

## Chapter XX

### THE MODERN HUNTER-GATHERER HUNTS ALIENS AND GATHERS POWER-UPS: THE EVOLUTIONARY APPEAL OF VIOLENT VIDEO GAMES AND HOW THEY CAN BE BENEFICIAL

Christopher J. Ferguson

*Texas A&M International University*

**Abstract:** Video game violence has been the focus on much recent concern among politicians, activist and some social scientists. Evolutionary psychology can help explain the origins of fascination of many individuals, particularly males, with violent games. Interest in violent video games can be viewed as an extension of normal and adaptive aggression instincts, in which video games provide a safe arena in which individuals can express aggression and manage mood without actually causing harm to others. An evolutionary model of violent game interest, the Catalyst Model, is presented and contrasted with traditional social learning models of video game violence use. It is argued that the harmful effects of violent game exposure on the majority of players is negligible whereas violent games may provide a useful platform for positive development in education, visuospatial cognition and social networking.

**Keywords:** Mass media; Computer Games; Violence; Aggression; Evolutionary Psychology

#### 1. INTRODUCTION

Humankind's fascination with violent entertainment has been noted during virtually every historical period (Kutner & Olson, 2008; Trend, 2007) as well as among most cultures. Such entertainment has varied in form and intensity, ranging from actual deaths for entertainment during Roman Games or medieval executions, to more modern forms of entertainment such as television and video games where the injuries and deaths

are largely fictional (excepting those occurring during sporting events perhaps). Media violence has historically had its critics as well ranging from moral philosophers such as Tertullian (200) and Augustine (397), to modern politicians and anti-media lobbyists. However, whatever one's feelings are about media violence, there can be little doubt that such entertainments are ubiquitous, popular, and a constant element of the human condition. As new media have developed quickly in the 20<sup>th</sup> and 21<sup>st</sup> centuries, cycles of "moral panics" have broken out regarding new media (Kutner & Olson, 2008; Trend, 2007). In most of these cases society "elders" who do not use the new media complain that this new media (whether novels, comic books, jazz, rock and roll, movies, television, Elvis Prestley, Betty Boop, Harry Potter, etc.,) will corrupt or "harm" youth. In retrospect most of these concerns seem absurd with media that previously caused great alarm now recognized as harmless, yet this does not stop the cycle from continuing with emerging media. In recent years, video games have been at the center of some of the most recent concerns (Anderson, 2004; Ferguson, 2008). This chapter concerns itself with understanding the use and impact of violent video games from the standpoint of evolutionary psychology. The chapter will be divided into two main parts: first discussing the appeal of violent video games from an evolutionary standpoint and second, discussing ways in which this appeal can be harnessed to use violent video games for positive outcomes.

## **2. UNDERSTANDING AGGRESSION**

Much of the discussion of aggression in the social sciences began with an assumption that aggression is an inherently bad thing, both for the individual as well as for society as large. This trickles down into news reports of scientific studies. For instance when people hear something along the lines of "Scientists conclude that eating pomegranates causes aggression" this is often met with considerable hand wringing among politicians, activists groups, parents, etc., about the deleterious effects of pomegranates, the moral turpitude of those who dare to farm pomegranates, and self-righteous questions about how anyone, particularly the youth of today, could possibly get any pleasure out of eating pomegranates. Some will call for the restriction of sale of pomegranates, particularly to minors. This all assumes that aggression is necessarily a bad thing. Certainly, in the extreme, when heightened aggression results in extreme

violence likely to cause harm to oneself and others this can be the case (Ferguson & Beaver, in press). However, aggressiveness may also have positive benefits and indeed be evolutionarily adaptive, particularly in moderate amounts. Moderate aggressiveness may aid us in defending ourselves and our family, standing up for our beliefs, seeking high-status positions in society, developing leadership, excelling in sports and many careers, enduring hardships, etc. These are behaviors that increase social status and reproductive success. Indeed, some scholars have recognized that aggressiveness, particularly when allowed to be defined broadly, may have more positive qualities than negative (Hawley & Vaughn, 2003; Smith, 2007). Aggression measures used in many social science studies do not adequately distinguish between healthy adaptive aggression and extreme violent behaviors (Ferguson & Rueda, 2009; Ritter & Eslea, 2005). Thus, much of the hand wringing may be premature.

Aggression is defined in this paper as “behavior that is intended to increase the social dominance of the organism relative to the dominance position of other organisms” (Ferguson & Beaver, in press). Aggressiveness is a ubiquitous human trait across societies and historical periods (Ferguson & Beaver, in press). Archaeological evidence from pre-historical human cultures reveals evidence of the use of fatal violence in these cultures (McCall & Shields, 2008). The evolutionary roots of aggression can be observed by examining humans’ closest genetic relative, the chimpanzee. Chimpanzees have been observed engaging in mass intergroup fatal violence (Goodall, 1979) and fatal abuse of infants (Goodall, 1977). Given that greater sexual competition exists among males (Gottschalk & Ellis, 2009), and that females are more invested in the care of young (Buss & Duntley, 2006), males engage in greater levels of aggression than do females, as is the case with most other mammalian species (Gottschalk & Ellis, 2009; Okami, & Shackelford, 2001). This *sexual selection* of male aggression and violence may also be related to the division of labor between males and females in prehistoric hunter-gather societies in which males typically undertook the riskier activity of hunting (Morris, 1999).

The observation that aggression is an evolutionary adaptation which provides a selective advantage to those individuals who possess a moderate level of the trait is at odds with much of the lingo and dogma of social science across the latter 20<sup>th</sup> century.

Historically it had been assumed that aggression and violence were learned behaviors, shaped largely by environmental influences including family and peers, but also media effects (e.g. Berkowitz, 1993). Increasingly, evidence has demonstrated that this tabula rasa (i.e. blank slate) view of aggression has been mistaken and that there are strong genetic roots to aggressive and violent behavior (Caspi et al., 2002; Ferguson, in press; Rhee & Waldman, 2002). Thus too often in social science, the presumed causal arrow between aggression and its correlates may have been misdirected.

### 3. VIOLENT VIDEO GAMES AND AGGRESSION

As noted earlier, complaints that various media forms would spark waves of rebelliousness, violence and moral turpitude are nothing unique to the 20<sup>th</sup> century. However the latter half of the 20<sup>th</sup> century saw a considerable emphasis on media violence research guided by the “social learning” theoretical tradition. Briefly, this tradition, attributed largely to Albert Bandura suggests that individuals learn through imitating or modeling the behavior of others. Arguably over time, modeling morphed, in the view of many social scientists from something that humans *can* do to something that they *must* do without volition or consideration of the benefits and costs of doing so.

Bandura’s “Bo-bo Doll” studies in particular provided much guidance for the media effects tradition of the latter 20<sup>th</sup> century (Bandura, Ross & Ross, 1961; 1963). There are actually numerous variations on these sets of studies, but in brief they had children (males and females) watch adults (also males and females) either in real life or in filmed sequences engage in a series of highly novel acts against a bo-bo doll (an inflatable toy doll which is designed to be boxed or hit). So, for instance, the models would sit on the bo-bo doll and punch it in the nose, or whack it with a mallet. The researchers then irritated the children by showing them a host of toys that they were not allowed to play with before bringing them to the test room with the bo-bo doll. Children who had seen an adult model these behaviors (either in real life or in film) were more likely to engage in similar behaviors. Although the bo-bo doll studies are not media violence studies per se, they purport to demonstrate that aggression can be imitated by children. Presumably these results would potentially be generalizable to television and other media forms.

However, there are limitations to the bo-bo doll studies that are important to acknowledge (see Guantlett, 1995). First, the effects appear to be small overall and evaporate very quickly. Secondly, the “aggression” in the study was directed at an object, not another person, and it remains unclear if the studies’ results can be generalized to real-life aggression against people. Related to that is the concern that the entire situation is contrived; after all, one might ask, what else are you supposed to do with a bo-bo doll other than hit it? Third, it is unclear whether the children were necessarily more motivated to engage in aggression in general, as opposed to mimicking *specific* aggressive acts. In other words, overall aggressive behaviors may not have changed much, but the style of the aggressive behaviors might have been altered due to the novel kinds of aggressive behaviors presented. Fourth, it is unclear that the children were necessarily motivated by aggression, as opposed to aggressive play or even the desire to please the adult experimenter. Children are quite used to being given instructions by adults and they may arguably have simply viewed the models (who were adults) as instructors telling them what to do. In other words, the children may have even believed that they might be scolded or punished if they didn’t follow the model’s lead. Lastly, in a subsequent paper, Bandura (1965) found that showing the model being punished for attacking the bo-bo doll decreased modeled behaviors in child participants. Yet the punishments themselves appeared to involve considerable aggressive behavior. As described in the original text (Bandura, 1965. p. 591):

For children in the model-punished condition, the reinforcing agent appeared on the scene [this occurs after the children watched the model hit the bo-bo doll] shaking his finger menacingly and commenting reprovingly, "Hey there you big bully. You quit picking on that clown. I won't tolerate it." As the model drew back he tripped and fell, and the other adult sat on the model and spanked him with a rolled up magazine while reminding him of his aggressive behavior. As the model ran off, cowering, the agent forewarned him, "If I catch you doing that again, you big bully, I'll give you a hard spanking. You quit acting that way."

From this description it is reasonable to wonder what we can conclude when it appears that children are willing to imitate non-violent aggression against an object, but viewing violence against an actual person inhibits their aggression. However one interprets the meaningfulness of the bo-bo doll studies, there is little doubt that they had considerable impact on the media violence debate.

The media effects tradition continued more or less along the same lines, testing the hypothesis that viewed violence produces increased aggression (although notice the slip in terms between violence and aggression...with the assumption once again that aggression is inherently pathological). The meaningfulness, and even size of this body of research has been debated for decades. For instance the American Academy of Pediatrics has infamously claimed upwards of 3500 studies on the topic of media violence, although an actual careful examination of the literature field found closer to 200 studies with mixed results (Freedman, 2002). Like the bo-bo doll studies, studies of media violence have oftentimes been limited by poor methodology, inadequate aggression measures, poor control of extraneous variables and an almost desperate effort to “prove” the theory rather than to meaningfully test hypotheses (Ferguson, 2009; Olson, 2004; Pinker, 2002; Savage, 2004). Indeed, in many studies, the study abstracts are worded so as to imply a meaningful connection between media violence viewing and aggression, whereas a careful perusal of the results finds non-significant or contradictory results (e.g. Anderson & Dill, 2000; Malamuth & Ceniti, 1986 see Ferguson, 2009 and Savage 2004 for complete discussions).

Not surprisingly, this research tradition has continued with the advent of video games. Research on video games began soon after the advent of video games, with “violent” video games oftentimes represented by games such as *Pac Man*, *Asteroids* and *Zaxxon* (e.g. Anderson & Ford, 1987; Dominick, 1984). That games such as these are an important source of youth violence today would likely be considered absurd to most individuals familiar with games (or youth violence for that matter). Indeed this highlights the very nature of the media violence moral panic cycle...that past panics appear absurd, yet new media continues to incite new panics (Guantlett, 1995). As video game technology has improved, some newer games have “pushed the envelope” on good taste, including considerable violence and sometimes lewd sexual content. However, recent

meta-analyses have indicated that such content is unlikely to increase violence risk among players (Ferguson & Kilburn, 2009; Savage & Yancey, 2008; Sherry, 2007).

Although the furor over video game violence effects is unlikely to die down soon, from a scientific view, it is probably time to reduce our focus on video games as an important causal contributor to youth violence. Instead of looking at how video game violence causes an increase in aggression, it may be more fruitful to examine the reverse. Namely, how aggressiveness among the human species promotes an interest in violent media including violent video games. Given that players of violent video games don't randomly stumble upon such games, this causal directionality arguably makes more sense. Why, though, do many humans find violent video games enjoyable to play?

Humans, perhaps like many other creatures, find violent acts to be intrinsically rewarding and pleasurable. There are exceptions to this, of course (and perhaps those exceptions go on to become social scientists wedded to tabula rasa views of aggression), however there is little argument that violent media, and violent video games are overwhelmingly popular. Recent research on mice has suggested that engaging in violent behavior activates reward centers of the brain (Couppis & Kennedy, 2008) and some have suggested that similar mechanisms may exist among humans (Taylor, 2009).

Although it's hardly a new idea to state it here, rather than humans becoming aggressive because of exposure to violent media, it is likely more true that humans like violent media because of an inherent aggressive streak in our species (Ferguson, 2002). Thus many individuals, particularly males, may be inclined to enjoy violent video games due to natural interests in aggression and competitiveness. Females may have used "sex selection" to promote aggressiveness in males (Okami, & Shackelford, 2001) as such traits are useful for hunting and protection of the family unit (Morris, 1999). Thus it should not be surprising to find that young males, in particular, almost universally play violent video games (Ferguson et al., 2008; Griffiths & Hunt, 1995; Kutner et al., 2007). Violent video game playing among females, although certainly not unheard of, is considerably less universal. Play of such game may relate to pre-existing needs for and enjoyment of aggressive and competitive stimuli. Indeed recent research has suggested that, far from stimulating antisocial behavior, video game play may relate to increased social behavior and civic engagement (Lenhart et al., 2008). Thus aggressiveness may

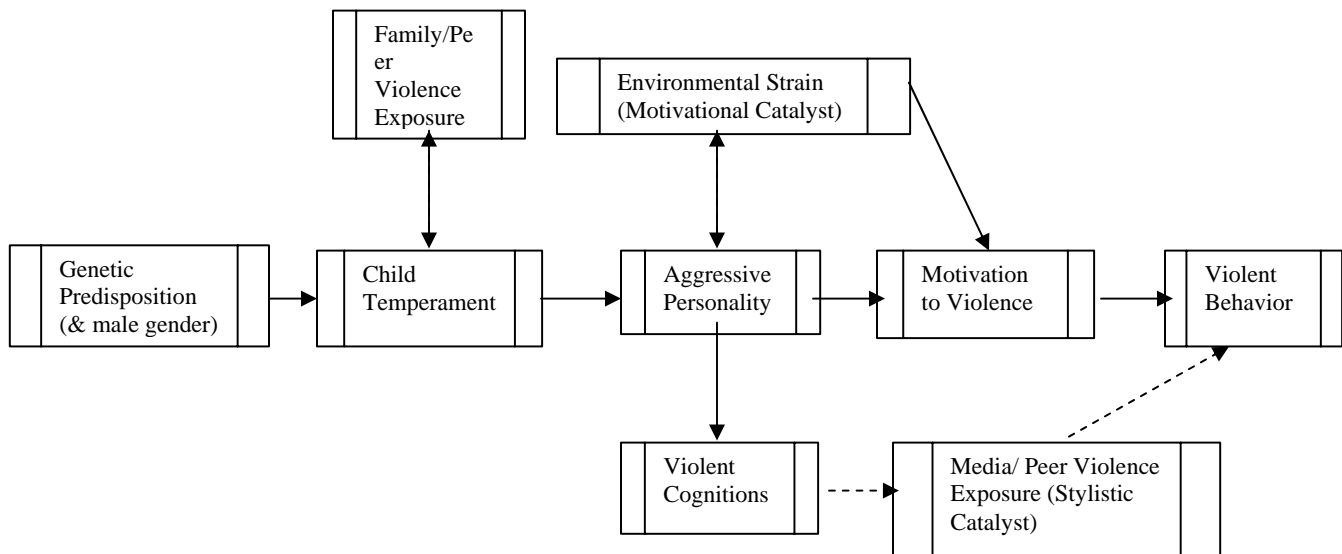
play an essential role in male bonding and dominance hierarchies. Violent game playing, like sports and competitive hobbies, may be merely a consequence of such pre-existing motivations, not a cause of them.

#### 4. AN EVOLUTIONARY MODEL OF VIOLENT VIDEO GAME PLAYING

Ferguson (Ferguson, 2009; Ferguson et al., 2008) has proponed a model, called the Catalyst Model, to explain the interaction between genes and evolution, environmental determinants of aggressiveness and violent video game playing. It should be noted that the term “violent video game”, like aggression, is rather broad, encompassing a wide variety of games, not only those such as *Grand Theft Auto* which tend to receive the most negative attention. As noted above, games such as *Centipede*, *Pac Man*, *Space Invaders* and *Asteroids* have been labeled as “violent” games. Although this is technically accurate (all of those games involve one thing attempting to destroy other things), it does point to the degree to which some of this debate has become absurd. Such notions are dependent upon the view that the human mind is naturally devoid of aggressive inclinations, that humans MUST model behaviors that they witness, and that even the slightest hint of violence potentially carries risks of deleterious outcomes.

The Catalyst Model, presented in Figure 1, approaches the relationship between video game playing and aggression from a different view than the traditional tabula rasa social science view. Briefly, this model suggests that excessive aggressiveness and a proneness to extreme violence (Ferguson & Beaver, in press) are the product of a combination of genetic effects, and exposure to violence in the family and among peers. This observation has been supported by existing literature (Beaver et al., 2009; Capsi et al., 2002). The Catalyst Model suggests that aggression (and eventually violence) increases in proportion to the amount of stress that the organism experiences. Increased stress results in increased violence risk. For individuals already prone to acts of extreme violence due to genetic or family of origin influences, the amount of stress required to “catalyze” aggression is less than for individuals with a normal or healthy genetic profile or background.

Figure 1.



Related to violent media and video games, individuals with aggressive tendencies (relatively speaking) may have more aggressive thoughts and may be more prone to seek out violent media than other individuals. Violent media may, at times, serve as a “stylistic catalyst.” In essence, a stylistic catalyst may influence the form that a violent act takes, but not the motivation to be violent itself. For instance a criminal who watches *CSI* or plays the video game spin-off, may use bleach to destroy evidence of a violent crime where they would not have done so before. However, whether or not the individual watched *CSI* or played a violent video game, the violent act still would have occurred. Thus, exposure to violence in video games may influence the *style* of a violent act, but not the frequency or motivation of violent acts. An offender might repeat a phrase from a game, dress like a character, or reference the game after being caught (offenders blaming video games after being caught is obviously self-serving and should be taken with a large grain of salt). Aside from these minor details, the game had no real influence on the offender’s motivation or intention to commit a violent act in the first place. Initial data on the Catalyst Model has suggest that it is superior to existing social learning based models in explaining the interaction between video game violence and aggressive behavior (Ferguson, et al., 2008).

A further evolutionary point is worth considering. Namely humans, with some variation and particularly among males, are intrinsically aggressive, and thus, to varying

degrees, drawn to aggressive stimuli. It thus follows that humans and males particularly will be drawn to violent stimuli, including that in the media. Although this issue is often referenced in regards to heinous violent crimes such as mass shootings (see Ferguson, 2008 for a discussion), evidence makes clear that even healthy non-pathological young males (and some females) enjoy consumption of violent media (Ferguson et al., 2008; Griffiths & Hunt, 1995; Olson et al., 2007). In condemning this reality, which is probably unchangeable no matter how much social critics might rant against it, are we missing an opportunity to use such media for positive outcomes?

### **5. USING VIOLENT VIDEO GAMES FOR POSITIVE PURPOSES**

In the above sections I have argued that humans are intrinsically aggressive, that aggressive behavior in moderate doses can be adaptive, and that as an aggressive species, humans and males in particular are likely to be drawn to violent media. Further I have argued that the evidence suggest that, for most consumers at least, violent media does not have a deleterious effect on viewers. I am well aware that other social scientists have advocated the opposing view, but I feel that such arguments are not based on data, but rather on scientific ideology, politics and emotion (see Grimes, Anderson & Bergen, 2008 for an excellent discussion of this issue).

One unfortunate element of this debate, which persists in a vacuum of evidence, is that the utility of an intrinsically attractive media is being missed. I'm not advocating that the most savagely and offensively violent games be employed in these contexts. However, I do argue that scientists might consider a balance involving incorporating educational elements into games with a moderate amount of violence that will be interesting and fun for students to play. Some games have already done this with considerable success (Kato, Cole, Bradlyn, & Pollock, 2008). One difficulty that educational games traditionally have is in competing with commercial games. Frequent gamers might find educational games "lame" in comparison to the sophisticated and action packed games that they are used to playing. As a related issue, the "shelf life" of many games, including educational games, can be limited. Some games such as "World of Warcraft" have exhibited remarkable staying power, however, and individuals interested in designing games for educational purposes would do well to learn some of

the lessons of commercial games rather than trying (and perhaps failing) to reinvent the wheel.

In the following sections I will discuss some of the existing research on the use of games, both commercial and “serious games” (i.e. games that are specifically developed for purposes related to human enhancement or development, rather than as entertainment only) for “positive” purposes. Specifically I focus on the “unintended” consequences of violent video game playing on visuospatial cognition, and the “intended” use of games, including both commercial and educational games with violent content in education.

*Visuospatial Cognition:* Put simply, visuospatial cognition refers to a set of intellectual abilities related to the mental manipulation of and memory for objects and relationships between objects. Such abilities may provide advantage in careers ranging from art to engineering to surgery. Generally it is acknowledged that males tend to perform higher on tasks related to visuospatial cognition than females (Collaer & Hill, 2006; Livesey & Intili, 1996; Parsons et al., 2004), although there may be some degree of task specificity in these differences (Ferguson, Cruz & Rueda, 2008; Halpern & Collaer, 2005). From an evolutionary perspective it is hypothesized that these differences may relate to a division of labor in early human hunter-gatherer societies in which males were involved in the hunting role, which benefited to a greater degree from high visuospatial cognition (Silverman & Eals, 1992; Morris, 1999).

Just as it makes sense that males who are more aggressive than females may be drawn to violent games, so too males high in visuospatial cognition relative to females (who, by contrast, excel in verbal skills) may be drawn to video games for their involvement with visuospatial cognition. Thus, any relationship between video game playing and gender might only be a gender effect, and thus gender should be carefully controlled in all research on this topic.

Nonetheless, evidence has emerged to suggest that individuals who play video games generally, and violent games specifically, tend to have better visuospatial cognition than non-gamers. Ferguson Cruz and Rueda (2008) found that gamers, and those who play violent games specifically, outperformed non-gamers on visual memory tasks, even when gender was controlled. Similar results were found by De Lisi and Wolford (2002) although Sims and Mayer (2002) found that playing non-violent games

such as *Tetris* did not translate to better visuospatial performance. As such there may be something particular about *violent* video games that relates to visuospatial cognition. It may not be the violence per se, but rather the type of fast action found in such games.

The results described above are largely correlational, however. Even though gender is controlled, it still may be true that those with better inherent visuo-spatial cognition are more attracted to video games and violent games specifically. However, more recent experimental research has confirmed that a causal pathway exists between violent video game play (these research articles typically refer to such games as “action” games, where as aggression articles refer to “violent” games, despite that these two groups of scholars use the same games...itself an interesting observation in how science is marketed for audiences) and improved visuospatial cognition (Feng, Spence & Pratt, 2007; Green & Bavelier, 2003; Green & Bavelier, 2006). Further research has also suggested that practice with violent video games is even related to improved performance in surgery for medical doctors (Rosser, Lynch, Cuddihy, Gentile, Klonsky, & Merrell, 2007). Lastly, a recent meta-analytic review has noted that the effect size for the relationship between playing violent games and improved visuospatial cognition is many times greater than for that seen between violent game playing and aggression, which was negligible (Ferguson, 2007).

This last finding raises the question of why violent games would function reasonably well at improving visuospatial cognition, despite that they don't increase aggression. Isn't all learning the same? The answer, obviously, is “no”, and the question assumes a rather simplistic and naïve version of “learning.” Behaving aggressively (or violently) requires intrinsic motivation. One must “decide” to engage in such behavior. Although innate genetic tendencies influence an individual's level of aggression, the influence of environment on aggression is correspondingly small (Ferguson, in press). That's not to say that environment has *no* impact on violence, but the largest environmental predictors appear to be related to stress, family violence and peer delinquency, as predicted by the Catalyst Model (Ferguson, San Miguel & Hartley, in press). After those factors are controlled, video game violence (or television) has no impact on violent behavior. Thus individuals are, to varying degrees, predisposed to violence, but ultimately “decide” to act violence, particularly when under stress.

Violence is an act of volition, and a personality trait that is not easily changed by environmental influences.

By contrast visuospatial cognition is an automatic cognitive task, not a volitional personality trait. Automatic cognitive tasks do not require volition to function, and improve with practice. Thus the difference between visuospatial cognition and aggression (or violence) is in the nature of the outcome...a volitional personality trait, versus an avolitional, automatic cognitive task. Cognitive tasks respond to practice, personality traits do not.

## 6. THE USE OF VIOLENT GAMES IN EDUCATION

The benefits of violent games on visuospatial abilities are probably not terribly controversial as such influences are *accidental*. In other words gamers become better at visuospatial tasks due to practice at those tasks, but that was never their intention. Violent games were not particular developed for those tasks. Using violent games in education may be considerably more controversial as, in many instances, this would involve purposely designing a violent game for use by children in schools, a notion that schools and parents may be uneasy about, even as kids are exposed to violence in the books they read in literature classes. The use of video games directly in educational settings faces several practical constraints, including time commitment limitations and teacher prejudices against video games (Rice, 2007). Nonetheless, as such games have inherent appeal to many children, there is potential for such games to make educational material more appealing.

In this context there are two research sets. One avenue considers the “accidental” educational value of commercial games, with considerable attention focusing on *World of Warcraft* in particular. The other focuses on games purposely developed for educational purposes, games that may be included under the heading of “serious games.”

In regards to commercial games it has been found that the use of violent video games in informal settings may promote some cognitive development, although this is usually an unintended element of game play. For instance research in this area has typically focused on *World of Warcraft* (WoW) a MMORPG (massively multiplayer on-line role playing game) that has enjoyed an unusually long active life. WoW is a fantasy role-playing game with violent content, for which many players actively participate in

message boards and blogs related to the game. Some early research has suggested that WoW may promote reading and writing achievement, including among boys who previously had little interest in such activities (Steinkuehler, in press; Steinkuehler & Duncan, 2009; Steinkuehler & Williams, 2006). Similarly VanDeventer and White (2002) found that children who displayed expertise at mildly violent games were likely to display higher-ordered thinking skills. Durkin et al., (2009) have found that frequent use of video games and other electronic media is associated with improved social and language development in children with language disorders.

Research on games purposely designed for use in education remains in its infancy. Some of the most promising research in this regard has come out of health psychology, where specifically targeted video games have promoted the health of young medical patients. In one remarkable recent study, researchers found that a first-person shooter game *Re-Mission* improved self-efficacy, cancer knowledge, and treatment adherence in teen and young adult cancer patients (Kato, Cole, Bradlyn & Pollock, 2008). In the game *Re-Mission* players play as a microscopic female robot who is injected into the bodies of cancer patients and blasts cancer cells and infections with a variety of weapons. Arguably the game succeeds because it presents a lively action-oriented platform that holds players' attention, allowing the educational components of the game greater opportunity for impact. *Re-Mission* takes advantage of the existing, popular first-person shooter format and applies this format for a pro-social purpose. Both non-violent and mildly violent educational games have demonstrated short-term efficacy for specific educational goals in controlled settings (Asakawa & Gilbert, 2003; Reiber, Smith, & Noah, 1998), yet little research has expanded outcomes to longer-term, global and ecologically valid results.

Research on the use of violent video games in promoting educational agendas remains in infancy. Yet the promise of *Re-Mission* directly, and *World of Warcraft* somewhat indirectly has led to calls for increased use of video games, including those with violent content, to promote educational agendas. For instance, NASA has begun development of an MMO to promote science education (NASA, 2008). The adoption of violent games as potential educational tools will naturally need to take place in the framework of a larger discussion of positive and negative effects of violent games. Yet,

given the appeal and staying power of violent games, it may be worth having this discussion.

## 7. REFERENCES

- Anderson, C. (2004). An update on the effects of playing violent video games. *Journal of Adolescence*, 27(1), 113-122.
- Anderson, C., & Dill, K. (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.
- Anderson, C., & Ford, C. (1987). Affect of the game player: Short term effects of highly and mildly aggressive video games. *Personality and Social Psychology Bulletin*, 12(4), 390-402.
- Asakawa, T., & Gilbert, N. (2003). Synthesizing experiences: Lessons to be learned from internet mediated simulation games. *Simulation & Gaming*, 34(1), 10-22.
- Augustine. (397). *Confessions*. Retrieved 10/1/08 from:  
<http://www.ccel.org/ccel/augustine/confessions.toc.html>.
- Bandura, A. (1965) Influence of models' reinforcement contingencies on the acquisition of imitative response. *Journal of Personality and Social Psychology*, 1(6), 589-595.
- Bandura, A., Ross, D., & Ross, S.A. (1961). Transmission of aggression through imitation of aggressive models. *Journal of Abnormal and Social Psychology*, 63(3), 575 – 582.
- Bandura, A., Ross, D., & Ross, S.A. (1963). Imitation of film-mediated aggressive models. *Journal of Abnormal and Social Psychology*, 66(1), 3 -11.
- Beaver, K.M., Shutt, J.E., Boutwell, B.B., Ratchford, M., Roberts, K., & Barnes, J.C. (2009). Genetic and environmental influences on levels of self-control and delinquent peer affiliation: Results from a longitudinal sample of adolescent twins. *Criminal Justice and Behavior*, 36(1), 41-60.
- Berkowitz, L. (1993). *Aggression: Its causes, consequences, and control*. New York: McGraw-Hill.

- Buss, D., & Shackelford, T. (1997). Human aggression in evolutionary psychological perspective. *Clinical Psychology Review, 17*(6), 605-619.
- Caspi, A., McClay, J., Moffitt, T., Mill, J., Martin, J., Craig, I., et al. (2002). Role of genotype in the cycle of violence in maltreated children. *Science, 297*(5582), 851-854.
- Collaer, M., & Hill, E. (2006). Large sex difference in adolescents on a timed line judgment task: Attentional contributors and task relationship to mathematics. *Perception, 35*(4), 561-572.
- Couppis, M., & Kennedy, C. (2008). The rewarding effect of aggression is reduced by nucleus accumbens dopamine receptor antagonism in mice. *Psychopharmacology, 197*(3), 449-456.
- Dominick, J. (1984). Videogames, television violence and aggression in teenagers. *Journal of Communication, 34*(2), 136-147.
- Durkin, K., Conti-Ramsden, G., Walker, A., & Simkin, Z. (2009, March). Educational and interpersonal uses of home computers by adolescents with and without specific language impairment. *British Journal of Developmental Psychology, 27*(1), 197-217.
- Feng, J., Spence, I., & Pratt, J. (2007). Playing an action video game reduces gender differences in spatial cognition. *Psychological Science, 18*(10), 850-855.
- Ferguson, C. J. (in press). Genetic contributions to antisocial personality and behavior (APB): A meta-analytic review (1996)-2006) from an evolutionary perspective. *Journal of Social Psychology*.
- Ferguson, C. J. (2009). Media violence effects: Confirmed truth, or just another X-File? *Journal of Forensic Psychology Practice, 9*(2), 103-126.
- Ferguson, C. J. (2008). The School Shooting/Violent Video Game Link: Causal Link or Moral Panic? *Journal of Investigative Psychology and Offender Profiling, 5*(1-2), 25-37.
- Ferguson, C.J. (2007). The good, the bad and the ugly: A meta-analytic review of positive and negative effects of violent video games. *Psychiatric Quarterly, 78*(4), 309-316.

- Ferguson, C. J. (2002). Media violence: Miscast causality. *American Psychologist*, 57(6-7), 446-447.
- Ferguson, C. J., San Miguel, C., & Hartley, R. D. (in press). A multivariate analysis of youth violence and aggression: The influence of family, peers, depression and media violence. *Journal of Pediatrics*.
- Ferguson, C. J., Rueda, S., Cruz, A., Ferguson, D., Fritz, S., Smith, S. (2008). Violent video games and aggression: Causal relationship or byproduct of family violence and intrinsic violence motivation? *Criminal Justice and Behavior*, 35(3), 311-332.
- Ferguson, C. J. & Beaver, K. M. (in press). Natural born killers: The genetic origins of extreme violence. *Aggression and Violent Behavior*.
- Ferguson, C. J., Cruz, A., & Rueda, S. (2008). Gender, video game playing habits and visual memory tasks. *Sex Roles: A Journal of Research*, 58(3-4), 279-286.
- Ferguson, C. J., & Kilburn, J. (2009). The Public health risks of media violence: A meta-analytic review. *Journal of Pediatrics* 154(5). 759-763.
- Freedman, J. (2002). *Media violence and its effect on aggression.: Assessing the scientific evidence*. Toronto: University of Toronto Press.
- Gauntlett, D. (1995) *Moving experiences: Understanding television's influences and effects*. Luton: John Libbey.
- Goodall, J. (1977). Infant-killing and cannibalism in free-living chimpanzees. *Folia Primatologica*, 28, 259-282.
- Goodall, J. (1979). Life and death at Gombe. *National Geographic*, 155, 595-621.
- Gottschalk, M., & Ellis, L. (2009). Evolutionary and genetic explanations of violent crime. In C. Ferguson, (ed.), *Violent crime: Clinical and social implications*. Thousand Oaks, CA: Sage.
- Green, S., & Bavelier, D. (2003). Action video game modifies visual selective attention. *Nature*, 423(6939), 534-537.
- Green, S., & Bavelier, D. (2006). Enumeration versus multiple object tracking: The case of action video game players. *Cognition*, 101(1), 217-245.

- Griffiths, M., & Hunt, N. (1995). Computer game playing in adolescence: Prevalence and demographic indicators. *Journal of Community and Applied Social Psychology*, 5(3), 189-193.
- Grimes, T., Anderson, J., & Bergen, L. (2008). *Media violence and aggression: Science and ideology*. Thousand Oaks, CA: Sage.
- Halpern, D., & Collaer, M. (2005). Sex differences in visuospatial abilities: More than meets the eyes. In P. Shah & A. Miyake, (Eds.), New York: Cambridge University Press.
- Hawley, P., & Vaughn, B. (2003). Aggression and adaptive function: The bright side to bad behavior. *Merrill-Palmer Quarterly*, 49(3), 239-242.
- Kato, P., Cole, S., Bradlyn, A., & Pollock, B. (2008). A video game improves behavioral outcomes in adolescents and young adults with cancer: A randomized trial. *Pediatrics*, 122, e305-e317. Retrieved 10/6/08 from: <http://pediatrics.aappublications.org/cgi/content/full/122/2/e305>.
- Kutner, L., & Olson, C. (2008). *Grand theft childhood: The surprising truth about violent video games and what parents can do*. New York: Simon & Schuster.
- Kutner, L., Olson, C., Warner, D., & Hertzog, S. (2007). Parents' and son's perspectives on video game play: A qualitative study. *Journal of Adolescence Research*, 23(1), 76-96.
- Lenhart, A., Kahne, J., Middaugh, E., MacGill, A., Evans, C., & Mitak, J. (2008). *Teens, video games and civics: Teens gaming experiences are diverse and include significant social interaction and civic engagement*. Retrieved 10/2/08 from: [http://www.pewinternet.org/PPF/r/263/report\\_display.asp](http://www.pewinternet.org/PPF/r/263/report_display.asp).
- Livesey, D., & Intili, D. (1996). A gender difference in visual-spatial ability in 4-year-old children: Effects on performance of a kinesthetic acuity task. *Journal of Experimental Child Psychology*, 63(2), 436-446.
- Malamuth, N., & Ceniti, J. (1986). Repeated exposure to violent and nonviolent pornography: Likelihood of raping ratings and laboratory aggression against women. *Aggressive Behavior*, 12(2), 129-137.

- McCall, G., & Shields, N. (2008). Examining the evidence from small-scale societies and early prehistory and implications for modern theories of aggression and violence. *Aggression and Violent Behavior, 13*(1), 1-9.
- Morris, D. (1999). *The naked ape: A zoologist's study of the human animal*. New York: Delta.
- National Aeronautic and Space Association. (2008). *NASA MMO game*. Retrieved 10/7/08 from: <http://ipp.gsfc.nasa.gov/MMO/>.
- Okami, P., & Shackelford, T. (2001). Human sex differences in sexual psychology and behavior. *Annual Review of Sex Research, 12*, 186-241.
- Olson, C. (2004). Media Violence Research and Youth Violence Data: Why Do They Conflict? *Academic Psychiatry, 28*(2), 144-150.
- Olson, C., Kutner, L., Warner, D., Almerigi, J., Baer, L., Nicholi, A., & Beresin, E. (2007). Factors correlated with violent video game use by adolescent boys and girls. *Journal of Adolescent Health, 41*(1), 77-83.
- Parsons, T., Larson, P., Kranz, K., Thieboux, M., Bluestein, B., Buckwalter, G., et al. (2004). *Neuropsychologia, 42*(4), 555-562.
- Pinker, S. (2002). *The blank slate: The modern denial of human nature*. New York, NY: Penguin.
- Reiber, L., Smith, L., & Noah, D. (1998). The value of serious play. *Educational Technology, 38*(6), 29-36.
- Rhee, S., & Waldman, I. (2002). Genetic and environmental influences on antisocial behavior: A meta-analysis of twin and adoption studies. *Psychological Bulletin, 128*(3), 490-529.
- Rice, J. (2007). New media resistance: Barriers to implementation of computer video games in the classroom. *Journal of Educational Multimedia and Hypermedia, 16*(3), 249-261.
- Ritter, D., & Eslea, M. (2005). Hot sauce, toy guns and graffiti: A critical account of current laboratory aggression paradigms. *Aggressive Behavior, 31*(5), 407-419.
- Rosser, J., Lynch, P., Cuddihy, L., Gentile, D., Klonsky, J., & Merrell, R. (2007). The impact of video games on training surgeons in the 21<sup>st</sup> century. *Archives of Surgery, 142*(2), 181-186.

- Savage, J. (2004.) Does viewing violent media really cause criminal violence? A methodological review. *Aggression and Violent Behavior, 10* (1), 99-128.
- Savage, J. & Yancey, C. (2008). The effects of media violence exposure on criminal aggression: A meta-analysis. *Criminal Justice and Behavior, 35*(6), 1123-1136.
- Sherry J. (2007). Violent video games and aggression: Why can't we find links? In R. Preiss, B. Gayle, N. Burrell, M. Allen, & J. Bryant, (Eds.) *Mass Media Effects Research: Advances Through Meta-analysis* (pp 231-248). Mahwah, NJ: L. Erlbaum.
- Silverman, I., & Eals, M. (1992). Sex differences in spatial ability: Evolutionary theory and data. In J. Barkow, L. Cosmides, & J. Tooby, (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 531-549). New York: Oxford Press.
- Smith, P. (2007). Why has aggression been thought of as maladaptive? In P. Hawley, T. Little, & P. Rodkin, (eds.), *Aggression and Adaptation: The Bright Side to Bad Behavior* (pp 65-83). Mahwah, NJ: Lawrence Erlbaum.
- Steinkuehler, C. A. (in press). Cognition and literacy in massively multiplayer online games. In D. Leu, J. Coiro, C. Lankshear, & K. Knobel (Eds.). *Handbook of Research on New Literacies* Mahwah NJ: Erlbaum.
- Steinkuehler, C. & Duncan, S. (2009). Informal scientific reasoning in online virtual worlds. *Journal of Science Education & Technology*. DOI: 10.1007/s10956-008-9120-8.
- Steinkuehler, C. & Williams, D. (2006) . Where everybody knows your (screen) name: Online games as "third places". *Journal of Computer-Mediated Communication, 11*(4), article 1.
- Taylor, K. (2009). *Cruelty: Human evil and the human brain*. New York, NY US: Oxford University Press.
- Tertullian. (200). *De spectaculis*. Retrieved 10/1/08 from:  
[http://www.tertullian.org/lfc/LFC10-13\\_de\\_spectaculis.htm](http://www.tertullian.org/lfc/LFC10-13_de_spectaculis.htm).
- Trend, D. (2007). *The myth of media violence: A critical introduction*. Malden, MA: Blackwell.

VanDeventer, S., & White, J. (2002, March). Expert behavior in children's video game play. *Simulation & Gaming*, 33(1), 28-48.