Model behavior:
A comparison of models explaining how video game violence affects aggression

by

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ABSTRACT

Two competing models of aggression were tested for effects of playing a violent video game: the General Aggression Model (Bushman & Anderson, 2002) and the Catalyst Model of Violent Crime (Ferguson et al., 2008). Analyses of factors usually included in studies using the General Aggression Model were not found to match predictions of this model, as exposure to playing a violent video game did not lead to increased aggression for all participants. Consistent with the Catalyst model, effects were found for aggressive personality on aggression measures and no predictive effects were found for playing a violent video game. Long term exposure to repeated violent video game play was found to have a negative effect on aggression, contrary to predictions of the General Aggression Model.

INTRODUCTION

Modern society's relationship with the media is a complex and conflicting one. On the one hand, the creation of new media has led to democratization through the increasing accessibility of information through cinema, radio, television and the Internet. On the other hand, these media are more often used for entertainment than for information purposes. This entertainment aspect has led to a public outcry for banning vulgar and violent types of media entertainment because of their supposed corrupting influence on our youth (but not ourselves). This appears to occur with the advent of new media whenever they rise to mainstream popularity. (Anderson, 2008).

This public reaction to new media types, which are accepted by the younger generations far faster than older ones, has been called a "moral panic" (Ferguson, 2008; Grimes, Anderson & Bergen, 2008). These so called moral panics still occur to this day and currently focus on the video game industry: the newest type of medium primarily used for entertainment (for a comprehensive review of moral panics, see Grimes, Anderson & Bergen, 2008).

The act of blaming modern media for as a cause for traumatic public events was perhaps most evident in the aftermath of the Columbine school shooting. In a study on the focus of the news in the aftermath of the event, 42% of news items were about gun control, 24% about the media's effect on culture, and only 5% of news items focused on factors involving teen life and cliques, factors that may have been the cause of the incident (Lawrence & Birkland, 2004). However, the FBI's investigation into risk factors of such an event occurring showed that the focus would need to be on the personality of the student, family dynamics, school dynamics and social dynamics (O'Toole, 2000); those factors that were at most only discussed in 5% of the news items about the shooting while almost one in four of all news items were about the media effect.

The debate about the influence of the media is not restricted to the public domain. Academic studies have largely coincided with and supported these debates in the past century, always repeating the same arguments and resulting in blaming society's media for society's ills (Anderson, 2008). Studies on interventions for aggressive behavior often consider depictions of violence in the media as one of the causes for this behavior. Some, such as Schooler & Flora (1996), go as far as naming common predictors for violent behavior and crime, such as access to socio-economic resources, racism, social oppression and access to firearms, only to then state that the media serves to validate the existing culture of violence. And as such, if the media would just be removed from the equation, the behavior would cease to exist. But one may raise the question if it is art imitating life, or life imitating art?

As the video game industry has now surpassed Hollywood in terms of revenue, so too has the public debate grown in scale over the years. Unfortunately, this has lead to the mingling of academic and public spheres, for example in the case of a Congressional hearing on the dangerous effects of violent video games (Anderson, 2000).

While the academic debate on such effects rages onwards, the current study aims to provide more insight by comparing two different models that have been used to explain said effects. Additionally, moral panic claims of how extensive video game play people into future killers will be investigated.

THE GENERAL AGGRESSION MODEL

Leaving the public debate to the public realm, the current academic debate prominently features a group of strong proponents of the existence of such an effect of violent content in video games on aggressive and violent behavior. These proponents are found primarily among social learning theorists (Anderson, 2008). The model that is used the most in order to find supporting evidence for this effect in

laboratory experiments is the General Aggression Model or GAM (Bushman & Anderson, 2002), a refined version of the General Affective Aggression Model or GAAM (Anderson, Deuser & DeNeve, 1995).

This model states that people create aggression scripts through exposure to all kinds of violence, most notably from violent media and video games. As people play violent games and are exposed to violent content, they will automatically and involuntary apply these to aggression scripts and schemata, which influence the aggressive personality and may then govern how these people will behave (Anderson & Bushman, 2002). These scripts also decide what kind of behavior people will act out when they are put in an ambiguous situation that could be interpreted as a hostile situation warranting aggressive behavior (Giumetti & Markey, 2007). Every single episode of exposure to violence would lead to the appraisal and strengthening of aggression scripts as shown in Figure 1.

However, this model also implies that humans are incapable to mitigating what they learn and incapable of subjectively learning anything. Pinker (2002) calls this a "tabula rasa" approach. As humans are not passive organic machines that can just be imprinted with cognitive scripts by mere exposure, some argue that these kinds of purely passive models ultimately have little functional use for explaining behavior in the real world (Grimes, Anderson & Bergen, 2008). Although the GAM is indeed such a theoretical passive exposure model, trait aggression is usually measured as part of the "Person" factor in the model, while video game exposure is usually placed into the "Situation" factor. Because of the nature of the model, this trait aggression is in turn affected by repeated exposure to violent content; effectively stating that exposure to violence creates trait aggression, or an aggressive personality on the whole.

Most studies that use the GAM indicate a correlational effect between violence in games on aggressive cognitions (Funk et al., 2002; Uhlmann & Swanson, 2004; Carnagey & Anderson, 2005; Kirsh, Olczak & Mounts, 2005; Markey & Scherer, 2009), affect (Anderson & Dill, 2000) and physiological arousal (Anderson & Bushman, 2001). However, exactly what role aggressive thoughts created through violent games have on predicting future overt aggressive behavior remains unclear in the longer term (Sherry, 2001).

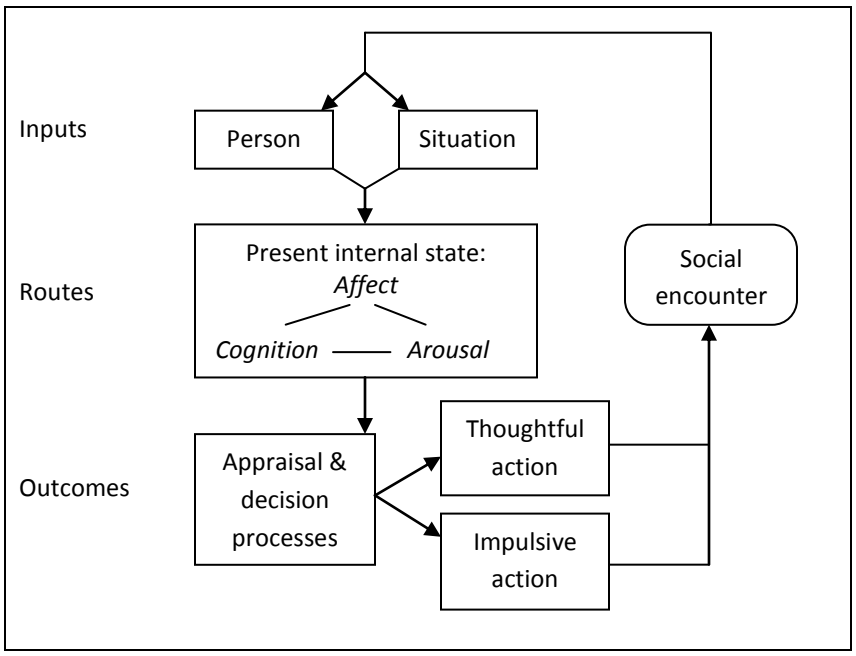

Figure 1: Single episode General Aggression Model (Bushman & Anderson, 2002)

While aggressive personality is the main predictor of violent behavior (Ferguson et al., 2008), the most common experimental aggressive personality measure to mediate violent media exposure effects on aggression in the violent video game literature is trait aggression (Anderson & Dill, 2000; Uhlmann & Swanson, 2004). Hostility, as a part of trait aggression, has also been shown to have a mediating effect on how exposure to violent video games affects short-term aggression measures (Gentile et al., 2004). However, many studies have also shown that the effect that violence in games has on people varies greatly and multiple factors have been shown to have a mediating effect on how videogame violence can affect short-term aggression.

DeVane & Squire (2008) showed that players used their own knowledge and experiences to give meaning to what happens in the virtual world they play in. Besides people's real life experiences, personality factors other than just trait aggression play a big role. Psychoticism has been found to be a predictor of both higher aggression as well as more enjoyment of violent content in media (Lynn, Hampson & Agahi, 1989). After being exposed to violent content, children with high psychopathy showed increased psychophysiological changes after exposure to violent content, while normal children did not show such effects (Grimes et al., 2004). Markey & Scherer (2009) found higher levels of state hostility and more aggressive cognitions after playing a violent video game, but this effect was mediated by levels of psychoticism: more psychoticism led to higher aggression levels after playing.

The problem with the GAM methodology is that it states that aggressive personality does not only mediate how violent content is appraised, but is considered to show a causal effect of exposure to violent content on actual violent behavior. While an aggressive personality makes people feel more aggressive after playing a violent video game for instance, the GAM claims that this in turn reinforces the aggressive personality through the creation of aggression scripts. However, it also claims that nobody is immune to these exposure effects, effectively stating that exposure to violence leads to a more aggressive personality which in turn leads to more aggression after further exposure, ad infinitum. If this were true though, the past 100 years of exposure to violence in the media through entertainment and news would have turned every human being with access to media into pathologically aggressive persons (Grimes, Anderson & Bergen, 2008).

Despite the fact that this is just not the case in reality, these causal claims have been attacked ever more often in the last couple of years. Not only are there counter claims that no such causal relationship has been proven to date (Ferguson, 2009), serious concerns over publication bias for these causal link studies have also been raised (Ferguson, 2007). Furthermore, the strength of the conclusions over these causal effects is not matched by equally strong results (Sherry, 2001; Olson, 2004). Also, the effects found for media violence on aggression do not explain a majority of the variance in such studies (Ferguson, 2002). No evidence of a real effect on actual criminal activity has been found either (Savage, 2004; Browne & Hamilton-Giachritsis, 2005), nor have long term effects of video game violence on aggressive cognitions or behavior been found (Williams & Skoric, 2005).

Most importantly, many positive effects have been found for video game playing. Most children play video games nowadays, and naturally they play the games that are the most popular, which tend to be relatively violent. Kutner & Olson (2008) found that children use all kinds of games, including popular violent ones, as a platform for social interaction and for sharing ideas with their peers. In fact, children who did not play any video games were more likely to be outcasts and would be more at risk of future violent behavior. For adolescent males, violent video games are used to freely explore a controlled virtual environment where they can experiment without any real life implications (Jansz, 2005). Jansz claims that this way, young males can form their identity without needing to conform to male archetypical behaviors in the real world society; something that tends to create a great deal of stress (for a full review see Jansz, 2005).

Video games can not only be used to experiment without penalty or as a social means of interaction, but they have also been found to have positive effects outside of the social realm. Playing violent first person shooter games has been found to lead to increased visuospatial skills (Ferguson & Cruz, 2008). Even playing Tetris as a memory formation interruption tool has been found to positively affect people with Post-traumatic stress disorders (Holmes et al., 2009).

THE CATALYST MODEL

While the GAM predominantly includes media violence as a causal factor for aggression, a recent model by Ferguson et al.(2008), the Catalyst model, attempts to incorporate possible media violence effects in a way that encompasses both the human being as a person and by using an evolutionary framework for aggression rather than a social learning one. This model uses aggressive personality as the main factor in violent behavior. However, merely having such a personality does not equate actual violent behavior. As can be seen in Figure 2, multiple paths of effect can be taken. Someone needs to have a motivation for violence before behaving violently, similar to how intention is required for behavior in the Theory of Reasoned Action (Ajzen & Fishbein, 1980). This motivation can be stimulated by environmental strain, such as stress caused of social or economic problems. Such environmental factors are called the Motivational Catalyst and its effect can be found all too commonly in inner city areas or even on the news, when a family drama has occurred when someone resorts to killing his family because of economic problems.

In an entirely different fashion, how violent behavior is acted out once the motivation to do it is there can be influenced through a Stylistic Catalyst. Someone with an aggressive personality may have more violent cognitions about things. These cognitions can be further supported by violent media or peer exposure, resulting in ideas on how violent behavior should be acted out. However, contrary to the GAM, this path does not affect *if* violent behavior occurs but only stylistically influences the way *how* it is acted out. For instance, people who watch the movie The Matrix will not generally start buying M-16 assault rifles and storming office buildings. However, if someone has an aggressive personality, is marginalized at school (a Motivational Catalyst) and decides to start shooting classmates and teachers he/she thinks deserve to die, then someone like that may dress in long black overcoats and may prefer to use automatic weapons rather than say, a shotgun or hunting rifle, after watching The Matrix many times.

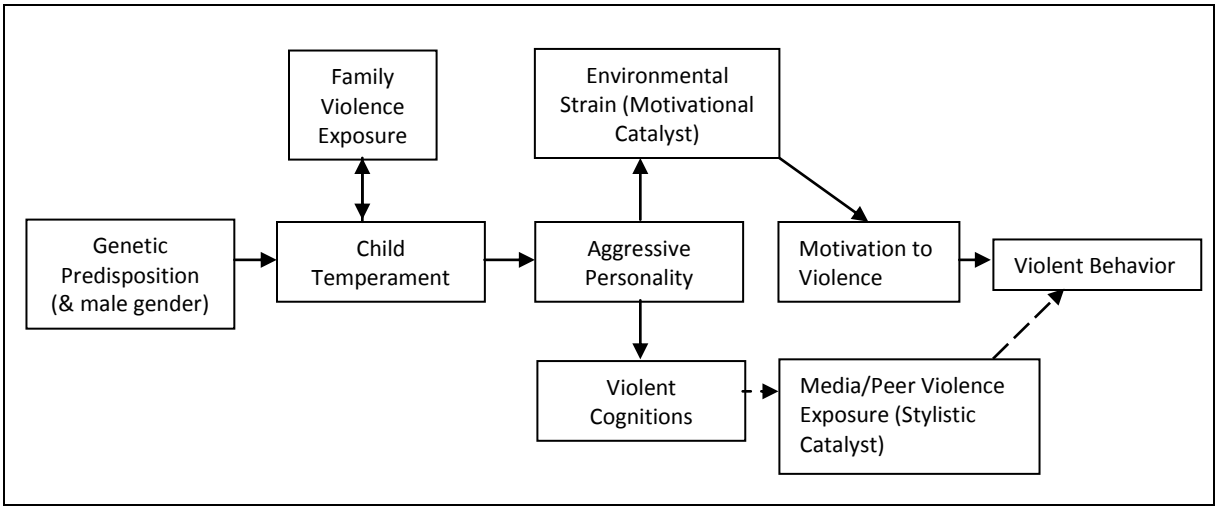

Figure 2: The Catalyst Model of Violent Crime (Ferguson et al., 2008)

Zillman & Weaver (1997) found that high levels of psychoticism leads to more acceptance of violence after watching modern violent movies, while this was not the case for older violent movies. If media violence is to affect the Stylistic Catalyst path, it will likely need to be relatively new or "cool" enough to model after. Most importantly, and also contrary to the GAM, the Catalyst model states that exposure to media violence does not equate nor predict future violent behavior, but may influence how it is acted out. Removing access to one type of media violence will not prevent a motivation for violent behavior to remain; if someone wants to perform a violent crime, this person will do that regardless of how many violent games or movies someone has played or seen.

The aggressive personality itself is predicted to be influenced by childhood factors and genetic predispositions. Being exposed to family violence when growing up can attribute to the formation of such a personality. Such effects are compounded by a genetic predisposition, including gender. A study on sibling's effects of watching violent media found that aggression was not influenced by differences in violent media exposure between siblings (Lynn, Hampson & Agahi, 1989).

Putting the GAM and Catalyst model side by side for video game violence effects, the GAM is focused on measuring aggression after exposure to a video game while the Catalyst model focuses measuring predictors of violent behavior with video games as one of many stylistic factors. While both models take different routes to explain aggressive and violent behavior, they can be used to view different ways of how video games can affect this behavior. While the GAM predicts an effect on hostile affect and cognitions after a single episode of violent video game play, the Catalyst model predicts this effect will not be found. The GAM also predicts that a high level of repeated exposure to violent games leads to more aggressive scripts in those that play these types of games a lot, compared to those that never do. As such, this exposure would lead to more aggressive appraisal of situations and a choice for aggressive behavior when that choice exists. The Catalyst model on the other hand does not say anything about an effect of repeated exposure on such aggressive behavior. This behavior would be caused by an aggressive personality, not exposure to video game violence.

METHODOLOGICAL CONCERNS WHEN STUDYING VIOLENCE IN VIDEO GAMES

While the GAM and Catalyst model have different means of measuring predictors for aggressive behavior, a further concern is not *what* to measure but *how* to measure these effects. A common complaint of media violence studies is their experimental nature: results in the laboratory do not necessarily reflect effects on real world behavior. However, such experimental studies are relatively cheap to conduct and sometimes the option to perform studies outside of the laboratory is not available. Besides these validity complaints, the methodology of many experimental studies on violent video games is not always sound. For instance, Anderson & Dill (2000) used Doom as a violent video game, which is a game that even in 2000 was considered to be an ancient game by adolescents who are generally deemed to be at risk by playing violent video games. A study on video games should use contemporary games from what is called the "current generation" of games. Such generations are mostly defined by the hardware running the software: new game consoles, video cards and faster PCs running more advanced games. In the present day, the current generation is defined by the Xbox 360, PlayStation 3 and Wii consoles and mid-range to high-end PCs. And as the concern of GAM experimenters is often that as technology progresses, exposure to violence becomes more and more lifelike though advanced in graphics, studies that test GAM predictions should at least use the latest generation of games.

Another example of methodological problems is a lack of understanding of the games being used and how they are perceived, as evidenced by Kirsh, Olczak & Mounts (2005). In their study, an emotional Stroop test uses words like "death", "threat" and "enemy" as negative valance words compared to

neutral words. The games that were used however were House of the Dead 2 and Kayak Extreme. House of the Dead 2's setting is all about death, threats and enemies as you shoot zombies with a cursor and have a limited amount of lives to worry about: it is only logical that those words would be recognized easier. Yet no words like "water", "rapids" or "boat" were used as control for Kayak Extreme. This way, whether cognitions are just associated with the game being played or whether violent cognitions are really more readily available is not proven at all. What was measured was not how violent games prime aggressive cognitions, but how a game primes the availability of words that are associated with that game, compared to how a totally different game primes words that have nothing to do with it. Both games also differed greatly in terms of how players control them, what the perspective of the player is, whether they are on the same level of technological complexity or graphics, the list goes on and on. Therefore, it is important to clearly define the games that are being used in an experimental study.

THE PRESENT STUDY

This study was designed to test GAM and Catalyst model predictions for the effects of playing a violent video game on aggression in an experimental study, while attempting to control for methodological pitfalls. Two hypotheses were tested to confirm both models' predictions. Because many of the experimental studies that use the GAM share the same design, this type of design was mirrored to test both hypotheses. This design uses a video game with a great deal of violent content and one that can be considered to consist of non-violent content.

As trait aggression can have a mediating effect on how violent video game exposure affects aggression (Giumetti & Markey, 2007), it was included to match the GAM type of design. Using this design, the first hypothesis was tested to attempt to confirm predictions of the GAM:

> *Hypothesis 1*: Playing a violent video game in a laboratory setting results in increased aggression when compared to playing a non-violent video game. The availability of trait aggression will increase this effect.

Not only should exposure to a violent video game result in an increase of short-term aggression, but it should also lead to a higher preference for aggressive behavior when confronted with conflict situations. However, as the Catalyst model predicts that aggression is rooted in an aggressive personality, which in turn is caused by genetic and family factors, it suggests that exposure to a violent video game will not affect the occurrence of aggressive behavior. Instead, it suggests that any aggression should be explained by personality factors. As such, the second hypothesis was tested to attempt to confirm the predictions of the Catalyst model:

> *Hypothesis 2*: Playing a violent video game in a laboratory setting will not result in increased aggression but this will be rooted in personality.

If exposure to playing a violent video game results in significantly increased aggression, the GAM would be supported. Likewise, if no such effects are found for this exposure, but instead can be explained by aggressive personality, the Catalyst model would be supported.

The present study furthermore investigated the claim that people who play a lot of violent video games will be significantly more aggressive. Contrary to such claims in the media, an interesting effect was found by Bartholomew, Sestir & Davis (2005). They found that people who had a high and repeated exposure to violent video games were actually less aggressive after playing a violent game than people

who had a low exposure to such games. The GAM explicitly states that such high exposure should lead to more aggression.

To this end, a profile of a "heavy gamer", who of all people spends the most time on playing video games, was created from data from the study. Contrary to media fears, this type of gamer (also often called "hardcore gamer" in gamer culture) generally claims that playing violent games does not make them act more violent in actual behavior at all. This type of gamer also tends to play the most popular and critically acclaimed games, which tend to be high in violent content. Therefore, a third hypothesis was tested to investigate the effect of extensive video game playing behavior on aggression:

> *Hypothesis 3*: People who spend the most time on playing video games will have a significantly higher level of aggression than other people.

If the GAM predictions were found to be correct, the high and continuous exposure to video games (most of which contain violent content) should lead to the confirmation of this hypothesis and result in increased aggression for this Heavy gamer group. However, the Catalyst model states that exposure to violent media does not affect aggression. Therefore, if no such effect was found, the GAM would not have been supported and instead the Catalyst model would have proven to contain a superior framework for the effect of exposure to violent video games on aggression.

To counter concerns of methodological soundness and to minimize the inevitable effect of differences between the video games used in the present study, a set of standards were created to keep the games as similar as possible in a number of ways. First of all, the games needed to reflect a current generation of games, the type of games that people were actually likely to play outside of the laboratory. The games that were tested needed to be of sufficient quality so that the players were sufficiently immersed in them. The games also needed to be sufficiently accessible for any level of experience with video games; veterans and novices are not equally capable of learning novel control schemes or gameplay times. As such, the controls for the games being used needed to be similar in nature: a PC game controlled by the mouse and keyboard is not likely to be used as efficiently by a heavy gamer as a non-gamer and cannot be compared to a game controlled by another type of controller such as a gamepad or a joystick. Finally, both games had to share a similar level of story immersion in the time they were being played, because the importance of a story for immersion is deemed to be very high (Schneider et al., 2004). If one game takes 20 minutes to tell a story before control is handed over to the player, it cannot be compared to a game with no story that starts right away. The context in which actions are taken in the virtual environment (gameplay and story being a key factor) must be adequately described (Sherry, 2001).

METHOD

PARTICIPANTS

74 students were recruited from Psychology and Communication Studies courses at the University of Twente. The subject population consisted of 44 (59.5%) males and 30 (40.5%) females. 67.6% was of Dutch nationality while 32.4% was German. The mean age for this group was 22.5 years, ranging from 18 to 29. Two groups of 37 subjects were randomly selected for both video game conditions. Males and females were equally distributed among these two groups.

MATERIALS

In concordance with the proposed set of standards for selecting video games for the present study, the used games are described in detail. Two Nintendo Wii games were used for this study: MadWorld[1] and Super Mario Galaxy[2]. Both games received high critical praise and have average review scores of 81% and 97% respectively on www.metacritic.com. The Nintendo Wii is considered to be mostly a "fun" game console with a game library consisting mostly of family friendly games. It is also less popular among students than the PC or the Xbox360 or PlayStation 3 consoles, which are considered to be more "hardcore" gaming systems. As such it was expected that not many participants would have experience with the controls, leveling the playing field of required learning. The Wii controls, with its motion controls and sparse button use in most games, are also relatively easy to learn compared to the many keys of the keyboard and the required mastery of mouse controls in PC games, or the many similar buttons on an Xbox360 or PlayStation 3 controller and the required mastery of the dual analog stick control schemes for these controllers. Concerns that motion controls would lead to significantly different effects compared to non-motion controls have been addressed by Markey & Scherer (2009), who found no such difference between control schemes.

In MadWorld, the player runs around in a 3D black and white world where red blood and yellow comic book style captions of "VRRRRR" are the only color. The graphical style is very similar to the violent movie Sin City and as that movie is based on a comic book, the game also shares a comic book style in its presentation. The player in MadWorld has a chainsaw mounted on his arm, which can be used by swinging the Wii remote in different directions. The goal of the game is to progress through different stages in a level, by beating up and killing enemies in the most brutal way possible for a maximum amount of points. For instance, the maximum amount of points in the beginning of the game is awarded by beating up a thug until he is stunned, then slamming a trashcan over his head, picking up a Stop sign and impaling him with it, and then picking him up to throw him into a set of meat grinders. The player is further encouraged to do so by two commentators who applaud your violent ways of dispatching enemies.

In Super Mario Galaxy, the player plays as iconic Nintendo character Mario in a colorful 3D world. The goal is to explore by jumping around platforms and finding your way to a giant star which indicates the end of a level. The world is inhabited by rabbits, talking toads, princesses and fantasy enemies that should not look frightening in the least to the participants of this study.

[1]Published by Sega, 2008, [2]Published by Nintendo, 2007

While MadWorld may be the most violent game on the Nintendo Wii, it is the only ultraviolent game on this system that is rated highly by critics. Manhunt 2, a controversial violent game that was banned in several countries, also requires the player to kill his enemies in brutal ways, but suffered from bad controls and not very fun gameplay. As such, the two games used in this study are games that not only reflect violent and non-violent content, but are also games that do not suffer from excessively complex controls or bad gameplay. The two games also share a similar camera perspective, similar controls (using the Nunchuk controller to move around and the Wii remote to attack and perform actions) and both games require the player to use approximately the same amount of motion control to attack. Both games spent a similar amount of time on story introduction. In Super Mario Galaxy, the story can be considered to be inconsequential to the gameplay. In MadWorld, the same can be said for the story as it doesn't become important until after the time that participants spent playing it.

MEASURES

Socio-economic childhood factors

Participants rated their family's income when they were growing up, and how they would rate the worst and best neighborhood they grew up in on a scale of 1-10 (1= lowest/worst , 10=highest/best).

Media consumption

Participants filled out an array of questions about the amount of hours a week they spent watching TV and/or movies. As students generally download a lot of movies and TV shows that don't air on TV, they were told to include the amount of time they watched these. They also filled out which genres of TV shows and movies they preferred. The list of genres was taken from iMDB.com's genre list of top-rated movies.

Participants also filled out how many hours a week they spend on playing video games. If they never played video games, this was entered as 0 hours. If they did play games, the systems they played them on were filled out on a list containing the PC, all consoles and handheld systems from the past 20 years. Most participants owned a PC (81.1%). Other than PCs, consoles from the last generation were the most prevalent in ownership: Xbox1 (16.2%), PlayStation 2 (12.2%) and GameCube (4.1%). Current generation consoles were slightly less common: Xbox360 (10.8%), Wii (10.8%) and PlayStation 3 (4.1%). The low occurrence of current generation console ownership meant that participants in the current study who play games were largely PC gamers.

Game preferences

Preferences for gaming genres were rated on a scale of 1-5 (1 = Strongly disagree, 5 = Strongly agree). A list of genres was taken from Gamespot.com. Some obscure genres like Parlor games and Card battle games were removed from the list, while Sports genres were only displayed one genre: Sports. All genres had one or more examples of some of the defining games for the genre in parenthesis behind the genre name, in order for participants to easily identify the genres.

Furthermore, participants gave their level of preference for the camera perspective or Point of view (POV) in games on a scale of 1-5 (1 = Strongly disagree, 5 = Strongly agree). The options offered were First Person, Third Person, 2D, Isometric, Fixed camera and No preference.

Preferences for how much a story matters to participants were also rated on a scale of 1-5 (1 = Strongly disagree, 5 = Strongly agree). Three options were given for liking a story: loving a story and only playing it if it has a good story, liking a story to see how it ends, liking a story but usually skipping through them. Three other options were given for not caring about a story: not caring because only the gameplay counts, not caring because it is always the same story and not caring about stories, period.

Trait aggression

The Buss-Perry Aggression Questionnaire – Short Form (BPAQ-SQ) was used to measure trait aggression. This shortened version by Bryant & Smith (2001) of the original BPAQ (Buss & Perry, 1992) contains 12 items spread over four subscales: Physical Aggression, Verbal Aggression, Anger and Hostility. Items were scores on a scale of 1-5 (1 = Very unlike me, 5 = Very like me). Within the current sample, the BPAQ-SF obtained an alpha coefficient of .76.

Personality

To test for possible levels of psychopathy, the short scale version of the Eysenck Personality Questionnaire – Revised (EPQ-R; Eysenck, Eysenck & Barret, 1985) was included. This scale consists of 48 items rated True or False. Items are divided into four subscales: Psychopathy, Extraversion, Neuroticism and Lie.

Family Conflict Scale

The Family Conflict Scale (FCS) by Ferguson et al. (2008) was used to test for childhood exposure to family violence. Consisting of item True/False items, this scale has subscales for exposure to physical abuse, exposure to family domestic violence, family of origin's use of spanking, exposure to verbal abuse, perceptions of a lack of care giving by the family, exposure to alcohol and/or drug abuse, perceptions of parental valuation of education and perceptions of parental affection. The FCS was found to have an alpha coefficient of .69.

State Hostility Scale

To test the aggressive affective state, the State Hostility Scale (SHS; Anderson, Deuser & DeNeve, 1995) was used. Items like "I feel furious" were rated on a scale of 1-5 (1 = Strongly disagree, 5 = Strongly agree). Although originally a 32-item scale, 3 items contained English words (willful, tender, vexed) which, according to the scale manual, participants had trouble understanding. These items were excluded in the present study. In GAM literature, this scale is used to measure aggression on the affective route of the model and is mostly used to measure short-term aggression effects.

Aggressive Provocation Questionnaire

The Aggressive Provocation Questionnaire (APQ; O'Connor, Archer & Wu, 2001) contains 12 stories with provocative conflict scenarios. One example is that you are in a great hurry and a car stops in front of you. A man gets out of the car but continues to talk to the driver, ignoring your calls to move while you cannot get past the car. Participants rate how they would feel in the given situation on a scale of 1-5 (1 = Not at all, 5 = Extremely) on the items Angry, Frustrated and Irritated. They were asked to rate all three feelings. They also had to choose one of give possible responses, which were encoded to be either an aggressive response, assertive response, doing nothing, feeling distant anger and avoiding the

situation. For the present study, the focus was on how many selected responses were of the aggressive kind.

The APQ provides insight into how participants would feel about certain situations after playing a violent or non violent game. It also asks participants to think about the situation. If the GAM is correct, aggression scripts will play a role in evaluation how to deal with these situations, and if participants have been exposed to a lot of media violent over many years, they would choose more aggressive responses. And as Anderson & Bushman (2001) state: "Perhaps the most important single cause of human aggression is interpersonal provocation". Following the GAM, a single episode of exposure to the violent game should also lead to a significant effect on selections of aggressive choices of behavior in the APQ.

Control questions

Some control questions that Ferguson et al. (2008) used in their study were included. These questions required participants to rate if the game they had just played was fun, exciting, frustrating, how competent it made them feel and if they would play it again.

Heavy gamer type profile

A profile of a type of "heavy gamer" in the current study was created from the amount of time that participants spent on video games. This profile would then be used to analyze if effects on aggression differed between this type of gamer and others who do not spend as much time playing video games.

PROCEDURE

Participants were seated in one of three relatively soundproof rooms containing a desk, a desk chair, one of three identical 51cm/20" standard definition flat-screen CRT televisions and a Wii console. The Wii consoles had been set up in advance so participants could start playing as fast as possible.

After filling out a waiver form, participants filled out a questionnaire containing all described measures except for the SHS scale, the control questions and the APQ. When they had completed the survey, they notified the experimenter who turned on the TV and asked them if they had prior experience with playing games on the Wii. Depending on experience, the button functions, button locations and how the Wii controllers work were explained to participants. Then participants were given the Wii controllers to start up a new game, giving them the chance to familiarize them with the controls.

After they had started a new game, the experimenter left. After 30 minutes, participants were told to stop playing the game and were given a second questionnaire containing the SHS, control questions and the APQ. The time spent on both games included about 3-5 minutes of story introduction before control was handed to the player. The total time spent on completing the questionnaires and playing the game was between 1 and 1.5 hours.

RESULTS

The results for media violence exposure descriptives, trait aggression, personality and childhood factors are described first, as they were used in subsequent analyses. Unless explicitly dummy coded, gender was coded with males as 1 and females as 2, while the video game condition was coded with the violent game as 1 and the non-violent game as 2.

Exposure to media violence

The average amount of time spent on watching TV and/or movies was 10.9 hours a week, with no significant gender difference. The Action genre was the most popular with an indicated preference for 70.3% of all participants. Males (M = 0.73) preferred this genre more than females (M = 0.40), $F(1, 73) = 8.64$, $p < .01$. The average amount of time spent on video games was 5.13 hours a week, ranging between 0 and 40 hours. Gender had a large effect on average weekly gameplay, $F(1, 72) = 19.06$, $p < .01$ as males played an average of 8.06 hours while females played an average of 0.93 hours a week. On average, participants started to play video games at an age of 8.97 years, and violent games at 11.95 years. No gender effect was found on starting age for either type of video game.

Trait aggression

Scores for trait aggression measured by the Buss-Perry Aggression Questionnaire – Short Form (BPAQ-SF; Bryant & Smith, 2001) are displayed in Table 1. Scores were summed for both the complete scale and the subscales. On the Physical Aggression subscale, significant differences for gender, $F(1, 73) = 4.68$, $p < .05$, were found. Overall, scores were low for the BPAQ-SF, indicating that participants in the current study did not have a very aggressive personality.

Table 1
Mean scores for trait aggression subscales and total scale

	Total		Males		Females		Possible total score
	M	S.D.	*M*	S.D.	*M*	S.D.	
Physical Aggression	5.76	2.32	6.22	2.53	5.07	1.80	20
Verbal Aggression	7.73	2.45	8.00	2.54	7.33	2.28	15
Anger	5.20	2.20	5.07	2.21	5.40	2.21	10
Hostility	6.70	2.01	6.89	2.14	6.43	1.81	15
Total Scale	25.39	6.07	26.18	6.34	24.23	5.56	60

Personality

The short-scale Eysenck Personality Questionnaire-Revised (EPQ-R; Eysenck, Eysenck & Barret, 1985) yielded varying (Table 2. Each subscale had a possible total score of 12. The high score on the Lie subscale raises concerns about the trustworthiness of the results. A significant correlation was found between Extraversion and Lie scores (r = .30, $p < .05$), but not with any other subscale. Psychoticism was significantly related to the male gender, $F(1, 72) = 4.56$, $p < .05$.

Table 2
Mean scores for EPQ-R subscales

	Total		Males		Females	
Subscale	*M*	S.D.	*M*	S.D.	*M*	S.D.
Psychoticism	3.26	2.15	3.70	2.20	2.63	1.94
Extraversion	8.49	2.97	8.05	3.18	9.13	2.56
Neuroticism	4.30	2.96	3.89	2.51	4.90	2.87
Lie	7.25	1.86	7.53	1.88	6.83	1.78

Childhood factors

Participants rated their family's income when growing up as 6.57 on average. They also rated their average worst and best neighborhood they grew up in as 6.55 and 7.43 respectively. Family income was correlated with the worst neighborhood (r = .50, p < .01) and best neighborhood (r = .58, p < .01) they lived in. As a higher income would ordinary lead to a better neighborhood, these results indicated that participants were truthful about their answers.

Exposure to family violence was very low for participants in the current study, as shown in Table 3. Mean scores were calculated by summing scores on subscales items (0= false, 1=true). A total score was created by inverting scores for the subscales of perceptions of parental valuing of education and parental affection and then summing all subscale scores, effectively creating a total score for negative family effects.

Table 3
Scores for Family Conflict Scale subscales and total recoded scale

Subscale	*M*	S.D.	Possible total score
Exposure to physical abuse	0.16	0.44	6
Exposure to family domestic violence	0.28	0.68	11
Family of origin's use of spanking	0.15	0.43	4
Exposure to verbal abuse	0.35	0.73	9
Perceptions of lack of care giving	0.12	0.34	4
Exposure to alcohol and/or drug abuse	0.84	1.12	5
Perceptions of parental valuing of education	4.11	0.84	5
Perceptions of parental affection	4.70	0.76	5
Total recoded scale	3.01	2.70	49

The following correlational effects for family income and living environment on family violence exposure were found. Exposure to physical abuse significantly correlated with family income (r = -.33, p<.01) and the best neighborhood lived in (r = -.39, p<.01) but not with the worst neighborhood lived in. Likewise, perceptions of a lack of caring by parents was significantly correlated with both family income (r = -.34, p<.01) and best neighborhood (r= -.32, p<.01) but not with worst neighborhood. However, exposure to verbal abuse was related to family income (r = -.45, p,.01), worst neighborhood (r = -.48, p<.01) and best neighborhood (r = -.43, p<.01). The low scores for both the subscale and the total recoded score, as well as the above average family income and the high score for the best neighborhood, indicated that participants came from relatively good family environments. The negative correlations that were found for family violence effects supported this.

General Affection Model effects

A number of analyses were conducted to test the first hypothesis that GAM predictions would be correct by finding an effect for playing a violent video game in a laboratory setting, mediated by trait aggression, on increased aggression.

First, scores on the State Hostility Scale (SHS; Anderson, Deuser & DeNeve, 1995) were analyzed. Participants who played the violent game had a higher mean score on the SHS (M = 84.7, SD = 21.88) than participants who played the non-violent game (M = 58.39, SD = 14.41). Figure 3 illustrates this difference between scores for the two game conditions. The significance of this effect was tested with an analysis of covariance (ANCOVA), with the total SHS scores as the dependent variable, gender and video game condition as fixed factors, and trait aggression subscales as covariates. This model was significant, $F(7, 73) = 10.74$, $p < .01$. No main effects for trait aggression were found except for the hostility subscale, $F(1, 73) = 6.59$, $p < .05$. A large main effect was found for the video game condition, $F(1, 73) = 36.87$, $p<.01$. An effect for gender showed a tendency towards significance but did not reach it, $F(1, 73) = 3.89$, $p=.053$, and no significant effect was found for gender x video game condition interaction, $F(2, 73) = 0.34$, $p=.56$.

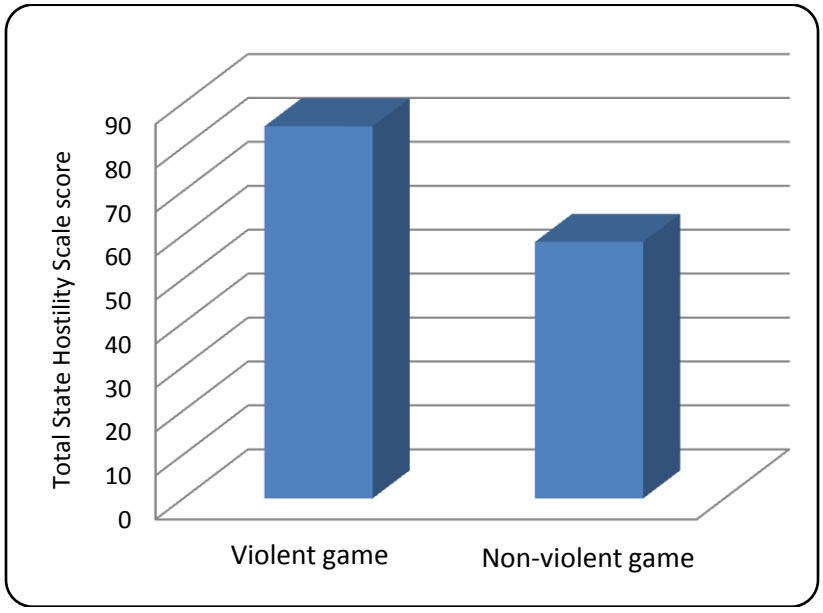

Figure 3: State Hostility Scale scores between video game conditions

Playing a violent video game led to significantly higher SHS scores than playing a non-violent game, which supported the first hypothesis. Furthermore, a significant effect for Hostility was found. Participants in the violent game condition had a higher, but not significantly higher mean Hostility score (M = 6.95, SD = 1.90) than those in the non-violent game condition (M = 6.46, SD = 2.12), $t(72) = 1.04$, $p = .30$. The lack of a significant difference indicated that hostility only had a positive mediating effect on SHS scores for participants in the violent game condition.

To further investigate claims of the GAM about the effect of exposure on aggression, a second ANCOVA was conducted. This one was similar to the previous ANCOVA, with SHS scores as the dependent variable, gender and video game condition as fixed factors, and trait aggression subscales as covariates. But this time the exposure factors of the amount of time spent on watching TV and movies, time spent on playing video games, and the age at which participants played their first violent

videogame were also entered as covariates. The results did not differ much from the previous analysis. The model was significant, $F(10, 73) = 7.07$, $p < .01$. Significant effects were again found for hostility, $F(1, 73) = 4.79$, $p < .05$, and the video game condition, $F(1, 73) = 29.97$, $p < .01$. The effects for both Gender and Gender x Video Game interaction were not significant, $F(1, 73) = 0.00$, $p = .97$; $F(2, 73) = 1.58$, $p = .21$. The effect of time spent on gaming was significant, $F(1, 73) = 4.62$, $p < .05$. Neither time spent on TV and movies nor the starting age for playing violent video games had a significant effect, $F(1, 73) = 0.05$, $p = .82$; $F(1, 73) = 1.51$, $p = .23$.

As the GAM claims that exposure to violent content and trait aggression predict short-term effects on creating an aggressive affective state, the way in which the effects found in the ANCOVA would predict scores on the SHS was analyzed by means of a linear regression for gender, video game condition, hostility and the amount of time spent on games. Gender and the video game condition were both dummy coded for this regression analysis (0 = male, 1 = female; 0 = non-violent game, 1 = violent game). Results, shown in Table 4, indicated a positive predictive relationship, $R = .71$ ($R^2 = .51$), that was significant, $F(4, 72) = 17.71$, $p < .01$. Exposure through the average amount of time spent on gaming did not have a significant predictive effect on SHS scores, nor did gender. However, trait hostility and playing the violent video game were found to be significant predictors for SHS scores. Similar to Giumetti & Markey's (2007) findings for trait anger as a moderating effect on playing a violent game, hostility significantly moderated the effect of the video game condition.

Table 4
Summary of Regression Analysis for Variables Predicting State Hostility (N = 74)

Variable	B	SE B	β
Gender	3.81	4.42	.86
Video game	24.05	3.86	.53**
Hostility	3.83	0.99	.34**
Average time spent on gaming	-.52	0.29	-.18

Note. $R^2 = .51$. *$p < .01$

While hostility moderated how exposure to a violent video game affects the aggressive affective state in a positive direction, long term exposure to video games did not. This last finding does not support the GAM prediction about the effect of long term exposure leading to increased aggression.

Although the effect of playing the violent game on the aggressive affective state, as measured by the SHS, was found to be large, the GAM also predicts that participants who played the violent game would select more aggressive responses in provocative situations (Bushman & Anderson, 2002). To test this effect, results for the Aggressive Provocation Questionnaire (APQ; O'Connor, Archer & Wu, 2001) were analyzed. The APQ uses both affective aggression measures by having participants rate how they would feel in certain provocative scenarios and requires participants to select how they would respond in such a scenario, which according to the GAM would both be influenced by short and long-term violent game exposure.

The affective measures indicated that participants did not differ in terms of how they felt in the proposed provocative situations, as no significant differences were found for feeling angry after playing the violent game ($M = 27.03$, $SD = 9.40$) compared to playing the non-violent game ($M = 28.62$, $SD = 7.19$), $t(72) = -0.82$, $p = .42$, feeling frustrated after playing the violent game ($M = 28.11$, $SD = 9.24$) compared to the non-violent game ($M = 25.76$, $SD = 9.31$), $t(72) = 1.090$, $p = .28$, or feeling irritated after

playing the violent game (*M* = 30.51, *SD* = 8.72) compared to the non-violent game (*M* = 30.35, *SD* = 9.13), *t*(72) = 0.08, *p* = .94. These findings are in striking contrast to the findings on the affective measures of the SHS. According to the GAM, both measures should have found a similar effect on the aggressive affective state after playing the violent game.

No difference was found for the selection of aggressive responses either, with selections for the violent game condition (*M* = 1.05, *SD* = 1.10) and the non-violent game condition (*M* = 0.97, *SD* = 0.80), *t*(72) = 0.36, *p* = .72, being both not significant and very small; on average participants in both groups only selected one out of twelve possible aggressive responses. This finding of such a small number of selections indicated that no effect for exposure to violent video game play existed.

To investigate this apparent lack of difference between video game conditions on both affective measures and aggressive response selections in more detail, ANCOVAs similar to the previously described ones were conducted on levels of anger, frustration, irritation and selections of aggressive responses. These analyses used total scores for feeling angry, frustrated and irritated and selections of aggressive responses as the dependent variable. Fixed factors were gender and video game condition, while trait aggression subscales and the amount of time spent on games were entered as covariates. While the amount of time spent on gaming has previously been shown to have no significant effect on SHS scores, the GAM is adamant about the effects of this exposure factor and it was therefore included in the current analyses. The resulting models for feeling Frustrated, Irritated and the model for Aggressive responses were all found not to be significant, *F*(8, 73) = 1.21, *p* = .31; *F*(8, 73) = 0.97, *p* = .47; *F*(8, 73) = 1.99, *p* = .06, respectively. The model for feeling angry was significant, *F*(8, 73) = 3.00, *p* < .01,. However, only the physical aggression subscale of trait aggression was found to have a significant effect on these feelings of anger, *F*(1, 73) = 7.94, *p* < .01. The effects of time spent on gaming and the video game condition in that model were both found to be not significant, *F*(1,73) = 3.20, *p* = .08; *F*(1,73) = 3.49, *p* = .07. Furthermore, a simple bivariate correlation between total SHS scores and scores of feeling Angry, Frustrated or Irritated found no significant effects, indicating there was no link between these two types of affective aggression measures.

These analyses showed that while playing a violent game led to higher SHS scores, this type of violent game exposure was not found to have an effect on any of the APQ scores; only a single main effect on feelings of anger was found for physical aggression. This is not only contrary to GAM predictions, as no effect for playing a violent game was found on aggression measures in the APQ, but is instead consistent with the Catalyst model, which predicts that only aggressive personality should affect any aggression such as measured by APQ scores.

Catalyst model effects

According to the Catalyst model, the gender, childhood factors and personality factors, with a stylistic catalyst of exposure to violent content, would create a hierarchical effect on violent behavior which is measured by the SHS and APQ scores in the present study. To test if such an effect existed in the present study and to test the second hypothesis, which stated that no effect for playing a violent game on aggressive preference would be found but instead would be caused by an aggressive personality, a number of analyses were performed.

First, the effects of the Catalyst model's predictive factors on aggression measures were analyzed separately. Multiple ANCOVAs were conducted with scores for the SHS and APQ reports of feeling angry, frustrated, irritated and aggressive selections as their respective dependent variables. This time, gender and the video game condition were entered as fixed factors, with trait aggression and EPQ-R scores on the Psychopathy, Extraversion and Neuroticism subscales entered as covariates in an attempt to provide more insight on personality factors. However, EPQ-R scores were found to have no significant effect in any of these analyses. The model for SHS scores was significant, $F(10, 73) = 7.27$, $p < .01$, with effects for hostility and the video game, $F(1, 73) = 5.69$, $p < .05$; $F(1, 73) = 34.95$, $p < .01$ respectively. These results were similar to those performed to test the GAM; further indicating that personality as measured by the EPQ-R did not affect SHS scores in the current study.

The models for feeling frustrated and irritated as well as the one for aggressive selections in the APQ were not significant, $F(10, 73) = 1.19$, $p = .31$; $F(10, 73) = 0.93$, $p = .52$; $F(10, 73) = 1.40$, $p = .20$. However, the model for reports of feeling angry was found to be significant, $F(10, 73) = 2.78$, $p < .01$. It showed a significant effect for physical aggression, $F(1, 73) = 4.334$, $p < .05$, but not for the video game condition, $F(1, 73) = 3.847$, $p = .06$. This result was similar to the previously found effect when the EPQ-R was left out of the ANCOVA and the amount of time spent on gaming was included. The EPQ-R may have suffered from either social desirability effects (as indicated by the high scores on the Lie scale) or was not an effective scale to measure personality in the current participant pool.

As the trait aggression subscales for hostility and physical aggression were the only personality factors found to influence aggression measures, these were the main aggressive personality factors for further analyses. In order to test what kind of effect gender and childhood factors had on these factors of the aggressive personality, ANCOVAs were conducted with hostility and physical aggression as dependent variables, gender as a fixed factor, and FCS subscale scores, family income, and the worst and best neighborhoods participants lived in as covariates. These models were both found not to be significant, $F(12, 73) = 1.61$, $p = .11$, $F(12, 73) = 1.79$, $p = .07$.

However, significant correlations were found between physical aggression and gender ($r = -.25$, $p < .05$), exposure to domestic violence ($r = .29$, $p < .05$), family income ($r = -.28$, $p < .05$) and the worst neighborhood participants grew up in ($r = -.25$, $p < .05$). For hostility, significant correlations were found with perceptions of a lack of caring ($r = .24$, $p < .05$) and perceptions of feeling loved ($r = -.24$, $p < .05$). Hierarchical multiple regressions were performed for both trait aggression subscales, with significantly correlated factors step-wise tested for their predictive value. The results for physical aggression indicated a positive predictive relationship, $R = .46$ ($R^2 = .21$) that was significant, $F(4, 73) = 4.65$, $p < .01$. The results for hostility however, were not significant, $F(3, 73) = 2.05$, $p = .12$. Results for the regression analysis on physical aggression are displayed in Table 5. As gender was dummy coded (male = 0, female = 1, the negative *b* indicated higher levels of physical aggression for males. Both the male gender and exposure to domestic violence showed significant predictive effects on physical aggression.

Table 5
Summary of Hierarchical Regression Analysis for Variables Predicting Physical Aggression (N = 73)

Variable	*B*	*SE B*	β
Step 1			
Gender	-1.16	0.54	-.25*
Step 2			
Gender	-1.09	0.52	-.23*
Family's income during childhood	-0.42	0.17	-.27*
Step 3			
Gender	-1.08	0.52	-.23*
Family's income during childhood	-0.32	0.20	-.20
Worst neighborhood when growing up	-0.20	0.19	-.14
Step 4			
Gender	-1.01	0.50	-.21*
Family's income during childhood	-0.21	0.20	-.14
Worst neighborhood when growing up	-0.27	0.18	-.18
Exposure to domestic violence	0.88	0.37	.26*

Note. R^2 = .06 for Step 1; ΔR^2 = .07 for Step 2 (*p*s < .05); ΔR^2 = .01 for Step 3 (*p*s = .28); ΔR^2 = .06 for Step 4 (*p*s < .05).
*p < .05

The results found when using the Catalyst model as a framework for analysis indicated that, despite problems with the EPQ-R results and low scores for childhood violence exposure on the FCS scale, aggressive personality did have a significant effect on both SHS scores and APQ scores of feeling angry. However, while no effects of playing a violent game were found for any of the APQ scores, such an effect was found for SHS scores, which cannot be explained by the Catalyst model. As such, the second hypothesis which stated that only aggressive personality and not violent game play would affect increased aggression was supported when this aggression was measured by APQ scores, but not supported when aggression was measured by SHS scores.

Control

During testing, participants, especially females, appeared to react very different to the game they played after they were done playing. Results on the control questions, reflected this as a significant difference for frustration between males (M = 2.19, SD = 1.20) and females (M = 2.90, SD = 1.37), $t(71)$ = -2.36, p <.05), was found. For females, significant differences were also found between the game conditions. The violent game was found to be less fun (M = 1.87, SD = 1.25), (M = 4.33, SD = 0.62) than the non-violent game (M = 4.33, SD = 0.62), $t(28)$ = -6.87, p < .01. The violent game was also more frustrating (M = 3.67, SD = 1.40) than the non-violent game (M = 2.13, SD = 1.06), $t(28)$ = 3.65, p <.01.

Finally, females said that they would be less likely to play the violent game (M = 1.53, SD = 0.74) than the non-violent game (M = 3.33, SD = 0.98), $t(28) = -5.68$, $p < .01$. Males on the other hand only reported a significant difference in how exciting they found the violent game (M = 3.55, SD = 1.22) compared to the non-violent game (M = 2.80, SD = 1.15), $t(41) = 2.03$, $p < .05$.

To investigate this striking contrast between males and females, ANCOVAs were conducted with SHS scores, APQ scores for feeling angry, frustrated or irritated and aggressive response selections in the APQ as dependent variables. The groups for the video game condition were split between males and females, and set as fixed factors in separate ANCOVAs. Trait aggression subscales and all control variables were set as covariates.

For males, the model for SHS scores was significant, $F(10, 42) = 5.90$, $p < .01$. As before, the video game condition had a significant effect, $F(1, 42) = 8.87$, $p < .01$. But another significant effect was found for frustration, $F(1, 42) = 7.17$, $p < .05$, and hostility no longer had a significant effect, $F(1, 42) = 3.49$, $p = .07$. For females, the model for SHS scores was also significant, $F(10, 42) = 7.58$, $p < .01$. However, the only significant effect that was found was for the fun control variable, $F(1, 42) = 7.38$, $p < .05$. The video game condition was found to have no effect on SHS scores for females, $F(1, 42) = 0.30$, $p = .59$. For males and females, none of the models for affective measures or aggressive selections in the APQ were found to be significant. For a more complete view of personality effects, EPQ-R scores were included as covariates in alternate ANCOVAs, but these models did not differ in significance and only showed significant effects for the same variables as when EPQ-R scores were not included. Therefore these results will not be discussed as their inclusion did not show any change in results.

In the earlier regression analysis, the effect of exposure to playing a violent game was found to have a predictive effect on SHS scores, mediated through hostility. Yet no significant predictive effect for gender was found. To test the effects of those control variables that had a significant effect on SHS scores for males and females, two sets of multiple regression analyses were conducted to investigate if control variables would have any effect on the previously found predictive effects on SHS scores. The video game condition was entered on the first step, hostility was entered on the second step and the respective significant control variable for either gender was entered on the third step. On the third step, these models indicated a predictive effect on SHS scores for both males, $R^2 = .61$, and females, $R^2 = .67$. Both models were significant for males, $F(3, 42) = 20.32$, $p < .01$, and females, $F(3, 29) = 17.92$, $p < .01$. Tables 6 and 7 show the results of the two respective regression analyses.

As the violent game was coded as 1 less than the non-violent game, a negative b for this variable indicated that playing the violent game leads to a higher SHS score. For males, this effect existed on every step of the regression. While hostility was found to have a significant predictive effect ($\beta = .40$), indicating a mediating effect on playing a violent game, but an even larger predictive effect was found for frustration ($\beta = .42$). For females, the effect of playing a violent game was initially also found to be significant, with hostility as a mediating factor. However, when the amount of fun after playing the video game was included in the regression, the effect of playing a violent game became small and no longer significant. Hostility still had a predictive effect ($\beta = .32$), but it was also found that fun had an even greater and negative predictive effect ($\beta = -.59$).

These control variables indicated that the effect of playing a violent game on SHS scores only existed for males, and that hostility and frustration both had a large mediating effect on how playing a violent game affected the SHS scores for this group. For females, only hostility and whether a game was considered to be fun were predictive effects of the SHS score. How the game was perceived had a large effect on the affective aggressive state, which is in contrast with the GAM as passive exposure to a violent game did not result in increased aggression for all participants.

Table 6
Summary of Hierarchical Regression Analysis for Variables Predicting State Hostility Scale scores for Males (N = 44)

Variable	*B*	*SE B*	B
Step 1			
Video game condition	-23.47	5.81	-.53**
Step 2			
Video game condition	-22.90	5.24	-.52**
Hostility	4.01	1.24	.39**
Step 3			
Video game condition	-22.23	4.40	-.51**
Hostility	4.11	1.04	.40**
Frustration	7.79	1.86	.42**

Note. R^2 = .29 for Step 1; ΔR^2 = .15 for Step 2 (*p*s < .01); ΔR^2 = .18 for Step 3 (*p*s < .01).
**p < .01

Table 7
Summary of Hierarchical Regression Analysis for Variables Predicting State Hostility Scale scores for Females (N = 30)

Variable	*B*	*SE B*	β
Step 1			
Video game condition	-30.53	6.50	-.66**
Step 2			
Video game condition	-26.82	6.16	-.58**
Hostility	4.28	1.73	.33*
Step 3			
Video game condition	-5.40	8.52	-.12
Hostility	4.16	1.49	.32**
Fun	-8.73	2.71	-.59**

Note. R^2 = .44 for Step 1; ΔR^2 = .10 for Step 2 (*p*s < .05); ΔR^2 = .13 for Step 3 (*p*s < .01).
*p < .05
**p < .01

Heavy gamer profile

As the control questions indicated, results for males and females showed different predictive effects on their aggression after playing a violent game. According to the GAM, this single episode exposure should have shown a main effect for the game play and at best a mediating effect for trait aggression. To test the third hypothesis that extensive exposure to playing video games would lead to significantly increased aggression, a profile of a "heavy gamer" was created to see what the effect of playing a violent game had on this type of gamer.

Following quartiles data of the average time spent on gaming, groups of gamer types were created for those that played 0 – 0.25 hours (non gamers), 0.50 – 1 hour (light gamers), 1.5 – 7 hours (medium gamers) and more than 7 hours a week (heavy gamers). As expected, gender had a significant effect on gamer type, $F(1, 73) = 45.60$, $p < .01$. Heavy gamers consisted of 34.1% (N = 15) of all males and 3.3% (N = 1) of females, while 40.9% (N = 18) of males and 6.7% (N = 2) of females were medium gamers. The

low amount of females who spent a relatively large amount of time on playing video games meant that no claims could be made about these female gamer types in the present study. Further analyses for gamer types will only concern males.

To test the third hypothesis and the GAM prediction that exposure to violent content will lead to increased state hostility, an ANCOVA was first conducted with total SHS scores as the dependent variable, video game condition and gamer types as fixed factors, and trait aggression and control variables as covariates. This model was significant, $F(16, 42) = 6.60$, $p < .01$. The effect of playing a violent game was significant, $F(1, 42) = 8.99$, $p < .05$, as were the effects for the gamer type, $F(3, 42) = 4.22$, $p < .05$, and frustration, $F(1, 42) = 10.81$, $p < .01$. The video game condition x gamer type interaction however, did not yield a significant effect, $F(3, 42) = 2.64$, $p = .07$.

A further analysis showed that males who were heavy gamers had a significantly lower SHS score ($M = 54.34$, $SD = 11.12$) than males who did not spend 7 hours a week or more on gaming ($M = 76.93$, $SD = 22.65$), $F(1, 44) = 13.06$, $p < .01$. Such an effect is completely contrary to GAM predictions and the third hypothesis. Figure 4 illustrates this effect for both video game conditions.

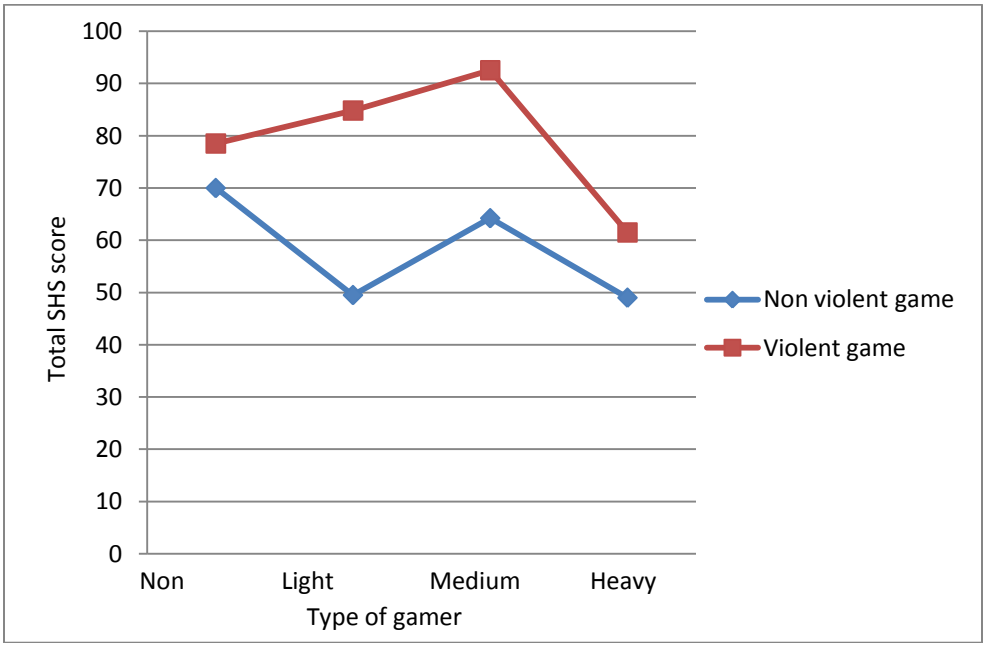

Figure 4: Total SHS scores for different types of male gamers.

An analysis of descriptive data for male heavy gamers showed they had a preference for specific movie genres: action (73% of heavy gamers), comedy (73%), science fiction (60%) and adventure (60%). Among game genres, First Person Shooters ($M = 4.07$, $SD = 0.96$) and Sandbox games such as Grand Theft Auto ($M = 4.33$, $SD = 0.90$) were rated as the most popular genres on a scale of 1-5. These are the types of genre that contain the most violence found in video games. Heavy gamers also had a high preference for the camera perspectives found in these genres: the first person perspective ($M = 4.07$, $SD = 1.14$) and 3rd person perspective ($M = 4.07$, $SD = 0.92$). They also started playing violent video games at the lowest age ($M = 11.40$, $SD = 3.20$) of all participants.

The story in a game was very important to this group of gamers. A higher likelihood for playing a game to see how the story ends was found for heavy gamers (M = 4.67, SD = 0.62) than other types of gamers (M = 3.48, SD = 1.18), $t(42) = 3.61$, $p < .01$. A lower likelihood to not care about the story at all was also found for heavy gamers (M = 1.07, SD = 0.26) than other types of gamers (M = 2.00, SD = 1.28), $t(42) = -2.78$, $p < .01$.

The descriptive data indicates that heavy gamers do not just spend a lot of time on games from mostly violent genres with a camera perspective that is used in most violent games, or start playing them at an earlier age than others, but also that they care about the story a lot which is a key component of immersion (Ermi & Mäyrä, 2005).

DISCUSSION

Some mixed results were found for the first two hypotheses. The first hypothesis predicted that playing a violent video game would lead to increased aggression, mirroring predictions of the General Aggression Model. This was supported by initial results when only effects of gender, trait aggression and the video game condition on the aggressive affective state, as measured by the State Hostility Scale, were analyzed. Playing a violent game had a significant effect on the total SHS score and was found to be mediated by the hostility subscale of trait aggression as measured by the BPAQ-SF. Even when personality factors were included as covariates, the same effects were found. These results showed support for the first hypothesis and followed the predictions for an effect of a single episode exposure to violence in a video game on increased aggression. However, when control variables were found to have a different effect depending on gender, the introduction of these variables in analyses showed that playing a violent video game only had an effect on SHS scores for males and not for females.

The results for scores on the Aggressive Provocation Questionnaire also found no effect for playing a violent video game for either gender. Because the APQ had its own aggressive affect measures where participants indicated how they felt in certain provocative scenarios, an effect for playing a violent video game on these measures would have confirmed GAM predictions that exposure to violent content in video games makes people think more aggressively in other situations that just a direct measure of the aggressive state directly after playing a violent game. Yet these scores did not even differ between participants who played a violent game and those who played a non-violent game. Analyses on selections of aggressive responses to the provocative scenarios for both video game groups also found no effects of exposure to violent content, trait aggression or gender; even when long term exposure to video game playing was included. The GAM predicts that longer exposure to violent video games would lead to more of these types of selections through the formation of aggression scripts, but no such effect was found. These combined results showed that the only effect of exposure to violent video games was found for state hostility in males, which was also mediated through hostility and frustration. As all other analyses found no effect for playing a violent video game, the first hypothesis was refuted.

The second hypothesis predicted that no effect for playing a violent video game would be found and that instead, any measures of aggression could be explained by the aggressive personality. This hypothesis followed the Catalyst model. Because not enough support was found for the first hypothesis of such an effect of playing a violent game, the lack of this effect instead provided support for the second hypothesis. Significant effects were found for scores on the trait aggression subscale of hostility on SHS scores, and scores on the subscale of physical aggression on feelings of anger in provocative scenarios of the APQ. Hostility remained a significant predictor of SHS scores for both males and females, even when controlled for how the video game was perceived subjectively. The inclusion of these control variables also rendered the effect of physical aggression to become insignificant. Following the Catalyst model, effects for the male gender and exposure to domestic violence and gender were found to predict higher scores for physical aggression. But the non-significance of this subscale's effect on feelings of anger after being controlled for frustration meant that childhood exposure to violent were not relevant for the present study. Scores for exposure to family violence were also very low for participants in this study. As the only consistent effects on aggression for all participants was found in aggressive personality factors, the second hypothesis can be considered to have been supported in the present study.

The creation of a heavy gamer profile from data on the time spent on playing games showed strong support against the third hypothesis, which predicted that more exposure to violent video games would lead to increased aggression. Instead of higher scores on the SHS, heavy gamers had significantly lower scores than other types of gamers. What caused this effect was not clear. In a study by Bartholomew, Sestir & Davis (2005) a similar effect was found. There, it was suggested that perhaps this type of gamer has become desensitized by their exposure to violent games. Yet the lack of any effects of exposure to violent video games on aggression in this study clearly contradicts claims of the GAM that higher exposure should lead to increased aggression. While it could be argued that extensive video game play does not equate extensive exposure to violent content, heavy gamers were found to have a high preference for the most violent genres of video games, as well as a high preference for those camera perspectives that are almost always used in games high in violent content. Heavy gamers also indicated that they care a great deal about the story told in video games, more so than other types of gamers. This could indicate that heavy gamers are generally more immersed in the games they play than others. While the fear that people who play a lot of violent games are at risk of turning into future killers seems to be common in contemporary mass media and politics, no evidence to support this fear was found.

In conclusion, very little evidence to support the GAM was found. Neither single exposure to violent content in a video game nor repeated exposure to violent video games were found have a sufficient effect on the aggression measures in the present study. Most of the results showed evidence that contrasts GAM predictions. Meanwhile, the Catalyst model's predictions that playing violent video games would not have a main effect on aggression but would only have a stylistic effect were supported as far as the aggression measures fitted this model. As no measure of actual violent behavior, or how participants would act it out, was tested, the evidence to support the Catalyst model in the present study was not strong enough to call it the 'right' model. However, as no contradicting effects were found the Catalyst model's predictions, it was clearly a better model than the GAM.

GENERAL DISCUSSION

The General Aggression Model has been used in many studies on the effects of violent video games on aggression and aggressive behavior, yet only the same group of researchers appears to be adamant in its defense. Even though critics point out methodological inconsistencies and shortcomings, a lack of strong effects for any found effects and evidence that proves these effects do not exist for all people, the GAM studies are still consistently used in public debates on the dangerous effects of playing violent video games. Not only do the public claims about such effects do not reflect the scientific evidence behind them, moral panic seems to be a key driver behind these claims.

In 2008, Thailand banned Grand Theft Auto after a 19 year old killed a taxi driver and claimed he was just copying what he learned in that game. Five more games were banned shortly afterwards. Germany is attempting to ban the sales of all violent video games, even though some game development companies that create violent games (such as Crytek) and employ hundreds are located in Germany and would no longer be able to sell games in their own country. Germany already requires blood to be turned green in video games, or it cannot be sold in stores. Australia has similarly strict rules on violent content in video games: video games with a lot of violent content are refused classification therefore cannot be sold. The United Kingdom's British Board of Film Classification (BBFC) used similar types of classifications and tried to do the same as Australia, although this has only resulted in the BBFC's classification system for video games being replaced by the more lenient Pan European Game Information (PEGI) system that is used in all European countries except for Germany.

The people that grew up playing video games as a child have now reached adulthood. New generations grow up playing video games as well. And no explosions of violent or aggressive behavior have occurred. Yet as more and more gamers reach adulthood, public policy in many countries often remains childish in their view of how video games affects behavior in a negative way. While studies show different positive and negative effects for video game play, the negative effects seem vastly overemphasized in the mass media, public debates and public policy creation. Of course, the mass media tends to prefer the negative effects as fear tends to sell better. And as the general viewer will not care about the methodological or validity aspects of a scientific study, criticism of such aspects tends to not reach the majority of people who are worried about the negative effects.

This perception about the dangerous effects of playing video games can be changed in two ways. First, the number of studies that show positive effects for video game playing could overwhelm the number of studies that show a negative effect. If this reaches people through the mass media and the Internet, a more balanced view of how playing video games affects us and our children could eventually be created. Second, overwhelming evidence that contradicts any negative effects found for playing video games, especially violent video games, could similarly affect perceptions. But how this evidence reaches the general public remains of key importance.

This study attempted to participate in the second way. It succeeded in part by finding that the GAM's predictions about the negative effects of playing violent video games on behavior were not supported. However, a lot remains to be further investigated in future studies. Primarily, the Catalyst model provides a realistic and superior framework for studying how violent video game play influences actual violent crime. Although the media tends to focus on school shooters to have played violent games, this is usually either not true or not a predictive factor for their behavior. That is not to say that there is no effect at all for playing violent video games. A general consensus does exist that people who have great difficulty in differentiating between the real world and a fantasy world can be influenced by exposure to violence in media. However, these people generally have a behavioral disorder that creates this lack of differentiation or suffer from high levels of psychoticism. And while the media similarly uses claims about violent crimes mirroring actions performed in violent games, the Catalyst model and its

Stylistic Catalyst offer the perfect framework from which to explain the modeling aspects of such violent crimes. Future studies should investigate these effects further, preferably disproving GAM predictions at the same time, as the models are mutually exclusive about their claims of how exposure to media violence affects aggression and violent behavior and crime.

Also, work must be performed towards a common methodology for how to test these effects. Although there is substantial academic debate about what measures should be used to test effects between a violent and a non-violent games, or multiple ones of either kind, little to no attention seems to be given to what games to use. People who actually play games do not tend to play games from more than two "generations" ago. Especially children and teenagers play the newest games if they can. Inner city youths could lack the funds to buy the latest and most technologically advanced games, but game systems from the previous generation are cheap enough that no games from an even older generation are likely to be played by the masses, at least in Western culture. And as gaming reaches higher importance in youth culture, having the latest games also becomes of social importance.

This study attempted to create a set of standards for choosing what games to use. Games should reflect the kind of games that are actually being played by people, and not the kind of games that are so old that it would be unlikely for anyone to even model their behavior after, when it comes to acting out potential violent behavior. If someone really wants to shoot people at his school for whatever reason, the guns of preference will be those found in Call of Duty 4, not those found in Doom. Games should also be similar in as many aspects as possible, while still reflecting games that are actually being played. This does not mean that for instance, removing blood from a popular game in one version cannot be compared to a version of the same game that does include blood. But when the game itself is not something anyone would ever play, such as a paintball game, then the results of such a study will have little validity.

As the preferences for the heavy gamer type in this study showed, a game should preferably have a first person or third person perspective and be a First Person Shooter or a sandbox game. Not only do these types of games generally have the most violence of all genres of games, but just look at the top 10 best selling violent video games in the past 5 years and see if more than 2 of them are not First Person Shooters, sandbox games or use a difference perspective than found in those genres. A warning should be given about thinking that all games with a first person perspective can just be compared because they share the same perspective. An adventures game with a first person perspective is inherently different than a shooter game with a first person perspective. Of course, sometimes the best theoretical alternative just does not exist. But for example, there are a number of first person firefighting games that let the player shoot water at fires. Such a game could be used to compare effects found in first person shooters that require the player to shoot human enemies. Then again, the likelihood of people playing a firefighting game in real life is slim. Although many obstacles remain for creating this set of standards for video game selection in studies, a great similarity between the games in many different aspects would help to better compare the effects on these games.

While this study showed that the existence of GAM effects found in laboratory studies can be refuted in a laboratory study, the participants in such studies are usually students. As shown in this study, these students tend to come from largely higher class neighborhoods, more supportive and less abusive families and suffer from less pathological behavioral problems than would be expected from people in the general public. School children would make much better participants, as different schools from different neighborhoods could be used to reflect a more realistic participant pool.

Finally, importance of the subjective experience of playing a video game and the subjective meaning of what is actually being done in the game cannot be overstated. For instance, do people who play a lot of first person shooter actually think they are shooting human beings in a virtual world? And does this repeated activity lead to desensitization to violence? Or does it just desensitize them to the novelty of the gameplay? As most first person shooters share a gameplay design where the player must

reach a point on a map by dispatching enemies that are in the way, it can be argued that the same kind of problem solving is performed in these games. The problem part is getting to the goal, the solving part is how to dispatch your enemies. Players, who do this activity over and over in different, but similar games, could be just as likely to not care about what they are shooting at to get to the goal as they are likely to get desensitized to shooting at people in a game.

Video games are a relatively new type of entertainment medium and are different primarily because they require an active interaction approach rather than a passive viewer approach to consume this entertainment. Yet do heavy gamers really take this active approach when they play the 100th first person shooter? Either way, as young as the medium is, the type of moral panic or public fear of its effects on youths is more than a century old. However, the interaction aspect of this specific medium has not been sufficiently researched by a long shot. As such, the research is as young as the medium and a lot more remains to be done. Hopefully, an objective, unbiased and open-minded approach will be taken by those that will conduct this research. And hopefully, the results will eventually become common knowledge for the general public.

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