Business, Technological, and Social Dimensions of Computer Games:

Multidisciplinary Developments

Maria Manuela Cruz-Cunha
Polytechnic Institute of Cávado and Ave, Portugal

Vitor Hugo Costa Carvalho
Polytechnic Institute of Cávado and Ave, Portugal

Paula Cristina Almeida Tavares
Polytechnic Institute of Cávado and Ave, Portugal

Information Science
REFERENCE

Senior Editorial Director: Kristin Klinger
Director of Book Publications: Julia Mosemann
Editorial Director: Lindsay Johnston
Acquisitions Editor: Erika Carter
Production Editor: Sean Woznicki
Typesetters: Keith Glazewski, Natalie Pronio, Jennifer Romanchak, Milan Vracarich Jr.
Print Coordinator: Jamie Snavely
Cover Design: Nick Newcomer

Published in the United States of America by
Information Science Reference (an imprint of IGI Global)
701 E. Chocolate Avenue
Hershey PA 17033
Tel: 717-533-8845
Fax: 717-533-8661
E-mail: cust@igi-global.com
Web site: http://www.igi-global.com

Library of Congress Cataloging-in-Publication Data

Business, technological, and social dimensions of computer games: multidisciplinary developments / Maria Manuela Cruz-Cunha, Vitor Hugo Carvalho and Paula Tavares, editors.
p. cm.
Includes bibliographical references and index.
Summary: “This book is a collection of the most recent developments in all areas of game development, encompassing planning, design, marketing, business management, and consumer behavior”--Provided by publisher.
ISBN 978-1-60960-567-4 (hbk.) -- ISBN 978-1-60960-568-1 (ebook) 1. Video games industry. 2. Video games--Design. 3. Video games--Social aspects. I. Cruz-Cunha, Maria Manuela, 1964- II. Carvalho, Vitor Hugo, 1979- III. Tavares, Paula, 1973-
HD9993.E452B87 2011
338.4’77978--dc22
2011012885

British Cataloguing in Publication Data
A Cataloguing in Publication record for this book is available from the British Library.

Chapter 17
Playing with Violence:
An Updated Review on the Effects of Playing Violent Electronic Games

Patrícia Arriaga
ISCTE-IUL, Cis-IUL, Portugal

Augusta Gaspar
ISCTE-IUL, Cis-IUL, Portugal

Francisco Esteves
ISCTE-IUL, Cis-IUL, Portugal

ABSTRACT

This chapter intends to contribute to the clarification of the controversy surrounding the short-term effects of playing violent games [VG] on aggressive and prosocial behavior, aggressive thoughts, feelings, and physiological measures. An updated review of research on the effects of playing VG on the main variables under analysis is reviewed and some theoretical approaches, as well as methodological concerns, are addressed. Finally, questions that remain unanswered are discussed and future areas of research in this area are suggested.

INTRODUCTION

Electronic games are one of the most popular forms of entertainment, with sales that exceed those in both the film (Raessens, 2005) and the music industry (Reuters, 2007). There are several platforms (e.g., console, computer, interactive television, mobile), allowing different modalities and social environments for the gameplay activity.

DOI: 10.4018/978-1-60960-567-4.ch017

Players can choose to either play alone or with others (face-to-face on the same computer, over a local area network [LAN], or over the internet), either off-line or online, and in cooperative or competitive mode. These differences may have distinct social impacts. For instance, playing online with real players from diverse locations across the world may enhance social networks. In addition to the *social* dimension, Gentile and co-authors (2009) emphasize the relevance of other game dimensions and their effects on players: *amount*

of time playing games (e.g., potential addiction, which can affect school/work performance; obesity; and development of social skills), *game content* (e.g., potential effects on either prosocial or anti-social behavior and on the development of cognitive skills), *game structure* (e.g., effects on visual attention skills and on memory), and the *mechanisms of gameplay* (e.g., effects on hand-eye coordination). These dimensions are intertwined, and the combination in which they occur can also affect players in distinct ways. Current discussions are consequently not on whether electronic games are good or bad for players, as the outcome depends on several moderating factors and the complex interactions among them.

In this paper we focus on electronic *game content* and specifically on the short-term effects of playing violent games (VG). The subject of media violence is not new and has contributed heavily to a variety of scientific and public debates over the last six decades. Conclusions are twofold: violence has been the most predominant content in media entertainment, such as television (Gunter, 2005) and electronic games (Smith, Lachlan, & Tamborini, 2003), and exposure to violence has negative effects on media viewers (Comstock, 2003) and video game players (Anderson, Gentile, & Buckley, 2007). The debates around this subject reflect the incongruity of the results and interpretations, mainly because the findings are neither obvious nor simple, and some questions remain unanswered. At one extreme the validity of some findings has been questioned by a number of scholars and the media industry (Ferguson, 2007a, 2007b). At the other extreme certain moral interpretations have obscured the understanding of the scientific findings, for instance the claim that VG are directly responsible for particular types of juvenile crime (e.g., school shootings) without taking into account the complexity of violence in our society (Lawrence & Birkland, 2004).

Theoretical Approaches

The General Learning Model (GLM) (Gentile, et al., 2009) holds that the way the individual develops and responds to the social world depends of situational and individual factors. A number of hypotheses have been put forward in order to understand, explain, and predict how and why dispositional and situational variables interact to influence outcome variables such as prosocial or aggressive behaviors. For negative outcomes, such as aggression, it is relevant to draw on the General Aggression Model (GAM), which is the precursor of the GLM. This model integrates several theories of aggression (e.g., social learning theory, cognitive neoassociationism, excitation-transfer theory, script theory, and social information processing theories) and has been widely used to test predictions regarding both short and long-term effects of playing VG (Anderson & Carnagey, 2004). According to GAM, a single gameplay session can interact with individual factors and affect behavior, taking three possible internal routes: cognitive, affective, and arousal. The individual factors may be any variables that a person brings to the situation. These personal characteristics include personality traits, gender, scripts, beliefs, attitudes, values, and/or the person's long-term goals. The interaction between these individual factors and game playing affects behavior directly or indirectly, depending on the potential mediation of one or more internal state routes.

The GAM proposes that these routes are distinct and should accordingly be studied in different ways. Affective states are usually measured by self-report (e.g., state hostility/anger, anxiety) in which the respondents are asked to report how they feel during and/or after playing (Anderson & Carnagey, 2009; Anderson & Dill, 2000; Anderson & Ford, 1986; Anderson & Morrow, 1995; Arriaga, Esteves, Carneiro, & Monteiro, 2006, 2008; Ballard & Wiest, 1996; Barlett, Branch, Rodeheffer, & Harris, 2009; Barlett, Harris, & Baldassaro, 2007; Barlett, Harris, & Bruey, 2008;

Calvert & Tan, 1994; Carnagey & Anderson, 2005; Eastin, 2007; Eastin & Griffiths, 2009; Farrar, Krcmar, & Nowak, 2006; Fleming & Rickwood, 2001; Markey & Scherer, 2009; Meyers, 2002; Nowak, Krcmar, & Farrar, 2006; Panee & Ballard, 2002; Persky & Blascovich, 2007; Uhlmann & Swanson, 2004; Williams & Clippinger, 2002; Wingrove & Bond, 1998). Arousal has also been considered part of the emotional experience as well as an outcome of playing action-oriented games. Most researchers have measured physiological responses (e.g., heart rate, skin conductance, and blood pressure) (Ballard & Wiest, 1996; Calvert & Tan, 1994; Fleming & Rickwood, 2001; Griffiths & Dancaster, 1995; Irwin & Gross, 1995; Panee & Ballard, 2002; Winkel, Novak, & Hopson, 1987) but also perceived arousal (Ivory & Kalyanaraman, 2007). As to the cognitive component of internal state, the rationale is that VG play primes aggression-related networks, making the aggressive constructs accessible in memory. To measure the accessibility of aggressive constructs, most studies have used information processing tasks such as thought-listing (Calvert & Tan, 1994; Tamborini et al., 2000, November), reading reaction-time (Anderson & Dill, 2000), word completion (Anderson et al., 2004; Barlett, et al., 2008; Carnagey & Anderson, 2005; Eastin, Appiah, & Cicchirllo, 2009; Markey & Scherer, 2009; Meyers, 2002), word pronunciation (Anderson & Carnagey, 2009), word association (Ivory & Kalyanaraman, 2007), emotional Stroop tasks (Arriaga, et al., 2008; Kirsh, Olczak, & Mounts, 2005), or the implicit association test (Uhlmann & Swanson, 2004). GAM also postulates that playing VG may affect players' beliefs about aggression (i.e., acceptance of aggressive responses as a way to deal with several adverse situations (Meyers, 2002) and activate schemata that bias the interpretation of ambiguous story stems in a hostile way. To assess expectations and attribution bias (Bushman & Anderson, 2002), studies typically use Story Completion Tasks (Bushman & Anderson, 2002; Eastin & Griffiths, 2006, 2009; Giumetti & Markey, 2007). Participants are faced with brief conflict scenarios in which the characters´ intention is generally not explicit and the outcome is open to interpretation. Participants are asked to report their expectations regarding the outcomes; to interpret the intentions, feelings, and thoughts of the main character; or to take the point of view of the character and to report their own reactions to others' negative actions (Barlett, et al., 2007). Projective tests, such as the Rosenzweig Picture-Frustration test, have also been used to assess the way children react to conflicting and frustration situations in interpersonal contexts (Graybill, Kirsch, & Esselman, 1985; Graybill, Strawniak, Hunter, & Oleary, 1987).

Labelling internal states as cognitive or affective is not straightforward, because their most common operational definitions suggest that cognitive and affective phenomena are concurrent. One can argue that (a) the measures that are generally used to assess the affective state are also measuring some cognitive processes, as most studies use self-evaluations of perceived emotional states and (b) the tasks that indirectly measure the aggressive thoughts may constitute affective measures themselves, as they introduce emotional content. The fact that these variables do not involve exclusively either cognitive or affective phenomena does not mean they are identical, as they clearly recruit different processes. In explaining aggressive behavior, the GAM also stresses the relevance of both automatic and controlled processes, known respectively as immediate appraisals and as reappraisals. Immediate appraisals are spontaneous, effortless and often do not require awareness. Although reappraisal implies larger availability of cognitive resources (e.g., time and cognitive capacity), which in turn may contribute to a thoughtful decision, the possibility of affecting aggressive behavior remains.

Distinct procedures and measures have been used to approach the subject of aggression in children: systematic observation of aggressive behavior during free play (Bensley & Van Eenwyk, 2001;

Cooper & Mackie, 1986; Irwin & Gross, 1995; Meyers, 2002; Schutte, Malouff, Post-Gorden, & Rodasta, 1988; Silvern & Williamson, 1987), and tasks in which the participant has the possibility of hurting another individual (e.g., a child being given the opportunity to punish another child who usually misbehaves and to reward another who is "well-behaved") (Cooper & Mackie, 1986). With adults, modified versions of the Teacher-Learner Aggression paradigm (Ballard & Lineberger, 1999; Winkel, et al., 1987) and the Competitive Reaction Time (CRT) task have been widely used to access aggression. In the CRT task, the levels of noise intensity and duration administrated to an opponent are indicators of aggression (Anderson, et al., 2004; Anderson & Dill, 2000; Anderson & Murphy, 2003; Arriaga, et al., 2008; Bartholow, Sestir, & Davis, 2005). In other studies the participant was asked to evaluate the researcher's or the confederate's performance in terms of courtesy, competence, or deservedness of financial support, knowing that his/her own evaluations would have consequences to others (Calvillo, 2002; Chambers & Ascione, 1987; Tamborini, et al., 2000; Winkel, et al., 1987). The Hot Sauce Paradigm is another way of measuring overt aggression: Participants choose the amount of hot chili sauce to give to another individual while knowing that the other individual does not like hot food. (Barlett, et al., 2009). Direct verbal aggression has been measured by means of recording the players' comments to others (Eastin, 2007; Eastin & Griffiths, 2009; Irwin & Gross, 1995; Nowak, et al., 2006). Modified versions of the Prisoner's Dilemma (a choice between cooperating with a partner for mutual gain, exploiting partners for own benefit, or withdrawing from interaction) have also been used (Sheese & Graziano, 2005). Finally, some studies have measured the participants' level of violent actions during gameplay (Anderson & Morrow, 1995; Wingrove & Bond, 1998), the amount of time using a weapon (Barlett, et al., 2007), or the specific localization of the violent action (e.g., head hits) (Persky & Blascovich, 2008).

In addition to stressing processes likely to facilitate aggressive behavior in the short-term, the GAM also points out long-term effects that the repeated exposure to violent entertainment might have on learning, on development, and on reinforcement of aggression-related knowledge structures (Anderson & Carnagey, 2004; Anderson & Dill, 2000). The GAM in fact postulates a cyclical process in which repeated exposure to VG may contribute to strengthen these knowledge structures. Such automatization may in time contribute to developing and maintaining aggression tendencies as individuals build their beliefs and aggressive expectations, create behavioral scripts, and change their perception of what violence is. This might also contribute to an emotional desensitization toward violence in the real-world. These factors have the potential to affect personality development, contributing toward aggressive traits (Anderson & Carnagey, 2004).

Research Limitations and Where to Improve

Most research on VG effects can be classified as either correlational (non-experimental) or experimental (mostly conducted in laboratory settings) research. Identifying the limitations of methods has played a role in the different interpretations of studies' results.

Using cross-sectional correlational design, researchers have usually evaluated self-reported gameplay (i.e., previous VG use and preference for VG) and individual variables such as trait aggression/hostility (Anderson & Dill, 2000; Arriaga & Ribeiro, 2001; Colwell & Payne, 2000; Gentile, Lynch, Linder, & Walsh, 2004; Van Schie & Wiegman, 1997), impulsivity, tolerance to frustration (Lin & Lepper, 1987), hostile attributional styles (Krahe & Moller, 2004), risk behaviors (Anderson & Dill, 2000), attitudes towards violence (Funk, Baldacci, Pasold, & Baumgardner, 2004; Krahe & Moller, 2004), prosocial behaviors (Van Schie & Wiegman, 1997), and empathy (Funk, et al.,

2004; Funk et al., 2002). Several authors have also considered parental control/involvement in media/playing habits (Colwell & Payne, 2000; Gentile, et al., 2004), school performance (Anderson & Dill, 2000; Gentile, et al., 2004; Lin & Lepper, 1987; Van Schie & Wiegman, 1997), loneliness, social isolation, popularity (Lin & Lepper, 1987; Van Schie & Wiegman, 1997), or beliefs about the world (Anderson & Dill, 2000; Van Mierlo & Van den Bulck, 2004). Findings have been somewhat divergent on the effects of the majority of variables. Nevertheless, with regard to aggression-related variables (e.g., hostility, risk behaviors), the majority suggested a positive relationship between these variables and playing habits. Correlational studies, however, present some methodological constrains, the main concern being that they do not allow causal inferences. A positive association might thus mean that a) playing VG on a regular basis leads players to be more aggressive, b) being aggressive leads people to play more VG, or c) the relationship is spurious because some other variable(s) produced the observed association (the "third variable" problem). Moreover, the reliance on self and hetero-reports also depends, among other factors, on the respondents' memory and on the social desirability of the responses. This type of methodology generally has weak internal validity.

Longitudinal studies have been recently introduced in this research domain (Anderson, Gentile, & Buckley, 2007; Anderson et al., 2008; Moller & Krahe, 2009; Wallenius & Punamaki, 2008). These studies also used surveys to analyze the relationship between VG exposure and several outcomes (e.g., aggression and prosocial behavior) (Anderson, Gentile, & Buckley, 2007). Because the measurements are taken from the same respondents at different points in time (months or years apart), they create the opportunity to infer long-term relationships between the variables being studied and about cumulative effects. Longitudinal panel studies also have important limitations, most of which relate to threats to internal validity, and specifically to the control of the "third variables". Nevertheless, several relevant variables, such as parental involvement in media habits, hostile attribution bias, and gender, have been controlled statistically (Anderson, Gentile, & Buckley, 2007), and the main results were in line with the hypothesis of a relationship between playing VG and physical aggression.

Although experimental design allows us to make causal inferences regarding the effects of independent over dependent variables, with the advantage of presenting high internal validity, it also has its shortcomings: low external validity because of the non-representative samples (most studies have used college students), the artificiality of the environmental settings and measurements (e.g., laboratory settings, brief exposures to the video games, and indirect methodology to study aggressive thoughts or behaviors), and temporal generalization (most studies evaluate short-term effects). Experimenter and participant expectancy effects and demand characteristics may also affect the validity of findings. These are of course the regular concerns with laboratory experiments. Conducting field research (e.g., observing participants' spontaneous behavior in natural settings) increases the ecological validity, but also has some disadvantages, such as the difficulty in maintaining tight control over the situation, which in turn reduces the internal validity, giving rise to plausible rival hypotheses. In fact, for both experimental and non experimental studies the "third variable" problem is considered the greatest concern. We know that the number of potential rival hypotheses can be countless and that no study can measure all the variables that might be associated with those under analysis. It might thus be more appropriate to control for those variables that are most likely to be related to both predictor and criterion, rather than attempting to control for all the alternative variables.

Table 1 summarizes experimental studies that have been conducted since 1985. We focus on experimental studies because they have received the greatest amount of research and allow causal-

ity inferences on the short-term effects of playing VG. Given the recent upsurge of interest in this subject, it is possible that not every single study that has been conducted is included. Those that we report here provide, however, what we feel to be a fair overall review of the research findings in this area.

Most experimental studies have tested the short-term effects of playing VG on distinct internal states (aggressive thoughts, affect, and arousal) and outcome variables (aggressive or prosocial behavior). Several researchers have tried to rule out alternative explanations, either pretesting the video games on several relevant factors or statistically controlling the variables that may affect the dependent variables (e.g., arousal and aspects of the gameplaying experience such as game difficulty, action, boredom, and frustration).

Most studies also examined if dispositional characteristics (e.g., gender and aggressiveness) moderated the relation between playing VG and the internal and behavioral outcomes (Anderson & Carnagey, 2009; Giumetti & Markey, 2007; Kirsh, et al., 2005; Markey & Scherer, 2009). A few studies have suggested that there is interindividual variability in the susceptibility to such effects, but the research is not consistent in this regard.

Recent research has also emphasized the need to consider other potential within-game moderators or mediators in understanding the effects of playing VG on the outcomes that we have been describing. These moderators or mediators include the gameplay platform (Eastin & Griffiths, 2006; Persky & Blascovich, 2008); the player's point of view (first vs. third person) (Farrar, et al., 2006); the type of controller (interactive light gun/motion capture controls vs. standard controller) (Barlett, et al., 2007; Markey & Scherer, 2009); the realism (Anderson, et al., 2004); the graphic quality (Ivory & Kalyanaraman, 2007); or specific features such as the presence of blood in the game (Ballard & Lineberger, 1999; Ballard & Wiest, 1996; Barlett, et al., 2008; Farrar, et al., 2006), the avatar's gender (Anderson & Murphy, 2003), the effect of rewarding or punishing violence during the gameplay (Carnagey & Anderson, 2005), or the nature of the interaction while playing (competitive versus cooperative) (Anderson & Morrow, 1995; Eastin, 2007).

Although most empirical studies, albeit using distinct methodologies, showed that playing VG has negative effects on players, not all reviews converged in their interpretation of evidence. Some emphasized the methodological constraints and others relied on the few studies that showed inconsistent results. These conflicting reviews probably express conflicting points of view. One fruitful way to clarify the situation and extract meaningful conclusions is thus to conduct meta-analyses.

Meta-analysis is a statistical technique that aggregates all individual studies on a topic: it aims to provide an estimate of the direction of effects and the magnitude of the effect size, taking into account some potential moderators. In Sherry's meta-analysis (2001), involving 25 independent studies, the overall effect size of playing VG on aggression was statistically significant, albeit lower (r = 0.15) than the effect sizes found in research concerning the effects of film violence.

The effect sizes in Anderson and Bushman's (2001) meta-analysis were slightly larger for aggressive behavior (r=0.19) and allowed the authors to conclude that playing VG is also linked to higher state hostility (r=0.18), physiological arousal (r=0.22), priming of aggressive thoughts (r=0.27), and less prosocial behaviors (r=- 0.16). The majority of the 54 independent studies entered into the analysis were experimental, suggesting a causal link between playing VG and these outcomes: participant age or gender did not contribute to modify the relationship between these variables. In 2004, Anderson reanalyzed research findings by adding additional studies and differentiating methodologically stronger studies from those with methodological flaws (e.g., no suitable control condition or VG containing little or no violence). Anderson concluded that in methodologically

Table 1. Summary of experimental studies

Authors	N	Age	Gender	Experimental Game Conditions (GC)	Main dependent variables	Main findings
Graybill, et al., (1985)	116	Children	Both	2 GC: VG vs. NVG	Responses to frustration: direction and type of aggression.	No effects on direction of aggression; VG: fewer defensive fantasies (blaming others and circumstances less, less denying of wrongdoing). .
Anderson & Ford (1986) (Study 2)	60	Adults	Both	3 GC: highly VG vs. mildly VG vs. no video game (control)	State anxiety, hostility and depression.	Highly VG: higher state anxiety and hostility than control group; Mildly VG: higher hostility than control group.
Cooper & Mackie (1986)	84	Children	Both	3 GC: play or watch VG vs. play or watch NVG vs. play or watch a paper-pencil game	Aggressive play, interpersonal aggression, prosocial behavior.	VG: more aggressive play (but only in girls' activity); No differences between playing and watching video games.
Chambers & Ascione (1987)	160	Adolesc.	Both	4 GC: (Content: VG vs. NVG) X Interaction (play alone vs. with peers)	Aggression, prosocial behavior.	VG: lower prosocial behavior.
Graybill, et al. (1987)	126	Children	Both	2 GC: play or watch VG vs. play or watch NVG	Responses to frustration situations, aggressive attitudes in conflict situations, Aggression, prosocial behavior.	No effects.
Silvern & Williamson (1987)	28	Children	Both	2: VG vs. watch a violent animated cartoon	Prosocial and aggressive behavior (free-play).	Aggression increased but no differences between conditions. No difference between playing and watching video games.
Winkel, et al. (1987)	56	Adolesc.	Both	4 GC: highly VG vs. mildly VG vs. NVG vs. no video game	Physical aggression, arousal, personality.	No effects.
Schutte, et al. (1988)	31	Children	Both	2 GC: VG vs. NVG	Aggressive play.	VG: more aggression
Calvert & Tan (1994)	36	Adults	Both	3 GC: VG with VR vs. VG without VR vs. watch VG	State hostility, arousal, aggressive thoughts.	VG with VR: higher arousal and aggressive thoughts. No effects on state hostility.
Anderson & Morrow (1995) (Study 2)	60	Adults	Both	2 VG: cooperative vs. competitive play	Within game violence, state hostility, agreeableness, interpersonal liking.	Higher aggressive play style for the competitive condition. No effects on the interpersonal liking of partners nor on hostility. Woman: felt more agreeable after the cooperative than the competitive game. Men: felt more agreeable after the competitive than the cooperative game.

continued on following page

Table 1. Continued

Griffiths & Dancaster (1995)	24	Adults	Both	Within GC: before, during, and after playing a video game	Arousal.	Higher arousal during gameplay compared to baseline Type A: higher HR than type B subject's while playing the game.
Irwin & Gross, (1995)	60	Children	Male	2 GC: VG vs. NVG	Aggression during free-play: interpersonal aggression and toward inanimate objects, toys selected, arousal.	VG: more physical and verbal aggression towards inanimate objects; more interpersonal physical and verbal aggression toward peers. No effects of GC on arousal.
Scott (1995)	117	Adults	Both	3 GC: highly VG vs. mildly VG vs. NVG	Hostility traits, personality.	No effects.
Ballard & Wiest, (1996)	30	Adults	Male	3 GC: highly VG vs. mildly VG vs. NVG	Hostility state, arousal.	Highly VG: higher arousal and state hostility.
Kirsh (1998)	52	Children	Both	2 GC: VG vs. NVG	Hostile attribution bias.	VG: more hostile attribution bias on some questions (e.g., intent of the harmdoer, retaliation).
Wingrove & Bond (1998)	23	Adults	Male	Within VG: Play a VG in cooperative mode	Affective states, attributions to failure.	Increase of state anxiety and anger after gameplay; Lower positive messages sent to the opponent during gameplay.
Ballard & Lineberger (1999)	119	Adults	Male	4 (GC: VG without blood vs. VG with blood vs. highly VG vs. NVG) X 2 (gender of confederate)	Physical aggression, prosocial behavior.	VG: less prosocial behavior, regardless the level of violence. Male rewarded other males less in the VG condition; VG: higher overall aggression than NVG. Women were punished more aggressively as the levels of violence increased.
Tamborini, et al. (2000)	92	Adults	Both	4 GC: VG vs. VG with VR vs. NVG vs. watch VG	Hostile thoughts, telepresence, aggression, physiological discomfort.	VG: higher telepresence, regardless VR. VG with VR: Higher discomfort. No effects on aggression.
Anderson & Dill (2000) (Study 2)	210	Adults	Both	2 GC: VG vs. NVG	State hostility, aggressive thoughts, physical aggression.	VG: higher aggressive thoughts and higher aggression.
Fleming & Rickwood (2001)	71	Children	Both	3 GC: VG vs. NVG vs. Paper-pencil game	General affective state, arousal.	VG: trend to higher state of anger, higher arousal (HR and self-report). Both games: positive affective state.
Bartholow & Anderson (2002)	43	Adults	Both	2 GC: VG vs. NVG	Physical aggression.	VG: greater aggression.
(Bushman & Anderson, 2002)	224	Adults	Both	2 GC: VG vs. NVG	Hostile expectation bias.	VG: higher hostile expectation bias.
Calvillo (2002)	52	Adults	Both	2 violent conditions: VG vs. TV violent	Aggression.	No effects of type of media on aggression.

continued on following page

Table 1. Continued

Meyers (2002)	144	Children and adolesc.	Male	6 conditions: 2 (Content: violent vs. nonviolent) X 3 (Type of media: play vs. watch a video vs. watch a video & play).	Aggressive thoughts, normative beliefs about aggression, aggressive play.	No game content effects on aggressive thoughts nor on physical aggression. More aggressive beliefs in those exposed to violence. No main effects of yype of media.
Panee & Ballard (2002)	36	Adults	Male	2 VG priming conditions: low (option of not to kill) vs. high aggressive priming (to kill was mandatory).	Arousal (prior: after training and during: after game playing), state hostility, within game violence.	High VG condition: more violent actions within game, higher hostility and SBP.
Williams & Clippinger (2002)	54	Adults	Both	Within GC: play against the computer vs. against an human opponent-same gender	State hostility.	Playing against the computer: more hostility.
Anderson & Murphy (2003)	90	Adults	Female	3 GC: VG with a female avatar vs. VG with a male avatar vs. NVG	Physical aggression, reasons for aggression.	GC: both aggressive motivations affected. VG: overall higher aggression; effect partially mediated by revenge. Trend to higher aggression with the VG character of the same gender
Funk, Buchman, Jenks, & Bechtoldt (2003)	66	Children	Both	2 GC: VG vs. NVG	Aggressive and empathic responses, arousal.	No game effects on proviolence and empathic responses. Positive correlations between VG playing habits and traits of empathy (ATVC scale) and lower empathic responses.
Anderson, et al. (2004) (Study 1)	130	Adults	Both	2 GC: VG vs. NVG	Aggressive thoughts, arousal, affective state.	For the set of 10 VG: increase of BP. For the NVG: no changes. VG: higher aggressive thoughts.
Anderson, et al. (2004) (Study 2)	190	Adults	Both	2 (Content: VG vs. NVG) X 2 (Type of provocation in CRT: ambiguous vs. increased)	Physical aggression, arousal, reasons for aggression.	VG: higher aggression after VG.
Anderson, et al. (2004) (Study 3)	204	Adults	Both	2 (Game content: VG vs. NVG) X 2 (Game version: old vs. recent)	Aggression, reasons for aggression, state anger.	VG: higher aggression.
Baldaro, et al. (2004)	22	Adults	Male	2 GC: VG vs. NVG	Anxiety, aggressiveness, arousal.	VG: higher state anxiety and systolic BP.

continued on following page

Table 1. Continued

Uhlmann & Swanson (2004)	121	Adults	Both	2 GC: VG vs. NVG	Aggressive automatic self-concept, affective state of aggression, self- and others evaluations, aggressiveness.	VG: more likely to automatically associate themselves with aggression. No effects of GC: feeling thermometer, semantic differentials, aggressiveness. Prior VG exposure correlated to automatic and to self-reported aggressiveness.
Kirsh, et al. (2005)	129	Adults	Both	2 GC: VG vs. NVG	Affect processing bias.	VG: greater interference for negatively valenced words than NVG. High trait hostility / VG condition: higher affect processing bias.
Sheese & Graziano (2005)	48	Adults	Both	2 GC: violence vs. non-violence version of a VG.	Cooperate vs. exploit others.	VG players: more choices on exploiting partners.
Carnagey & Anderson (2005) (Study 1)	75	Adults	Both	3 GC: killing was rewarded vs. killing was punished vs. killing not possible (NVG)	State hostility.	VG: higher state hostility than NVG. Reward conditions: more killings than punishment condition.
(Carnagey & Anderson (2005) (Study 2)	66	Adults	Both	3 GC: killing was rewarded vs. killing was punished vs. killing not possible (NVG)	Aggressive thoughts.	Reward condition: higher aggressive thoughts than punishment and NVG conditions. Reward conditions: more killings than punishment condition.
(Carnagey & Anderson, 2005) (Study 3)	141	Adults	Both	3 GC: killing was rewarded vs. killing was punished vs. killing was not possible (NVG)	Aggression.	Reward condition: more aggressive than the punishment and NVG conditions. Reward conditions: more killings than punishment condition.
Bartholow, et al., (2005) (Study 2)	76	Adults	Male	2 GC: VG vs. NVG	Aggression.	VG: higher aggression, trait hostility/anger partially account for this effect. Past exposure to VG: more aggression (regardless of the manipulation).
Cicchirillo & Chory-Assad (2005)	64	Adults	Both	2 CG: VG vs. NVG	Aggressive thoughts, aggressive behavior.	VG: more aggressive behavior. No differences on aggressive thoughts and on evaluations of the researcher's competence.
Arriaga, et al. (2006)	87	Adults	Both	4 GC: NVG with no action/ desktop; NVG with action/ desktop; VG/ desktop vs. VG / VR device)	State hostility, state anxiety, arousal.	VG: higher state hostility; no effect on state anxiety. Marginal effect of VG on state hostility for those high in aggressiveness. No differences between playing VG using distinct interface (VR vs. desktop).

continued on following page

Table 1. Continued

Eastin & Griffiths (2006)	219	Adults	Male	2 (Interface: VR vs. standard console) X 3 (Content: fighting, shooting, and driving with no violence) X 3 (Context: playing against the computer vs. another person)	Presence, hostile expectation bias.	VR: greater hostile expectations bias, lower sense of presence. Shooting game: greater presence, lower hostile expectations bias compared to the fighting game. Hostile expectations greater in the fighting VR condition, followed by the shooting and driving conditions.
Farrar, et al. (2006)	184			4 VG conditions: 2 (point of view: third vs. first person) X 2 (blood: on vs. off)	State hostility, aggressive intentions, presence.	VG with blood-on: higher levels of physical aggressive intentions than VG with blood-off; No effects on state hostility, Involvement and immersion perceptions within game: higher state hostility and physical aggression. intentions.
Nowak, et al. (2006)	227	Adults	Both	2 GC: VG vs. NVG	State hostility, resentment, perceived violence, verbal aggression, physically aggressive intentions, frustration; presence.	VG: less sense of presence. No direct paths from game manipulation to verbal or physical aggression. Habitual players: less frustrated, more sense of presence, these variables associated with greater verbal and physically aggressive intentions and hostility.
Weber, Ritterfeld, & Mathiak (2006)	13	Adults	Male	VG Within-players: non-violent and violent phases of gameplay.	Brain activity and arousal during gameplay.	Effects occur in conditions that involve virtual violence and immediate phases of violent activity.
Barlett, et al. (2007)	99	Adults	Both	Within VG conditions: 3 (gameplay time: baseline, time1 and 2) X 2 (level of game) X 3 (Controller type: interactive light gun vs. standard)	Arousal, aggression responses to negative actions of others, state hostility, frustration.	HR increased over time, aggression and hostility only increased from baseline to Time 1. Light gun: higher arousal, hostility, and aggressive responses compared to standard controller.
Carnagey, et al., (2007)	257	Adults	Both	2 GC: VG vs NVG	Physiological desensitization (baseline, after videogame exposure, during violent film exposure).	HR increased from baseline to post-gameplay (similar for VG and NVG), no significant changes in GSR across times for both GC. VG: less arousal during the exposure to film violence than participants in the NVG conditions (lower HR and GSR), suggesting a physiological desensitization to violence.
Eastin (2007)	162	Adults	Both	6 VG conditions: 3 (Group size: 6-, 4- or two-person groups) X 2 (Game motivation: competitive vs. cooperative)	Within game violence and verbal aggression during play; state hostility.	Larger group: greater state hostility. No differences on hostility between competitive vs. cooperative groups. More aggressive verbalization during gameplay related to greater hostility post game.

continued on following page

Table 1. Continued

Giumetti & Markey (2007)	167	Adults	Both	2 GC: VG vs. NVG	Hostile expectation/attribution bias.	VG: responded more in an aggressive way. High trait anger: more hostile/aggressive interpretations after VG than those who played NVG. Low trait anger: less affected by VG.
Ivory & Kalyanaraman (2007)	120	Adults	Both	4 GC: 2 (Content: VG vs. NVG) X 2 (Advancement: older vs. newer)	Presence, involvement, arousal, aggressive thoughts, state hostility.	Newer games: higher presence, involvement, and arousal (SCL and self-report).
Konijn, Bijvank, & Bushman (2007)	99	Adolesc. with low education	Male	4 GC: violent–realistic, violent–fantasy, nonviolent–realistic, nonviolent–fantasy.	Aggression.	VG: more aggression than the NVG conditions. Higher wishful identification with the VG characters related to greater aggression.
Kirsh & Mounts (2007)	197	Adults	Both	2 GC: VG vs. NVG	Recognition of facial emotional expressions.	VG: reduction in the recognition of happy expressions.
Persky & Blascovich (2007)	155	Adults	Both	4 GC: 2 (Platform: VR vs. desktop) X 2 (Content: VG vs. NVG)	Physiological markers of threat, aggressive feelings/hostility, artistic feelings (creativity).	VG: less artistic feelings, more aggressive feelings. VG/ VR: more aggressive feelings than VG/Desktop platform. NVG/ VR: less aggressive feelings than NVG/desktop. Both NVG conditions and desktop/violent condition: HR did not change from baseline. VR/VG condition: HR levels increased, CO and TPR did not change.
Arriaga, et al. (2008)	148	Adults	Both	4 GC: 2 (Content: VG vs. NVG) X platform (VR vs. standard interface)	State hostility, arousal, aggressive and fear thoughts, aggressive behavior.	VR: increase HR changes, regardless of game content. VG: higher hostility and more aggressive behavior. State hostility mediated the relationship VG-Aggression.
Barlett, et al., (2008) (Study 1)	74	Adults	Both	4 conditions of blood in a VG: maximum, medium, low, and absent.	State Hostility, arousal, within game violence.	Blood: increase in hostility from baseline to after the VG play. Maximum blood: increase in HR from baseline to after the VG play. Blood conditions: more use of weapon than the blood absent condition.
Barlett, et al. (2008) (Study 2)	31	Adults	Both	2 blood GC: maximum blood vs. absent.	Aggressive thoughts.	Blood condition: greater number of aggressive thoughts.
Persky & Blascovich (2008) (Study 1)	66	Adults	Male	2 VR platform conditions: VG using VR vs. VG using desktop	Within game violence, presence, aggressive feelings.	VR: trend to higher aggressive feelings, higher sense of presence, fewer hits overall, but significantly more head hits than users of desktop computer. Presence did not mediate the relation VR platform and in-game aggression.

continued on following page

Table 1. Continued

Persky & Blascovich (2008) (Study 2)	127	Adults	Male	2 VR platform conditions: VG with VR vs. VG using desktop with gun controller	Within game violence, presence, aggressive feelings, aggressive behavior, physiological responses.	VR: more sense of presence, more aggressive feelings, higher proportion of head hits, higher aggressive behavior, and larger increase in HR than desktop interface. Presence mediated the relationship platform – aggressive feelings.
Anderson & Carnagey (2009) (Study 1)	120	Adults	Both	2 Sport GC: VG vs. NVG	Aggressive thoughts.	VG: higher levels of aggressive thoughts.
Anderson & Carnagey (2009) (Study 2)	154	Adults	Both	2 Sport GC: VG vs. NVG	State hostility, attitudes towards violence in sports.	VG: felt more aggravated, more supportive of violence in hockey. Past VG exposure positively related to aggravation, but it did not moderate the VG condition effect.
Anderson & Carnagey (2009) (Study 3)	103	Adults	Both	2 Sport GC: VG vs. NVG	Aggressive behavior.	VG: more aggression.
Barlett, et al. (2009) (Study 1)	91	Adults	Both	2 (content: VG vs. NVG) X_2 (delay: 4 min vs. 9 min).	State hostility, aggressive thoughts, arousal, aggressive behavior.	VG: significant increase in aggressive feelings, thoughts, arousal, and aggression; Effects of VG on aggressive thoughts and feelings last less than 4min;,whereas HR may last more than 4 but less than 9min. State hostility, aggressive thoughts and arousal mediated the relation VG play – aggression.
Barlett, et al. (2009) (Study 2)	91	Adults	Both	Delay manipulation of the outcome: 0 vs. 5 vs. 10 min after VG play	Aggressive behavior.	The effect of VG on aggression lasted 5 to 10 minutes.
Bushman&Anderson (2009) (Study 1)	320	Adults	Both	2 GC: VG vs. NVG	Helping behavior, notice of an outside fight, severity of fight evaluation.	VG: longer time to help a victim, less likely to report hearing the fight, rated the fight as less serious, no effect on helping rates. Preference for VG: lower helping rates than those with preference for NVG.
Eastin, et al. (2009)	178	Adults	Both	4 VG conditions: 2 (race of avatar: black vs. white) × 2 (race of opponent: black vs. white) design	Aggressive thoughts.	White players: more hostile thoughts when playing with a Black than with a White “avatar”; Black players: more hostile thoughts when playing against a White opponent than against a Black opponent.

continued on following page

Table 1. Continued

Eastin & Griffiths (2009)	162	Adults	Both	6 VG conditions: 3 (group size: two, four or six members) x 2 (group motivation: play either cooperatively or competitively)	Verbal aggression, state hostility, hostile expectation bias.	As group size increased in competitive play, verbal aggression and state hostility increased, which in turn increased hostile expectations. Game motivation affects state hostility through verbal aggression.
Gentile, et al. (2009) (Study 3)	161	Adults	Both	3 GC: Prosocial vs. Neutral vs. VG	Helping and hurting.	Prosocial game: more helpful. VG: less helpful and more hurtful.
Krcmar & Farrar (2009)	186	Adults	Both	2 (Content: VG vs. No game); 4 VG: 2 (perspective: first- vs. third-person) and 2 (blood: present vs. absent).	Aggressive behavioral intentions, aggression, aggressive thoughts, state hostility.	VG: more verbal and physical aggressive intentions, but higher funding to researchers. Aggressive thoughts and hostility were not mediators, instead they moderated the effects of internal VG manipulations: a) Third-person with more violent thoughts: more verbally and physically aggressive intentions and more aggressive; b) Blood with more aggressive thoughts: more verbally aggressive, Blood with higher hostility: more aggressive.
Markey & Scherer (2009)	118	Adults	Both	2 (Game condition: VG vs. NVG) X 2 (Device: traditional controller vs. motion capture controller)	State hostility, aggressive thoughts.	VG: more hostile and higher aggressive thoughts. Controller game devices did not moderate the effects. Higher psychoticism: more affected by VG on hostility and aggressive thoughts.
Weber, Behr, Tamborini, Ritterfeld, & Mathiak (2009)	13	Adults	Male	VG Within-players: non-violent and violent phases of gameplay over time.	Arousal.	Highest arousal levels: players run out of ammunition and were forced to stop shooting. Low arousal: players observe an opponent/ use the equipment menu. Arousal decreases after extended play.

Note. GC = Game conditions, NVG = Non-violent game, VG = Violent game, VR = Virtual reality, TV = Television, CO = Cardiac output, HR = Heart rate, BP = Blood pressure, SC = Skin conductance.

stronger studies the effect sizes are clearly larger and are also larger in experimental than in correlational studies. Although these effect size estimates appear to be small, most researchers posited that they are "large enough" to be considered relevant.

In contrast, Fergunson (2007a, 2007b) was concerned about the shortcomings of this area of research. His main concern was with what he called "unreliable methodologies" and especially with non-validated measurements of aggressive behavior (CRT is the most discussed in his review) which produced greater effect sizes than other standardized measures (self-reports). However, these allegedly "unreliable methodologies" of aggressive behavior have been validated in several countries and with different populations (Arriaga, Esteves, & Monteiro, 2004; Giancola & Parrott, 2008; Giancola & Zeichner, 1995). A more relevant criticism is the potential problem of a publication bias: both of Ferguson's meta-analyses (2007a, 2007b) suggested publication bias in papers that studied aggression, but no such bias in papers that studied aggressive thoughts and prosocial behaviors.

All in all, the meta-analyses and the recent experimental studies (see Table 1) provided robust evidence on the negative effects of playing VG. However, several questions remain, especially the "why?", "how?", and "in what conditions?" questions. For instance, only a few studies (Anderson & Dill, 2000; Arriaga, et al., 2008; Barlett, et al., 2009) have tested the mediational hypotheses of the three internal factors in the same study on the relationship between playing VG and aggression, but only one recent study (Barlett, et al., 2009) produced evidence of their mediating role. Other variables may also contribute to explain the effects, such as the way players perceive the environment in which they play (e.g., the role of being inside the VG environment has been explored, but the findings have been inconclusive). In addition to taking into account the players' interpretation of their own gameplay activity, it would be productive to continue exploring the relevance of other internal game features. Among other limitations of previous research to be considered in future research, we would also like to stress the near absence of studies conducted with representative samples, as most have used convenience samples of college students and few have targeted the crucial populations, which are children and adolescents.

Until now, efforts have been concentrated on the short-term effects of playing VG, and further research using longitudinal designs is required. Very recently, Barlett and co-authors (2009) addressed the question of "How long do the short-term VG effects last?". Using experimental design, they found different time frames for the short-term effects of VG on internal states and on the behavioral outcome postulated by GAM. Other outcomes should, however, also be considered. Emotional desensitization is, for example, usually considered a long-term effect of repeated exposure to violence. The rationale is that viewing violence elicits intense arousal and negative affective states, and with continuing and repeated exposure these initial adverse emotional reactions tend to be attenuated. Recent research suggests, however, that both short- and long-term exposures to playing VG may desensitize individuals (Arriaga, Monteiro, & Esteves, in press; Bartholow, Bushman, & Sestir, 2006; Carnagey, Anderson, & Bushman, 2007). Even though earlier theories predicted this effect from exposure to media violence, this outcome is underexplored, both theoretically and empirically, and is a rather new subject in the area of VG research.

Implications for Parents, Educators, and Policy Makers

The accumulation of evidence on the negative outcomes of VG provides enough justification for regulatory laws envisaging the protection of minors to enforce clear labeling warning of violent content in video games. Because violent content surrounds children and adolescents, social

agents such as politicians, counselors, educators and parents should take an integrated strategy to mitigate the effects of violent content in media and preferably avoid exposure to certain types/levels of violence. A sensible decision would be to have violent content rated consistently across all different media and according to age group. Swing, Gentile, and Anderson (2008) envisioned the development of a detailed rating-system for VG combined with accurate labeling, ethical marketing of the products, and informing parents about the rating system: all these measures would to be taken by the video game industry. They proposed that retailers and video-rental businesses would also play their part by restricting access to violent content on the basis of the rating system. Finally, parents would take action by monitoring the time spent playing. Without legislation and enforcement it would, however, probably be too optimistic to entrust the industry with such great moral social responsibility. There has been, since 2003, a European rating system for video games: PEGI (Pan-European Game Information), created by ISFE, an organization representing publishers. The PEGI webpage actually downplays the negative impact of VG, stating insufficient research support. One piece of legislation regarding video games in the EU regulates the eligibility of French producers to a tax reduction for creative educational games expressing Europe's cultural heritage or diversity and not containing "pornographic or extremely violent sequences" (Comission, 2007). Violence, even for educational purposes, thus seems acceptable and eligible for funding, as long as it is not extreme. Our point is that the media industry and retail and rental businesses could certainly regulate themselves in response to very conscious consumers: educated proactive parents and educators. As consumers "control" the market, educating parents about content and ways to reach their children's interests via alternative games and other media is probably the fastest way to reach the goal of avoiding the negative consequences of VG. In fact, a recent study conducted by Anderson, Gentile, and Buckley (2007) showed that children whose parents are more involved in their media use are less affected by the violence of VG. In addition, parents should become familiar with game content and be able to encourage and reinforce their children's choices for positive content and form. Educators have a role to play in re-orienting youngsters' interest to educational, "friendly", and cooperative games or internet locations and in informing parents about these media. Prioritizing media that children prefer, such as the internet and video games, is shifting from prohibition to substitution.

Educators and counselors are in a good position to advise the industry to produce creative new products, developing video games in which the storyboard forces the playing character to ponder ethical dilemmas and to make socially adequate choices. The main focus should be on ensuring that during gameplay or other media use children and adolescents are rehearsing social skills and increasing knowledge, while, nevertheless, having "loads of fun", which is the very definition of play.

REFERENCES

Anderson, C. A. (2004). An update on the effects of playing violent video games. *Journal of Adolescence*, *27*(1), 113–122. doi:10.1016/j.adolescence.2003.10.009

Anderson, C. A., & Bushman, B. J. (2001). Effects of violent video games on aggressive behavior, aggressive cognition, aggressive affect, physiological arousal, and prosocial behavior: A meta-analytic review of the scientific literature. *Psychological Science*, *12*(5), 353–359. doi:10.1111/1467-9280.00366

Anderson, C.A., & Carnagey, N. L. (2004). Violent evil and the general aggression model. In Miller, A. (Ed.), *The social psychology of good and evil* (pp. 168–192). New York, NY: Guilford Publications.

Anderson, C. A., & Carnagey, N. L. (2009). Causal effects of violent sports video games on aggression: Is it competitiveness or violent content? *Journal of Experimental Social Psychology*, *45*(4), 731–739. doi:10.1016/j.jesp.2009.04.019

Anderson, C. A., Carnagey, N. L., Flanagan, M., Benjamin, A. J., Eubanks, J., & Valentine, J. C. (2004). Violent video games: Specific effects of violent content on aggressive thoughts and behavior. *Advances in Experimental Social Psychology*, *36*, 199–249. doi:10.1016/S0065-2601(04)36004-1

Anderson, C. A., & Dill, K. E. (2000). Video games and aggressive thoughts, feelings, and behavior in the laboratory and in life. *Journal of Personality and Social Psychology*, *78*(4), 772–790. doi:10.1037/0022-3514.78.4.772

Anderson, C. A., & Ford, C. M. (1986). Affect of the game player: Short-term effects of highly and mildly aggressive video games. *Personality and Social Psychology Bulletin*, *12*(4), 390–402. doi:10.1177/0146167286124002

Anderson, C. A., Gentile, D. A., & Buckley, K. E. (Eds.). (2007). *Violent video game effects on children and adolescents: Theory, research, and public policy*. New York: Oxford University Press. doi:10.1093/acprof:oso/9780195309836.001.0001

Anderson, C. A., & Morrow, M. (1995). Competitive aggression without interaction: Effects of competitive versus cooperative instructions on aggressive-behavior in video games. *Personality and Social Psychology Bulletin*, *21*(10), 1020–1030. doi:10.1177/01461672952110003

Anderson, C. A., & Murphy, C. R. (2003). Violent video games and aggressive behavior in young women. *Aggressive Behavior*, *29*(5), 423–429. doi:10.1002/ab.10042

Anderson, C. A., Sakamoto, A., Gentile, D. A., Ihori, N., Shibuya, A., & Yukawa, S. (2008). Longitudinal effects of violent video games on aggression in Japan and the United States. *Pediatrics*, *122*(5), e1067–e1072. doi:10.1542/peds.2008-1425

Arriaga, P., Esteves, F., Carneiro, P., & Monteiro, M. B. (2006). Violent computer games and their effects on state hostility and physiological arousal. *Aggressive Behavior*, *32*(2), 146–158. doi:10.1002/ab.20111

Arriaga, P., Esteves, F., Carneiro, P., & Monteiro, M. B. (2008). Are the effects of Unreal violent video games pronounced when playing with a virtual reality system? *Aggressive Behavior*, *34*(5), 521–538. doi:10.1002/ab.20272

Arriaga, P., Esteves, F., & Monteiro, M. B. (2004). Estudo psicométrico de duas medidas no âmbito da agressão humana. [Psychometric study of two measures in the field of human aggression] In Vala, J., Garrido, M., & Alcobia, P. (Eds.), *Percursos de Investigação em Psicologia Social e Organizacional* (pp. 177–199). Lisboa: Edições Colibri.

Arriaga, P., Monteiro, M. B., & Esteves, F. (in press). Effects of playing violent Un(real) Tournaments on emotional desensitization and on aggressive behaviour. *Journal of Applied Social Psychology*.

Arriaga, P. A., & Ribeiro, J. L. P. (2001). The relationship between playing violent electronic games and aggression in adolescents. In Martinez, M. (Ed.), *Prevention and control of aggression and the impact on its victims* (pp. 129–135). New York, NY: Kluwer Academic/Plenum.

Baldaro, B., Tuozzi, G., Codispoti, M., Montebarocci, O., Barbagli, F., & Trombini, E. (2004). Aggressive and non-violent videogames: Short-term psychological and cardiovascular effects on habitual players. *Stress and Health*, *20*(4), 203–208. doi:10.1002/smi.1015

Ballard, M. E., & Lineberger, R. (1999). Video game violence and confederate gender: Effects on reward and punishment given by college males. *Sex Roles*, *41*(7-8), 541–558. doi:10.1023/A:1018843304606

Ballard, M. E., & Wiest, J. R. (1996). Mortal Kombat (tm): The effects of violent videogame play on males' hostility and cardiovascular responding. *Journal of Applied Social Psychology*, *26*(8), 717–730. doi:10.1111/j.1559-1816.1996.tb02740.x

Barlett, C., Branch, O., Rodeheffer, C., & Harris, R. (2009). How long do the short-term violent video game effects last? *Aggressive Behavior*, *35*(3), 225–236. doi:10.1002/ab.20301

Barlett, C. P., Harris, R. J., & Baldassaro, R. (2007). Longer you play, the more hostile you feel: Examination of first person shooter video games and aggression during video game play. *Aggressive Behavior*, *33*(6), 486–497. doi:10.1002/ab.20227

Barlett, C. P., Harris, R. J., & Bruey, C. (2008). The effect of the amount of blood in a violent video game on aggression, hostility, and arousal. *Journal of Experimental Social Psychology*, *44*(3), 539–546. doi:10.1016/j.jesp.2007.10.003

Bartholow, B. D., & Anderson, C. A. (2002). Effects of violent video games on aggressive behavior: Potential sex differences. *Journal of Experimental Social Psychology*, *38*(3), 283–290. doi:10.1006/jesp.2001.1502

Bartholow, B. D., Bushman, B. J., & Sestir, M. A. (2006). Chronic violent video game exposure and desensitization to violence: Behavioral and event-related brain potential data. *Journal of Experimental Social Psychology*, *42*(4), 532–539. doi:10.1016/j.jesp.2005.08.006

Bartholow, B. D., Sestir, M. A., & Davis, E. B. (2005). Correlates and consequences of exposure to video game violence: Hostile personality, empathy, and aggressive behavior. *Personality and Social Psychology Bulletin*, *31*(11), 1573–1586. doi:10.1177/0146167205277205

Bensley, L., & Van Eenwyk, J. (2001). Video games and real-life aggression: Review of the literature. *The Journal of Adolescent Health*, *29*(4), 244–257. doi:10.1016/S1054-139X(01)00239-7

Bushman, B. J., & Anderson, C. A. (2002). Violent video games and hostile expectations: A test of the General Aggression Model. *Personality and Social Psychology Bulletin*, *28*(12), 1679–1686. doi:10.1177/014616702237649

Bushman, B. J., & Anderson, C. A. (2009). Comfortably numb: Desensitizing effects of violent media on helping others. *Psychological Science*, *20*(3), 273–277. doi:10.1111/j.1467-9280.2009.02287.x

Calvert, S. L., & Tan, S. (1994). Impact of virtual reality on young adults' physiological arousal and aggressive thoughts: Interaction versus observation. *Journal of Applied Developmental Psychology*, *15*, 125–139. doi:10.1016/0193-3973(94)90009-4

Calvillo, T. L. (2002). *Differential effects of television and video game violence on aggressive behaviour*. Los Angeles: California State University.

Carnagey, N. L., & Anderson, C. A. (2005). The effects of reward and punishment in violent video games on aggressive affect, cognition, and behavior. *Psychological Science*, *16*(11), 882–889. doi:10.1111/j.1467-9280.2005.01632.x

Carnagey, N. L., Anderson, C. A., & Bushman, B. J. (2007). The effect of video game violence on physiological desensitization to real-life violence. *Journal of Experimental Social Psychology*, *43*(3), 489–496. doi:10.1016/j.jesp.2006.05.003

Chambers, J. H., & Ascione, F. R. (1987). The effects of pro-social and aggressive videogames on children's donating and helping. *The Journal of Genetic Psychology*, *148*(4), 499–505.

Cicchirillo, V., & Chory-Assad, R. M. (2005). Effects of affective orientation and video game may on aggressive thoughts and behaviors. *Journal of Broadcasting & Electronic Media*, *49*(4), 435–449. doi:10.1207/s15506878jobem4904_5

Colwell, J., & Payne, J. (2000). Negative correlates of computer game play in adolescents. *The British Journal of Psychology*, *91*, 295–310. doi:10.1348/000712600161844

Comission, E. (2007). Commission Decision - Tax credit introduced by France for the creation of video games. *Official Journal of the European Union*. Retrieved from http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:118:0016:0029:EN:PDF

Comstock, G., & Scharrer, E. (2003). Meta-analyzing the controversy over television violence and aggression. In Gentile, D. (Ed.), *Media violence and children*. Westport, CT: Praeger.

Cooper, J., & Mackie, D. (1986). Video games and aggression in children. *Journal of Applied Social Psychology*, *16*(8), 726–744. doi:10.1111/j.1559-1816.1986.tb01755.x

Eastin, M. S. (2007). The influence of competitive and cooperative group game play on state hostility. *Human Communication Research*, *33*(4), 450–466. doi:10.1111/j.1468-2958.2007.00307.x

Eastin, M. S., Appiah, O., & Cicchirllo, V. (2009). Identification and the influence of cultural stereotyping on postvideogame play hostility. *Human Communication Research*, *35*(3), 337–356. doi:10.1111/j.1468-2958.2009.01354.x

Eastin, M. S., & Griffiths, R. P. (2006). Beyond the shooter game: Examining presence and hostile outcomes among male game players. *Communication Research*, *33*(6), 448–466. doi:10.1177/0093650206293249

Eastin, M. S., & Griffiths, R. P. (2009). Unreal: Hostile expectations from social gameplay. *New Media & Society*, *11*(4), 509–531. doi:10.1177/1461444809102958

Farrar, K. M., Krcmar, M., & Nowak, K. L. (2006). Contextual features of violent video games, mental models, and aggression. *The Journal of Communication*, *56*(2), 387–405. doi:10.1111/j.1460-2466.2006.00025.x

Ferguson, C. J. (2007a). Evidence for publication bias in video game violence effects literature: A meta-analytic review. *Aggression and Violent Behavior*, *12*(4), 470–482. doi:10.1016/j.avb.2007.01.001

Ferguson, C. J. (2007b). The good, the bad and the ugly: A meta-analytic review of positive and negative effects of violent video games. *The Psychiatric Quarterly*, *78*(4), 309–316. doi:10.1007/s11126-007-9056-9

Fleming, M. J., & Rickwood, D. J. (2001). Effects of violent versus nonviolent video games on children's arousal, aggressive mood, and positive mood. *Journal of Applied Social Psychology*, *31*(10), 2047–2071. doi:10.1111/j.1559-1816.2001.tb00163.x

Funk, J. B., Baldacci, H. B., Pasold, T., & Baumgardner, J. (2004). Violence exposure in real-life, video games, television, movies, and the internet: Is there desensitization? *Journal of Adolescence*, *27*(1), 23–39. doi:10.1016/j.adolescence.2003.10.005

Funk, J. B., Buchman, D. D., Jenks, J., & Bechtoldt, H. (2003). Playing violent video games, desensitization, and moral evaluation in children. *Journal of Applied Developmental Psychology*, *24*(4), 413–436. doi:10.1016/S0193-3973(03)00073-X

Funk, J. B., Hagan, J., Schimming, J., Bullock, W. A., Buchman, D. D., & Myers, M. (2002). Aggression and psychopathology in adolescents with a preference for violent electronic games. *Aggressive Behavior*, *28*(2), 134–144. doi:10.1002/ab.90015

Gentile, D. A., Anderson, C. A., Yukawa, S., Ihori, N., Saleem, M., & Ming, L. K. (2009). The effects of prosocial video games on prosocial behaviors: International evidence from correlational, longitudinal, and experimental studies. *Personality and Social Psychology Bulletin*, *35*(6), 752–763. doi:10.1177/0146167209333045

Gentile, D. A., Lynch, P. J., Linder, J. R., & Walsh, D. A. (2004). The effects of violent video game habits on adolescent hostility, aggressive behaviors, and school performance. *Journal of Adolescence*, *27*(1), 5–22. doi:10.1016/j.adolescence.2003.10.002

Giancola, P. R., & Parrott, D. J. (2008). Further evidence for the validity of the Taylor aggression paradigm. *Aggressive Behavior*, *34*(2), 214–229. doi:10.1002/ab.20235

Giancola, P. R., & Zeichner, A. (1995). Construct-validity of a competitive reaction-time aggression paradigm. *Aggressive Behavior*, *21*(3), 199–204. doi:10.1002/1098-2337(1995)21:3<199::AID-AB2480210303>3.0.CO;2-Q

Giumetti, G. W., & Markey, P. M. (2007). Violent video games and anger as predictors of aggression. *Journal of Research in Personality*, *41*(6), 1234–1243. doi:10.1016/j.jrp.2007.02.005

Graybill, D., Kirsch, J. R., & Esselman, E. D. (1985). Effects of playing violent versus nonviolent video games on the aggressive ideation of aggressive and nonaggressive children. *Child Study Journal*, *15*(3), 199–205.

Graybill, D., Strawniak, M., Hunter, T., & Oleary, M. (1987). Effects of playing versus observing violent versus nonviolent video games on children's aggression. *Psychology (Savannah, Ga.)*, *24*(3), 1–8.

Griffiths, M. D., & Dancaster, I. (1995). The effect of type-a personality on physiological arousal while playing computer games. *Addictive Behaviors*, *20*(4), 543–548. doi:10.1016/0306-4603(95)00001-S

Gunter, B., & Harrison, J. (2005). *Violence on television: An analysis of amount, nature, location and origin of violence in British programmes*. UK: Taylor & Francis Group.

Irwin, A. R., & Gross, A. M. (1995). Cognitive tempo, violent video games, and aggressive-behavior in young boys. *Journal of Family Violence*, *10*(3), 337–350. doi:10.1007/BF02110997

Ivory, J. D., & Kalyanaraman, S. (2007). The effects of technological advancement and violent content in video games on players' feelings of presence, involvement, physiological arousal, and aggression. *The Journal of Communication*, *57*(3), 532–555. doi:10.1111/j.1460-2466.2007.00356.x

Kirsh, S. J. (1998). Seeing the world through mortal kombat-colored glasses: Violent video games and the development of a short-term hostile attribution bias. *Childhood-a Global Journal of Child Research*, *5*(2), 177–184.

Kirsh, S. J., & Mounts, J. R. W. (2007). Violent video game play impacts facial emotion recognition. *Aggressive Behavior*, *33*(4), 353–358. doi:10.1002/ab.20191

Kirsh, S. J., Olczak, P. V., & Mounts, J. R. W. (2005). Violent video games induce an affect processing bias. *Media Psychology*, *7*(3), 239–250. doi:10.1207/S1532785XMEP0703_1

Konijn, E. A., Bijvank, M. N., & Bushman, B. J. (2007). I wish I were a warrior: The role of wishful identification in the effects of violent video games on aggression in adolescent boys. *Developmental Psychology*, *43*(4), 1038–1044. doi:10.1037/0012-1649.43.4.1038

Krahe, B., & Moller, I. (2004). Playing violent electronic games, hostile attributional style, and aggression-related norms in German adolescents. *Journal of Adolescence*, *27*(1), 53–69. doi:10.1016/j.adolescence.2003.10.006

Krcmar, M., & Farrar, K. (2009). Retaliatory aggression and the effects of point of view and blood in violent video games. *Mass Communication & Society*, *12*(1), 115–138.

Lawrence, R. G., & Birkland, T. A. (2004). Guns, Hollywood, and school safety: Defining the school-shooting problem across public arenas. *Social Science Quarterly*, *85*(5), 1193–1207. doi:10.1111/j.0038-4941.2004.00271.x

Lin, S., & Lepper, M. R. (1987). Correlates of children's usage of video-games and computers. *Journal of Applied Social Psychology*, *17*(1), 72–93. doi:10.1111/j.1559-1816.1987.tb00293.x

Markey, P. M., & Scherer, K. (2009). An examination of psychoticism and motion capture controls as moderators of the effects of violent video games. *Computers in Human Behavior*, *25*(2), 407–411. doi:10.1016/j.chb.2008.10.001

Meyers, K. S. (2002). *Television and video game violence: Age differences and the combined effects of passive and interactive violent media*. Baton Rouge: Louisiana State University and Agricultural and Mechanical College.

Moller, I., & Krahe, B. (2009). Exposure to violent video games and aggression in German adolescents: A longitudinal analysis. *Aggressive Behavior*, *35*(1), 75–89. doi:10.1002/ab.20290

Nowak, K. L., Krcmar, M., & Farrar, K. M. (2006). Examining the relationship between violent video games, presence, and aggression. *Presence (Cambridge, Mass.)*, 139–146.

Panee, C. D., & Ballard, M. E. (2002). High versus low aggressive priming during video-game training: Effects on violent action during game play, hostility, heart rate, and blood pressure. *Journal of Applied Social Psychology*, *32*(12), 2458–2474. doi:10.1111/j.1559-1816.2002.tb02751.x

Persky, S., & Blascovich, J. (2007). Immersive virtual environments versus traditional platforms: Effects of violent and nonviolent video game play. *Media Psychology*, *10*(1), 135–156.

Persky, S., & Blascovich, J. (2008). Immersive virtual video game play and presence: Influences on aggressive feelings and behavior. *Presence (Cambridge, Mass.)*, *17*(1), 57–72. doi:10.1162/pres.17.1.57

Raessens, J., & Goldstein, J. (2005). *Handbook of computer game studies*. Cambridge, MA: The MIT Press.

Reuters. (2007). Video-game sales overtaking music. Retrieved from http://articles.moneycentral.msn.com/ Investing/ Extra/ VideoGameSales OvertakingMusic.aspx

Schutte, N. S., Malouff, J. M., Post-Gorden, J. C., & Rodasta, A. L. (1988). Effects of playing videogames on children's aggressive and other behaviors. *Journal of Applied Social Psychology*, *18*(5), 454–460. doi:10.1111/j.1559-1816.1988.tb00028.x

Scott, D. (1995). The effect of video games on feelings of aggression. *The Journal of Psychology*, *129*(2), 121–132. doi:10.1080/00223980.1995.9914952

Sheese, B. E., & Graziano, W. G. (2005). Deciding to defect: The effects of video-game violence on cooperative behavior. *Psychological Science*, *16*(5), 354–357. doi:10.1111/j.0956-7976.2005.01539.x

Sherry, J. L. (2001). The effects of violent video games on aggression: A meta-analysis. *Human Communication Research*, *27*, 409–431.

Silvern, S. B., & Williamson, P. A. (1987). The effects of video game play on young children's aggression, fantasy and prosocial behavior. *Journal of Applied Developmental Psychology*, *8*, 453–462. doi:10.1016/0193-3973(87)90033-5

Smith, S. L., Lachlan, K., & Tamborini, R. (2003). Popular video games: Quantifying the presentation of violence and its context. *Journal of Broadcasting & Electronic Media*, *47*(1), 58–76. doi:10.1207/s15506878jobem4701_4

Swing, E. L., Gentile, D. A., & Anderson, C. A. (2008). Violent video games: Learning processes and outcomes. In Ferdig, R. E. (Ed.), *Handbook of Research on Effective Electronic Gaming in Education* (*Vol. II*, pp. 876–892). Hershey, PA: Information Science Reference. doi:10.4018/9781599048086.ch050

Tamborini, R., Eastin, M. S., Lachlan, K., Feduik, T., Brady, R., & Skalski, P. (2000, November). *The effects of violent virtual video games on aggressive thoughts and behaviors*. Paper presented at the meeting of the 86th Annual Convention of the National Communication Association, Seattle, WA.

Uhlmann, E., & Swanson, J. (2004). Exposure to violent video games increases automatic aggressiveness. *Journal of Adolescence*, *27*(1), 41–52. doi:10.1016/j.adolescence.2003.10.004

Van Mierlo, J., & Van den Bulck, J. (2004). Benchmarking the cultivation approach to video game effects: a comparison of the correlates of TV viewing and game play. *Journal of Adolescence*, *27*(1), 97–111. doi:10.1016/j.adolescence.2003.10.008

Van Schie, E. G. M., & Wiegman, O. (1997). Children and videogames: Leisure activities, aggression, social integration, and school performance. *Journal of Applied Social Psychology*, *27*(13), 1175–1194. doi:10.1111/j.1559-1816.1997.tb01800.x

Wallenius, M., & Punamaki, R. L. (2008). Digital game violence and direct aggression in adolescence: A longitudinal study of the roles of sex, age, and parent-child communication. *Journal of Applied Developmental Psychology*, *29*(4), 286–294. doi:10.1016/j.appdev.2008.04.010

Weber, R., Behr, K. M., Tamborini, R., Ritterfeld, U., & Mathiak, K. (2009). What do we really know about first-person-shooter games? An event-related, high-resolution content analysis. *Journal of Computer-Mediated Communication*, *14*(4), 1016–1037. doi:10.1111/j.1083-6101.2009.01479.x

Weber, R., Ritterfeld, U., & Mathiak, K. (2006). Does playing violent video games induce aggression? Empirical evidence of a functional magnetic resonance imaging study. *Media Psychology*, *8*(1), 39–60. doi:10.1207/S1532785XMEP0801_4

Williams, R. B., & Clippinger, C. A. (2002). Aggression, competition and computer games: computer and human opponents. *Computers in Human Behavior*, *18*(5), 495–506. doi:10.1016/S0747-5632(02)00009-2

Wingrove, J., & Bond, A. J. (1998). Angry reactions to failure on a cooperative computer game: The effect of trait hostility, behavioural inhibition, and behavioural activation. *Aggressive Behavior*, *24*(1), 27–36. doi:10.1002/(SICI)1098-2337(1998)24:1<27::AID-AB3>3.0.CO;2-P

Winkel, M., Novak, D. M., & Hopson, H. (1987). Personality-factors, subject gender, and the effects of aggressive video games on aggression in adolescents. *Journal of Research in Personality*, *21*(2), 211–223. doi:10.1016/0092-6566(87)90008-0