer & Mügge, 2012) or on cognitive abilities (Green & Bavelier, 2003). In all these cases, careful attention to the game’s content, player’s role, and the interplay between game and player will lead to better explication of the causal substrates and pathways.

Certain casual pathways may not be mediated by communication with the player. For example, some research maintains that violent games can affect behavior through subconscious priming processes, such increasing the accessibility of aggressive thoughts so that aggressive actions are more likely to be elicited (see, e.g., Anderson & Bushman, 2002). These causal pathways would be expected to circumvent the player’s conscious processes and act directly on cognitions and behaviors.

On the other hand, other proposed mechanisms rely on more conscious processes. For example, it has been suggested that violent games make real-world violence seem more prevalent and less objectionable. If this is the case, then it is necessary that the player attends to the violent content, judges the message as valid, stores it, and later retrieves it. These processes are likely to be influenced by observational-learning theory (Bandura, 1977), which predicts increased effects when the model performing the behavior is attractive to the viewer, the context is realistic, and the behavior is followed by reward (see also APA Task Force statement, 2005). Attention to the mechanisms mediated by the player will provide new insights to the processes by which games do and do not influence behavior, yielding more refined and accurate estimates of outcomes associated with game use.

The GAIM may exist in concert with other theoretical models of game effects such as the General Learning Model (Buckley & Anderson, 2006; Lindsay & Anderson, 2000) or the Integrated Model of Player Experience (Elson, Breuer, & Quant, 2014). GAIM does not supplant these models and does not argue against their predictions. Instead, the GAIM serves to explain and model *how* the content of a game and the nature of the player interact to predict the psychological effects of game use. This is a refinement upon previous theories of game effects, which struggled to define a game’s content, did not consider the entirety of gameplay activity, and did not formally acknowledge the player’s role as active participant and interpreter.

**Communication Theories in the GAIM**

A novel contribution of the GAIM is that it integrates theories of communication to highlight the potential importance of player attention, construal, and interpretation in moderating game effects. One early theory of media influence was “magic bullet theory,” which held that media content had a direct and powerful effect on its audience, universally penetrating its audience and injecting a message or influence (as described and disparaged by Berger, 1995). These theories presented media effects as pervasive, inevitable, and universally potent, and furthermore, that “all members of an audience ‘read’ a text the same way and get the same things out of it.” (Berger, 1995, p. 174). This has been the prevailing model of game research to date: presuming that all players have a single monolithic experience of a particular video game, and that this experience universally causes slight but inevitable changes in behavior, for better or for worse. Given the diversity of players’ tastes, personalities, and abilities (Hilgard et al., 2013), this model likely overlooks many important mediators and moderators of game effects.

Since this time, these crude theories of communication have fallen out of favor, replaced by more nuanced theories such as the Limited Capacity Model of Motivated Mediated Message Processing (LC4MP; Lang, 2000) or the Social-Cognitive Information Processing model (SCIP; Huesmann, 1998). LC4MP holds that the audience member is an active participant in receiving, encoding, and retrieving the medium’s message. The audience’s capacity to perform these functions is limited, and so effort towards attending to a particular feature may come at the cost of attention to another feature. Under this theory, attributes of the player determine which facets of the game are given attention, stored in memory, and later retrieved. This theory would suggest that a player who is attending closely to the strategy and competition of the game may be less aware of the violence on screen. Similarly, SCIP points out that the social information activated by a stimulus depends on the salience of, and attention to, the stimulus. The salience of a stimulus is said to depend on the situation, moods, and schema of the viewer. Finally, even after attention has been allocated, social perception is yet affected by the process of interpretation, by which the receiver constructs meaning from the received communication. We apply these modern theories of communication to psychological game research.

There is reason to believe that at least some players attend to games’ ludological and physical content, not the fictional content. For example, an interview study found that players most frequently described their violent acts in gameplay verbs rather than aggressive verbs, e.g. “You only try to move the crosshair […] It’s only about dexterity, nothing to do with killing.” (Klimmt, Schmid, Nosper, Hartmann, & Vorderer, 2006, p. 318). The authors concluded that “Reaching goals and winning competitions are obviously much more important than violent action per se.” (Klimmt et al., p. 323). Others have suggested that the cognitive demands of effective gameplay performance requires players to shift their attention from the fictional meaning of game graphics to their ludological meanings, for example, seeing enemies as requirements for certain in-game strategies rather than representations of human beings (Kontour, 2009; Squire, 2006). It is possible, then, that while the fictional content is the most obvious to an outside observer, it is the ludological content which most closely holds some players’ attention.

We understand that certain theoretical mechanisms of violent game effects consider interpretation and construal to be irrelevant to effects. For example, if violent game effects are due to the priming and rehearsal of aggressive scripts, those aggressive scripts may be more likely to be activated in a real-life situation, regardless of whether the person thinks it appropriate to apply those scripts. This possibility could be well-modeled through a “magic bullet” theory of communication. However, other mechanisms such as social learning will require more cognitively involved causal pathways. It may be possible to find larger effect sizes and create models with greater predictive ability by teasing apart universal “magic bullet” mechanisms from more nuanced mechanisms requiring attention and interpretation.

**Support for the GAIM**

Some evidence from previous research highlights the importance of considering the player as a moderator of game effects. For example, some studies find that effects are larger among men than women (Bartholow & Anderson, 2002) or among individuals who are theoretically predisposed to violence (Engelhardt et al., 2011; Markey & Scherer, 2009). This supports the GAIM in that aggressive players are more likely to attend to images of violence in media, construe them positively, and integrate them into the self, while less aggressive players may be attending to other facets of the media, construing violence more negatively, and rejecting integration of violent content into the self. Furthermore, one study has found that violent content’s effects on aggressive behavior may be moderated by wishful identification with the protagonist (Konijn et al., 2007), which would increase the likelihood of attending, positively construing, and integrating the character’s violent behavior. Another study finds moderating effects of similarity of appearance between player and avatar, such that players demonstrated greater increases in aggressive affect when their avatar in a violent game physically resembled them (Williams, 2011). Again, the player is expected to pay greater attention to self-relevant content, so harm inflicted upon and perpetrated by a self-relevant avatar should be more salient and more likely to be integrated into the self. Finally, Przybylski, Ryan, and Rigby (2009) found that players high in trait aggression placed higher value on games with violent content, even when those violent contents did not enhance their enjoyment of the game. Therefore, The player is an important actor in selecting, experiencing, and interpreting violent content.

**Falsifiable predictions of the GAIM**

This model establishes a number of testable predictions. First, games are able to influence behavior through their physical and ludological content, not just their fictional content. For example, the rules of the game shape players’ in-game behaviors, teaching players to cooperate or compete, to trust or to betray. An examination of the literature on decision-making games such as the Prisoner’s Dilemma, the Ultimatum Game, or the Public Goods Game readily demonstrates how changes to the structure and content of a game’s rules can alter in-game behaviors and game-theoretic strategies. For example, when players are given the goal of maximizing joint, rather than individual, earnings, they cooperate more frequently (Deutsch, 1958). These rules are expected to communicate a media message themselves and may affect behavior: a game which encourages betrayal, exploitation, or picking on weaker parties would be expected to increase aggressive behavior even in the absence of violent fictional content. Research from Adachi et al. (2011b) indicates that competitive ludological content can increase aggressive behavior, even in the presence or absence of violent content.

Second, the model allows processes and individual differences of the player to mediate and moderate the effects of violent games. For example, players who find violence distasteful will be likely to reject the media message of a violent game, experiencing smaller increases in aggressive behavior than would players who have more positive attitudes about violence. Our previous survey research indicates that players differ in their attitudes and motivations towards violence in games: some players find that violence is rewarding and cathartic, while others do not (Hilgard et al., 2013). These individual differences may predict who attends to violent game content, positively construes it, and integrates it into the self. These players may also be more likely to seek out violent content within games even in cases where the game’s rules do not incentivize it, such as needlessly shooting civilians in *Grand Theft Auto*. Finally, in some cases, the game itself may contain a message which helps the player to reject the violent content, as it may punish the player for violent behaviors or portray violence as stupid or harmful. The presence of violence in a game is not necessarily an endorsement of violence (Juul, 2014).

It has been a common assumption that, compared to violent movies or television, violent games should have stronger effects on behavior because of the player’s role as an active participant in the violence (for a review of this perspective, see Anderson & Dill, 2000). However, this assumption has failed to find empirical support. Meta-analyses of violent games find effects which are equal to or smaller than effects from meta-analyses of violent television (games: *r* = .21, Anderson et al., 2010; television: *r* = .3, Paik & Comstock, 1994). Through integration of the LC4MP, the GAIM is able to explain this counter-intuitive finding. First, GAIM points out that there are many other active contents of a violent game beyond the fictional violence. Second, GAIM indicates that the player’s limited capacity for attention, storage, and retrieval may be occupied with these other physical and ludological game contents. Thus, the challenges of manipulating the player-character through the controller and developing effective gameplay strategies may limit, rather than amplify, the player’s ability to attend to and learn from violent game content. Indeed, Huesmann (1998) writes “As arousal levels become higher than normal, attention seems to be directed more narrowly at a few cues that seem to be the most salient […] Very high levels of arousal seem to decrease working memory capacity […]” (p. 83). If players must focus on the ludological cues to ensure effective gameplay performance, the exciting gameplay may actually serve to *decrease* attention to the fictional violent content. Of course, in the case that a player is himself violent, or plays games for the sake of their violent content, that player should be expected to attend most closely to the violent fictional content, rather than the physical or ludological game content.

**Summary**

Future research stands to benefit from more careful examination of the underlying constructs which are manipulated in experiments and thought to represent causal pathways. These criticisms are not intended to discredit the extant body of research, nor any particular researcher, but rather to improve and refine our current interpretations and future research. The authors hasten to reiterate that it is their firm belief that the extant literature has demonstrated reliable effects of *certain games* as compared to others. Research has been well-powered, and meta-analyses have been compelling. However, research practice and the accumulated evidence lack the necessary resolution to make firm statements about specific causal substrates. The considerations and recommendations outlined in this manuscript will serve to further refine and reinforce our understanding of game effects in general and violent content effects in specific. More precise models offer the promise of better prediction and larger effect sizes in the specific populations and contexts where violent game content does predict aggressive outcomes.

It is recommended that the current sweeping definition of “violent game” be divided into “violent games” and “aggressive games.” We urge researchers to design experiments comparing the effects of aggressive and non-aggressive non-violent games in order to separate the effects of fictional harm from ludological harm. We also recommend that statistical tests examine the measurement and effects of media violence as a continuous, rather than dichotomous, variable. In this way, we can determine whether *Super Mario* is likely to be as influential as *Call of Duty* in increasing aggressive behavior. This will also help to determine whether censorship of violent game content is at all effective in reducing aggressive outcomes. Precise examinations of the realism, severity, and experienced harm of in-game aggression will have important implications for the construction of media effect theories and the prediction of the effects of particular games.

We further suggest that researchers should remember that violent video games are *games*. It has been an unfortunate assumption that violent video game use is directly analogous to violent television consumption, with the added suspicion that effects ought to be larger because the player is an active participant in the violence. This assumption has caused game features beyond the fictional to be woefully neglected. To make precise predictions of violent game effects, one must consider the whole content of the game, and how the combination of its physical medium, its fictional metaphor, and its ludological system of rules and strategies will be experienced, interpreted, and introjected by the player. Play is a rich, heterogeneous, multifaceted, active cognitive experience – it is not the passive experience of pressing a button to watch a man’s head explode.

Building upon this previous point, researchers must carefully consider the role of genre in VVG research. Genre tends to overlap with violent content, but may also represent important effects of physical and ludological content. Using genre as a proxy for violence, then, is likely to confound fictional violent content with ludological contents. Attention to ludological content is crucial, as in-game rules and behaviors may have cognitive & behavioral effects just as interesting as that of violent fictional content. It is often presumed that Chess is good for mental development while *Call of Duty* is not, despite the role of spatial control and strategy in the play of both games.

We further urge researchers to determine the precise components of game content before making suggestions to public policy applications. The heterogeneity of research methods and game-violence definitions make it impossible to say precisely which games would need to be restricted. If game violence is “any game in which one character attempts to harm another,” then not only should sales of *Call of Duty* or *Mortal Kombat* be restricted, but so too should sales of children’s less-violent games such as *Super Mario*, *Pokemon*, and *Minecraft*. Such an argument would require decisive evidence of pronounced effects to justify the cost to liberty and expression caused by restrictions of multiple genres of game – more evidence than is currently available. On the other hand, it is yet possible that only games which feature realistic and graphical violence are responsible for increases in aggression, but neither the research, definitions, nor meta-analytic practice are yet specific and refined enough to support this claim. Finally, if changes in aggression were found to be related to other game features such as competition, researchers could find themselves in the untenable position of recommending the restriction of not only graphically-violent video games, but other games with similar ludological features such as Chess. Even without application to legislation, an accurate understanding of connections between games and aggressive behavior would nonetheless have important application for parenting advice, self-knowledge, and psychological theory.

The Gaming Active Interpretation Model combines the above concerns into a unified model of game contents, mechanisms, and outcomes. The GAIM draws upon the disciplines of game studies and communications to provide a more precise model of game effects, generating many testable hypotheses. It is intended as a supplement to the General Learning Model, not a replacement, and offers novel insights as to *which game contents* cause *which outcomes, for whom,* and *how*. We encourage researchers to use this model to investigate the effects of violent content when all other game content is held constant. This theoretical framework may also be used to study effects of rules and strategies on players’ cognitions and behaviors, as well as the possible role of players’ personalities, motives, and beliefs in moderating game effects.

For the moment, laboratory experimental research has chiefly examined the effects of single-player games played in isolation, a paradigm which is well-described by the GAIM. However, future research and theory may also wish to consider and examine the social and cultural context of game use, which many communications scholars argue is important to both an understanding of video games and their effects (Elson et al., 2014a; Kontour, 2009; Yates & Littleton, 1999).

It is possible that this review is excessively skeptical and demands a level of precision and validity unusual for psychological research. However, since this research is frequently called upon for court testimony and expert witnesses (Barry, 2011; “Matrix Defendant,” 2003; “Video Game Expert,” 2013) and attempts to apply itself to public policy (Brief of Amicus Curiae in Support of Petitioners, Brown v. Entertainment Merchants Association, 2010), it is necessary to be skeptical and precise. It can be concluded that certain games can cause certain outcomes, but further research is still needed to make precise predictions regarding the specific game contents responsible.

By implementing these solutions, the field of media effects research has much to gain. First, research will be more readily communicated and interpreted, and it will be less likely to be scoffed at outright when researchers insist that *Pac-Man* is a violent video game. Experts will mean what they say when issuing public statements about the unique dangers of *Call of Duty* relative to *Super Mario*. Theory will determine whether effects of game violence are specific to the social learning of violence, or whether they are due to broader effects of competition and scarcity. Research will determine if game genre represents a meaningful portion of the game violence construct, or whether it is a separable construct with its own pattern of effects. Through attention to the unique properties of video games as media, research can expect to perform more precisely controlled experiments and develop more precisely predictive models.

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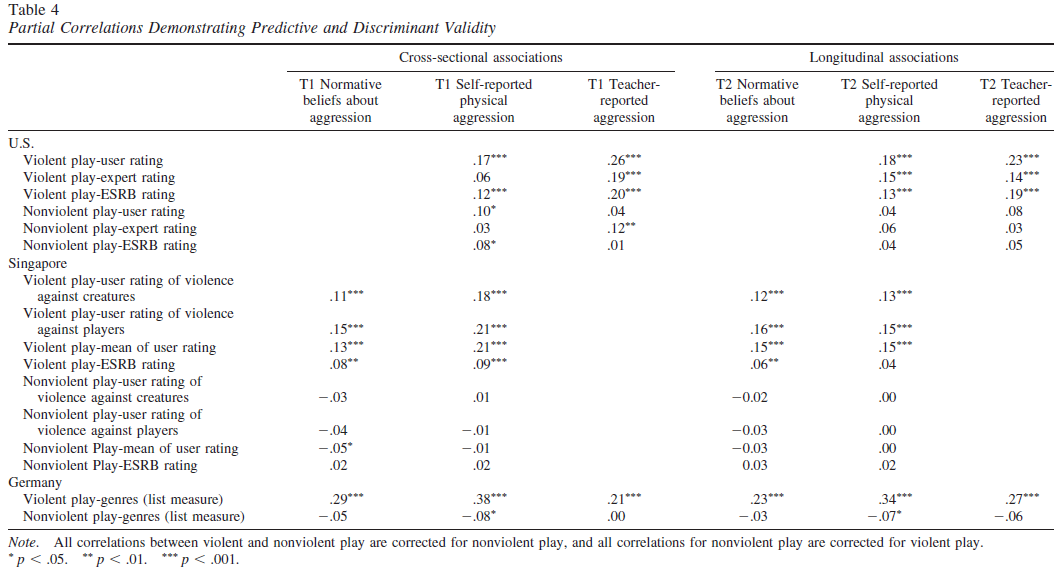
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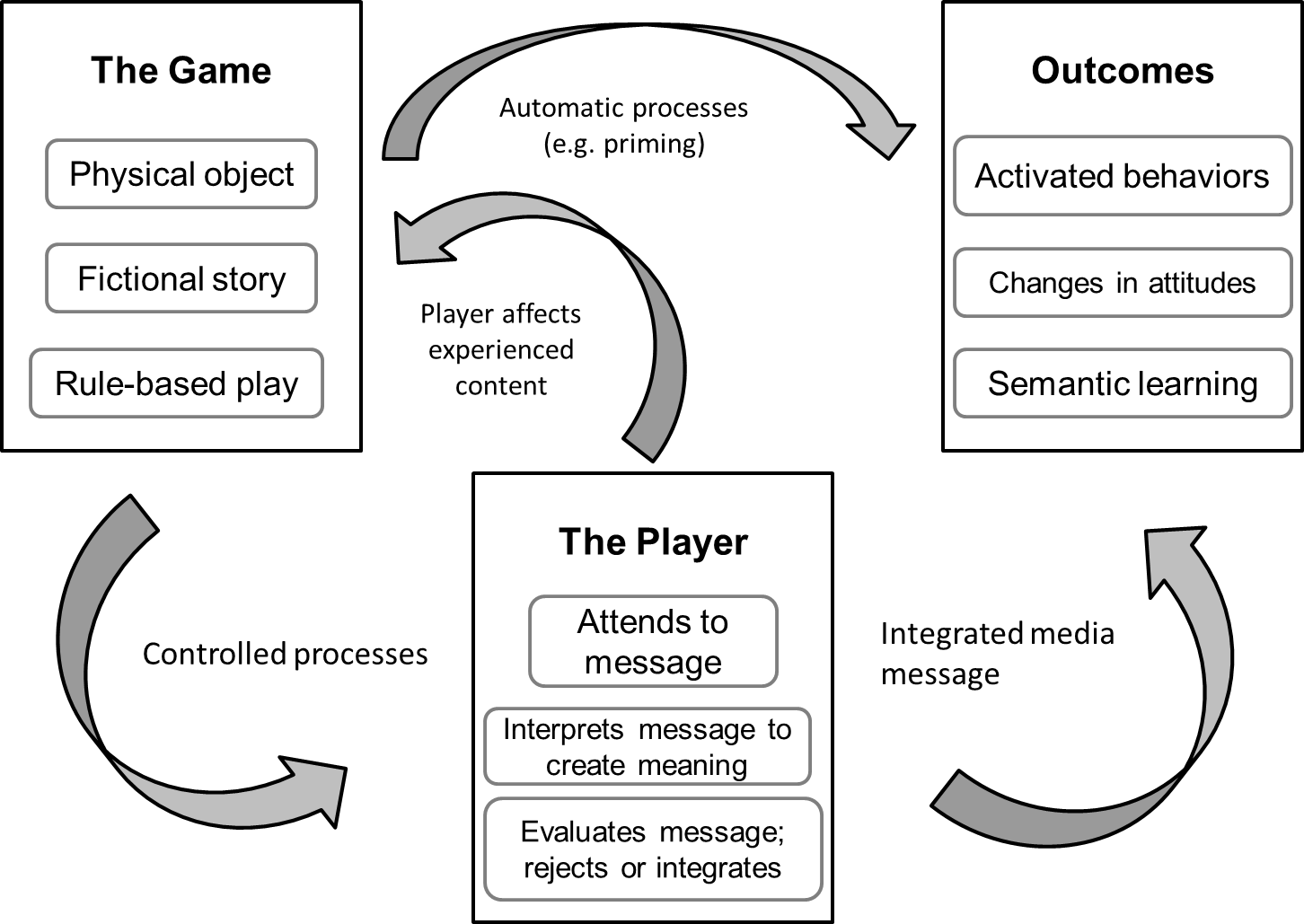
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*Table 1. Table of effect size estimates from diverse measurement strategies, reprinted from Busching et al., 2013, Table 4. Effect sizes are larger when participants report on the content of their own games than when game content is rated by an expert, suggesting that expert ratings may not be more effective and precise than lay definitions of violent content. Additionally, effect sizes are larger when violent content was perfectly confounded with game genre, suggesting that game genre may represent a confound which increases the apparent effects of game violence.*

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*Figure 1. The Gaming Active Interpretation Model (GAIM). A game consists of physical, fictional, and ludological contents. The physical contents describe the system with receives, stores, and processes inputs to the game state (e.g. the game console and controllers, the button mappings held in player memory, even the players’ bodies). The fictional contents describe the game’s narrative and representational features (e.g. storyline, characters, graphics, violence). The ludological contents describe the game’s system of rules and goals which give rise to strategy and play.*



1. In personal communication with Dr. Anderson, he says, “Concerning Brooks, I can only assume that we found that Moto Racer included violent content. I haven't the time to try to dig out exactly what the content is, probably the ability to crash into other racers, but that's just a guess.” We do not doubt Dr. Anderson’s finding, but this case does highlight the difficulty of accurately perceiving, construing, and interpreting violent content, especially when definitions are this imprecise.  [↑](#footnote-ref-2)
2. This contrast was neither provided by nor requested from the original authors. Other reported tests in this publication were used to solve for the standard error of the contrast, then the supplied means were used to calculate this t-statistic. This t-statistic may be slightly inaccurate due to this rough approach and the assumption of equal variances across cells. In any case, it is clear that the effect is rather small. [↑](#footnote-ref-3)
3. Violent genres were action-adventure, military strategy, hybrid, beat-em up, RPG, shooter, and survival-horror. Nonviolent genres were construction strategy, classic adventure, simulation, and sports. [↑](#footnote-ref-4)
4. The beta-weight in Study 1 of this manuscript was initially misreported due to a typographical error. We have received the correct beta-weight through personal correspondence with Dr. Przybylski. [↑](#footnote-ref-5)
5. To compare the censored and original versions of these games, see the following video links.

   Wolfenstein 3D: <http://www.youtube.com/watch?v=NdcnQISuF_Y>.

   Noah’s Ark 3D: <http://www.youtube.com/watch?v=FVvPppPovkM>.

   Doom: <http://www.youtube.com/watch?v=CHIuoW_EL8Q>

   Chex Quest: <http://www.youtube.com/watch?v=PSjD8855qo0>

   Command and Conquer: Generals: <http://www.youtube.com/watch?v=NRMqonctTtQ>

   Team Fortress 2 (original): <http://www.youtube.com/watch?v=h42d0WHRSck>

   Team Fortress 2 (censored): <http://www.youtube.com/watch?v=710Xi4JkK_s> [↑](#footnote-ref-6)