Effects of violent video games on aggressive thoughts and feelings: video games and reward

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ABSTRACT

Violent video games (VVGs) have been at the centre of the controversy of media effects on aggression for the past three decades. Several theories have been applied to explaining effects of VVGs, though few studies have directly studied them, the most cited of these being the social learning theory. This study investigated how different types of reward in a VVG can influence aggressive cognition and mood differently and also long-term effects of frequent VVG exposure. The present study had three conditions, direct reward, indirect reward and a control condition, all conditions involved participants playing 'Gears of War 3' with the settings manipulated for each condition. Participants completed measures of aggression before and after gameplay. The results of this study showed that direct and indirect conditions increased equally but not significantly more than the control condition. There was no difference in aggressive increases between high and low videogame players. A small positive relationship between VVG and initial aggressive cognition scores was found. It was concluded that the social learning theory does not fit the effects of VVGs as well as other theories, such as excitation-transfer. Future studies were urged to investigate how the effects of VVGs can differ from violent television.

KEY WORDS:	VIDEO GAMES	AGGRESSION	REWARD	EXCITATION-TRANSFER	NEO-ASSOCIATIVE PRIMING

Introduction

Video games have become a prominent leisure activity in society over the past 3 decades, being a source of entertainment for children, adolescence and adults. 99% of adolescents have played video games at some point in their lives, 7% playing more than 30 hours per week (Griffiths & Hunt, 1995). In the 10 years since that study was conducted, video game sales have trebled (Ferguson, 2008), cementing its position as a part of modern culture. However, VVGs have also been subject of serious debate in the media, with first-person shooter Doom being suggested to have inspired the Columbine high school shooting in 1999. More recently, the media's initial response to the Virginia Tech shooting in 2007 was that VVGs were a causal factor, despite the subsequent review revealing that the shooter had no previous exposure to VVGs (Ferguson, 2008). This response by the media suggests that there is still public confusion as to the influence VVGs can have on a player's thoughts and behaviour. Literature on VVGs effect on aggression is limited and has not gone too far into investigating what aspects of VVGs can effect aggression. Therefore, it can be considered important to show video games true effect on aggression to prevent further public confusion.

Definitions of a VVG have been the subject of much debate for several years as most video games include some form of violence during gameplay; even games rated for everyone such as 'Super Mario 64' include punching and kicking to dispatch enemies. A US court case attempting to prohibit sales of VVGs to minors defined them as providing the player with options including the killing, maiming, dismembering or sexually assaulting an image of a human-being in the game (Brown v. Entertainment Merchants Association, 2011). 'Super Mario 64' involves punching and kicking, but the enemies are cartoony and fall over and disappear into a cloud of smoke when dispatched. While video games that are First-Person Shooters (FPS) and Fighting games such as 'Call of Duty' and 'Mortal Kombat' involve performing violent acts towards realistic looking human beings resulting in visible pain and/or death. So, VVGs can be defined as a video game where the aim is to perform violent acts on human beings to win.

Previous research has established a link between onscreen television violence and heightened aggression in viewers (Paik & Comstock, 1994). A 25 year longitudinal study conducted by Huesmann, Moise-Titus, Podolski and Eron (2003) found that amount of television violence viewing in childhood, identification with same-sex television characters and realistic perceptions were correlated with aggressive behaviours in later adult life. With the continuing rise in popularity of video games over the past 3 decades, researchers have looked to investigate whether similar effects can be produced with exposure to VVGs. Researchers have noted that while television and video games are technically similar, video games require more involvement and attention on the part of the player (Carnagey & Anderson 2004). VVGs also contain higher frequencies of violence, allow for greater identification with the main character and also reward the player for carrying out violent acts.

Craig Anderson has conducted a great deal of research into the effects of VVGs, including three meta-analyses into the effect of VVGs. The first of these, Anderson and Bushman (2001) found an increase in aggressive behaviour, aggressive cognition, aggressive affect and physiological arousal. This meta-analysis also found a decrease in pro-social behaviour when exposure to VVGs. A second meta-analysis

by Anderson (2004) included more studies, supported previous findings and also found a correlation between aggression and previous VVG play. The last meta-analysis, Anderson *et al*. (2010) also supported previous findings by finding increases in aggressive behaviour, affect and cognition across experimental, cross-sectional and longitudinal studies. This analysis included studies from Japan and found similar increases in aggression in eastern and western studies, thus suggesting that the effects of VVGs are cross-cultural. This meta-analysis also found possible long-term effects, which suggests that frequent exposure to VVGs can permanently increase levels of aggression. This meta-analysis also looked at desensitisation where individuals who play VVGs frequently tend to show less physiological reaction to witnessing violent acts in games and the real world. There is the possibility that the long-term associations found may be due to more aggressive individuals seeking more exposure to VVG. However, a recent longitudinal study by Willoughby, Adachi and Good (2011) found that higher levels of aggression did not predict higher frequency of VVG play in later life. These meta-analyses suggest an association between VVGs and aggressive thoughts and feelings. The strength of the associations found in Anderson's meta-analyses, however have been the subject of debate. Ferguson (2010) stated the possibility of publication bias in his meta-analyses and over interpretation of his findings. Anderson has also been criticised these meta-analyses tend to rely on correlational research and he interprets these positive correlations as VVGs being a causal factor in aggression, despite lacking evidence to back this claim (Ferguson, 2008).

There have been various theories and models that have been applied to VVGs and aggression, most of which have previously been used to explain the effects of violent television. One of these being Bandura's social learning theory which suggests that social behaviours such as aggression are learned from role models who receive reward for aggressive behaviour or learn to not imitate when observing punishment (Bandura, 1965). Vicarious learning is considered to take place as the child can learn to imitate a perceived behaviour just from observing behaviour, such as aggressive acts, being rewarded. Bandura, Ross and Ross (1963) found, in a follow-up to their classic bobo-doll study, that replacing the live model performing the aggressive behaviour towards a bobo-doll with a filmed person or cartoon cat lead imitative behaviour by children similar to a live model. The social learning theory can be easily applied to VVGs; main characters can act as models and violent acts carried out by these characters are often rewarded (through points, verbal praise etc.). Brain activity research by Keopp (1998) found that playing a video game activated the neural reward system quite effectively. They reported increased dopamine release, which has been linked to learning and reinforcement of behaviour, though this study did not use a VVG it shows that learning and reinforcement does take place while playing a video game.

Alternate theories that have also been applied to violent media's influence include Berkowitz's Cognitive Neo-association Theory (1984). He propositioned that violent movies can prime semantically related thoughts. Afterwards, encountering cues related to the violent stimulus witnessed may activate the semantically related thoughts. This priming to certain cues increases the likelihood that an individual may resort to aggressive actions to resolve problems in the future. Unlike Bandura's theory, Berkowitz suggests that individuals just need to witness violence in order to be affected by it. When applied to VVGs, the cognitive neo-association theory

suggests that exposure to violence in video games may prime thoughts and feelings in the player, which may be activated later in the future. Berkowitz (1990) has stated that these primed thoughts and feelings are usually short-term and dissipate over time, though it is possible that they may be retained long-term due to personal factors.

Zillman and Bryant (1974) suggest that increased aggression from violent media may be the result of excitation-transfer. This theory suggests that after experiencing an exciting event, such as VVG play, an individual may form an aggressive disposition. With this arousal from a first event the individual may be more likely to misattribute this arousal to a second event, in this case they are more likely to perceive and react to provocation. This disposition is assumed to only be short-term and the effect will dissipate after a while. When applied to VVG, this suggests that VVG will only have a short-term physiological effect which will dissipate over time and does not acknowledge that frequent VVG exposure will have a significant effect on aggression.

Anderson and Bushman's (2001) general aggression model (GAM) integrates the previously stated theories into one model and attempts to explain aggression across many different contexts. GAM is based on the premise that aggression comes from knowledge structures that have developed from personal experiences and can influence perceptions and behavioural sequences. The GAM suggests that situational factors (violent media) interact with the individual's internal state priming aggressive cognition, affect and arousal which may result in aggressive decision making processes, which results with aggressive behaviour. When applied to VVGs, the GAM states that an individual playing violent video games learns, rehearses and reinforces aggression related knowledge structures. This causes the individual to develop more aggressive beliefs and attitudes, perceptions, expectations, behaviour scripts and desensitisation, which combine to give the player an increase in aggressive personality. A criticism of the GAM is that it is too broad an explanation to account for the details and intricacies of video games (Krcmar and Farrar, 2009).

One area of research of the effects of VVGs that requires more attention is how the VVGs differ when presenting violence, more specifically how the player is rewarded for in-game violence. Violent acts are often rewarded in VVGs (via points, verbal praise etc.), therefore the social learning theory and the GAM have often been applied in VVG literature to explain how rewarding violence can influence a players beliefs, attitudes and expectations from aggression. However, video game research has rarely directly looked into the effects of VVGs rewarding violence. The one study investigating the effects of reward and punishment in VVGs conducted by Carnagey and Anderson (2005) identified that reward in VVGs for violent acts may be a significant contributor towards aggressive thoughts and feelings. They found that video game players that were rewarded with points for killing everybody in a game (enemies and civilians) had greater increases in aggressive cognition and affect than just gaining points for killing enemies. Carnagey and Anderson suggested that reinforcement can come from direct and indirect rewards. Direct (or explicit) rewards regard the player being directly rewarded with points, level progression and verbal praise. Indirect rewards include visual and audio feedback due to violent acts, such blood and gore. Carnagey and Anderson suggest that indirect rewards in VVGs

should be just as influential as direct rewards, despite lack of evidence to support this claim.

There have been few studies that have investigated the effect of levels of in-game blood on aggression. Farrar, Krcmar and Nowak (2006) manipulated the levels of blood in 'Hitman 2: Silent Assassin' and found that addition of blood increased physical aggressive responses and self-reported levels of hostility. Farrar *et al*. suggested that seeing blood can be seen as a form of reward because visuals of blood may be unconsciously interpreted as a sign of success. In a follow-up study, Krcmar and Farrar (2009) found individuals who play in a 'blood on' condition tended to have increases in aggressive cognitions and verbally aggressive behaviour. Krcmar and Farrar state that presence of blood in a VVG may also act as a form of reward, the player can interpret blood as a sign that they have done well and are progressing to achieve their goal. Thus, the sign of blood may act as reinforcement, increasing the risk of aggressive thoughts and consequently aggressive behaviour. Interestingly this study found that the biggest increases in aggression were found when a player played with the blood on and with a third person perspective. They concluded that this is possibly because it is easier to relate to the in game character if you can see them, this fits in with what the SLT predicts. Both these studies support the claims of Carnagey and Anderson that the presence of blood in a game acts as a form of reward which can be just as effective as direct reward. Bartlett, Harris and Bruely (2008) also found that manipulating the level of blood in 'Mortal Kombat: Deadly Alliance' to medium and high significantly increased arousal and hostility in players, while low and no blood had no such increases. This study also supports Carnagey and Anderson's claim that indirect rewards can affect aggression results. However, these three studies do not compare how direct and indirect reward for violent acts in VVGs can influence aggression.

The lack of research into how VVGs differ in their presentation of violence and how they may reward the player for violence suggests that research into the effect of VVG on aggressive thoughts and feelings is far from over. Most research into VVGs compare two completely different games. For example Bartholow and Anderson (2001), compared Mortal Kombat to PGA Tournament Golf. These two games are completely different in multiple ways, such as the type of game, the speed of gameplay, the environment and characters controlled. The present study will investigate the effects of changes to reward in the same game. Social learning theory suggests that being directly rewarded for certain behaviours or observing direct reward are effective in increasing the frequency a behaviour is repeated in the future. However, as previously stated there is evidence that indirectly supports Anderson and Carnagey's claim that direct and indirect award can have an equal influence on aggression.

The aim of the present study is to directly compare the effect that direct and indirect rewards in VVGs can have on aggressive cognitions and affect. Another expected effect to be found in the present study is the effect of desensitisation to violence. Carnagey, Anderson and Bushman (2006) found that previous exposure to VVGs resulted in lower physiological responses to observing real-life violence. The authors suggested that this lack of a physiological response could be a sign of a psychological desensitisation; witnessing violence will appear less significant and non-consequential be it in a video game, television or in real-life. As stated before,

these findings have been supported by Anderson's latest meta-analysis who found that frequent video game players show less of a response witnessing violent acts (Anderson *et al*., 2010). Desensitisation is included in the GAM, which suggests that individuals who are repeatedly exposed to violence, both real-life and fictional, will be at risk of a reduced emotional and physiological response to witnessing violence. However, as with much VVG research, research of this effect is rare and inconsistent; a recent longitudinal study by Teng, Chong, Siew and Skoric (2011) failed to replicate these findings by getting participants to play a VVG for a total of twelve hours over three weeks, after which they found no changes in participant's empathy. Due to this uncertainty, the current study will attempt to replicate the findings of Anderson's latest meta-analysis. This study will be using participants who will have varying levels of exposure to VVGs. According to Anderson's findings it can be expected that participants who have more exposure to violent video game content will have lower increases in aggression than individuals with less exposure to VVGs.

The existing body of research and developed rationale led to the following hypotheses being constructed:

i) Individuals playing a VVG that reward points for kills (direct Reward) and individuals playing a VVG that contains blood and gore (indirect Reward) will have equal increases of aggression.

ii) The direct reward condition and indirect reward condition will both have higher levels of aggression than a control condition that has no direct or indirect rewards.

iii) Individuals with higher self-reported exposure to VVGs will experience a smaller increase in aggression than those with lower reported exposure due to desensitisation.

iv) Individuals with higher self-reported exposure to VVGs will have higher initial levels of aggression than those with lower reported exposure.

Methodology

Design

This study used a quantitative design and followed a 3 X 2 mixed participants design comprising of two dependant variables and three independent variables. The two dependant variables were aggressive cognition and aggressive affect. The first independent variable was between-subjects and was 'type of reward' which has three conditions, these being 'inclusion of a points system' (direct reward), 'inclusion of blood and gore' (indirect Reward) and a 'control condition' (no inclusion of a points system or blood and gore). The second independent variable was VVG exposure, was between subjects and had two conditions, being 'high VVG Exposure' and 'low VVG Exposure'. The last independent variable was within subjects and was

the time of measurement and comprised of two conditions, these being 'pre-gameplay measure' and 'post-gameplay measure'.

Participants

Thirty-nine participants were recruited to take part in this study. This sample comprised of twenty-four female participants and fifteen male participants. Participants ranged from 18 to 28 years of age. All participants recruited were students from Southampton Solent University, who were recruited opportunistically, using the participant forum on Mycourse and a poster on the project notice board. Forty-five minutes participation time was used as incentive. Participants were required to be over the age of 18 in order to participate due to the 'mature' rating of the game used. Males and females were both encouraged to take part. Previous exposure to VVGs were not being controlled for. Age and gender was also recorded but not used in the analysis.

Materials

A recruitment advertisement was posted on the participant forum on Mycourse to recruit participants. A poster asking for participants was posted on the project notice board.

The video game used for the three conditions of 'type of reward' was 'Gears of War 3', the third instalment of the popular 'Gears of War' franchise developed by Epic Games. 'Gears of War 3' is a Third-Person Shooter where the player and three computer-controlled allies must kill enemies to progress through levels. British Board of Film Classification (BBFC), who rates movies and video games into age categories based on their content in Britain, gave 'Gears of War 3' an 18 age certificate, citing that it includes 'Strong Bloody Violence'. There are two different types of enemies in 'Gears of War 3', the 'Lambent' and the 'Locust', the participants in this study only fought the 'Locust', as they are more human like of the two. Also, the 'Lambent' enemies just explode into yellow liquid when killed and this would disrupt the conditions of this study as this effect cannot be switched off. The level participant's played was close to the start of Act 1, Chapter 6, in which the player only fought 'Locust'. 'Gears of War 3' allows individuals to manipulate the game experience slightly, one option is to turn on Arcade Mode which is the same as the games campaign mode but when the player kills enemies they receive points, which are added to a total score. This is seen as directly rewarding the player for violence. There is also an option that manipulates blood and gore, when turned off the blood and gore is replaced with sparks. Blood and Gore being left on can be considered to be indirect reward. This game was played using an Xbox 360, LCD Television and headphones.

To measure aggressive cognitions, a word completion task was used (Anderson, Carnagey & Eubanks, 2003). The designers of the measure gave permission to other researchers to use it as long as it was cited. With this measure, participants are supplied with a list of 24 partially completed words, which have various possible answers (e.g. des_ _ _ _ can be dessert, destiny or destroy). The measure has a coding guide which distinguishes answers into neutral, ambiguous, aggressive and non-words. When aggressive words are used as an answer, this is thought to reflect

aggressive cognitions; therefore more aggressive answers reflect more aggressive cognition. Different sets of words were used for pre-gameplay and post-gameplay.

To measure aggressive affect, the Social Hostility Scale (SHS) was used (Anderson, Deuser & DeNeve, 1995). The designers of the measure gave permission to other researchers to use it as long as it was cited. The SHS comprises of a list of mood statements (e.g. I feel outraged), participants were asked to, on a Likert scale state 1 to 5 how much they agree with the mood statements (1 = strongly disagree, 5 = strongly agree).

To measure previous exposure to VVGs, the Video Game Habit measure was adapted from Anderson and Dill (2000). Participants were required to report their top five video games that they regularly play and rate on two Likert-scales of 1-7 how often they play it and how violent they rate the content to be. For each of the five video games the violent content score was multiplied with the how-often score. The total violence exposure score was then be recorded by finding the average of these five scores.

An Information sheet was provided to participants before the study was conducted. The information sheet outlined what the study was about, specifically that they would be exposed to a VVG and made it clear that they may withdraw from the study at any point of the study. Upon completion of the study participants were supplied with a debrief sheet detailing why the study was carried out and what the results the study were expected to be. The debrief sheet contained contact details of the researcher, if participants would have liked to find out the results of the study upon its completion or would like to withdraw their results from the study after taking part.

The aggressive effects of ‘Gears of War 3’ could potentially have persisted after the participant had taken part in the study. To prevent this from occurring, participants were provided with mood repair after taking part in the study. This involved participants staring at a picture of a relaxing landscape for 20 seconds in order to restore the participant’s mood and remove any form of negative effect that VVG exposure may have on participant’s mood. The mood repair was a peaceful landscape that contained no aggressive stimuli which may have primed aggressive thoughts and feelings.

Participants were also supplied with a quick control reference sheet for ‘Gears of War 3’, So that they may quickly look up the controls, while playing the game.

An Ethics Form has been completed and submitted to the Ethics Board. Full ethical approval was granted before data collection started.

Procedure

Participants individually participated in lab conditions at Southampton Solent University. They were first asked to read and sign the information sheet. Participants were allocated into one of the three ‘type of reward’ conditions in order of participation. After which they were supplied with the video game questionnaire to complete; this measure was completed after the other two measures to prevent aggressive thoughts and feelings accessed from previous video game experiences having an effect on the measures of aggressive thoughts and feelings. Next,

participants were given the SHS and then the word completion task and asked to complete the words as quickly as possible. Participants then played a level from 'Gears of War 3', which is close to the start of Act 1, Chapter 6 of the game. This level was played across all conditions to maintain validity as individuals would encounter the same enemies and use the same weaponry. Act 1, Chapter 6 starts with the main characters zip lining onto a bridge with 'Lambent' enemies on. This area of the bridge was cleared of enemies by the researcher prior to the participants exposure to the game as it contains Lambent enemies, for reasons explained earlier and after being cleared provides a perfect area for training participants to play the game. 5 minutes was spent training in this area if required, training involved being talked through the games controls and objectives. Participants were then left to play the level for 15 minutes on their own. After 15 minutes of gameplay, participants were then asked to complete the post-gameplay SHS and Word Completion Task, again they were asked to complete the words as quickly as possible. Upon completion, participants were then supplied with a debrief sheet and a mood repair to restore mood.

Ethical Considerations

The content of 'Gears of War 3' is violent and may have caused distress for participants. Participants were warned of the violent content in the advertising poster and on the participant forum. All participants were over the age of 18 and took part with their own consent. Participants were offered 45 minutes participation time as incentive; participants were recruited through the participation forum and the project noticeboard by their own freewill and they were not be pressured into participation. This study involved exposing participants to violent content, which could potentially have had a negative effect on the individual's mood and emotional state. To account for this, mood repair was supplied after the study to cancel out potential negative effects. The exposure to violent gameplay was brief and was unlikely to have long-term effects. The researcher was only exposed briefly to violent content through training each participant. During free gameplay, the researcher was not observing the participant playing the game and did not hear the game due to the use of headphones.

Analysis

SPSS was used to conduct all statistical analysis. The analysis for this study used six independent sample t-tests and two Pearson correlations. In order to measure changes in aggressive affect and aggressive cognition, the pre video game score was subtracted from the post video game score to create an affect difference (measured with SHS) and a cognition difference (word completion task).

In testing the first hypothesis, investigating differences in the increases of aggression scores between the three conditions, two independent sample t-tests were used to compare the affect difference and the cognitive difference between the direct and indirect reward conditions.

In order to test the second hypothesis, investigating differences in the increases of aggression scores between the reward conditions (direct and indirect conditions) and the control condition, the direct and indirect conditions were grouped together by using a cut point to form a new reward condition. Two independent sample t-tests

were used to compare the affect difference and the cognitive difference between the reward condition and the control condition.

To test the third hypothesis on the effect of video game violence exposure, the median of the scores of the Video Game Habit Questionnaire were calculated and split into two conditions; high (scores above median) and low (scores below median) VVG Exposure. Two independent sample t-tests were used to compare the affect difference and the cognitive difference between the high VVG exposure condition and the low VVG exposure.

To test the fourth hypothesis on the relationship between VVG exposure and initial aggressive affect and aggressive cognitive scores, two one-tailed Pearson correlations were conducted.

Results

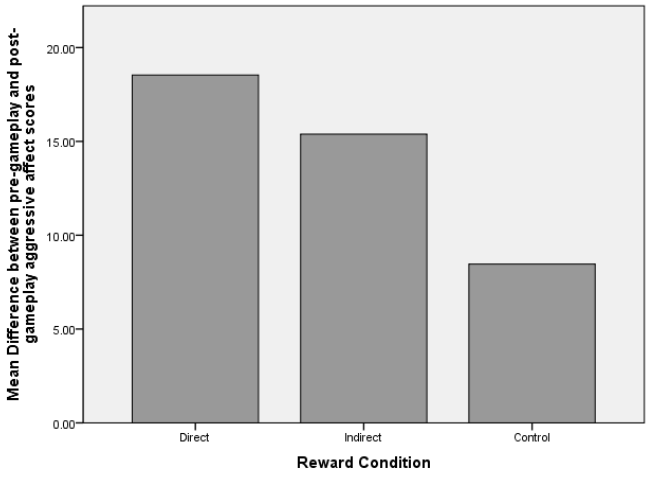

Figure 1a: **The mean differences in aggressive affect scores between the pre-gameplay and post-gameplay for the direct, indirect and reward conditions**

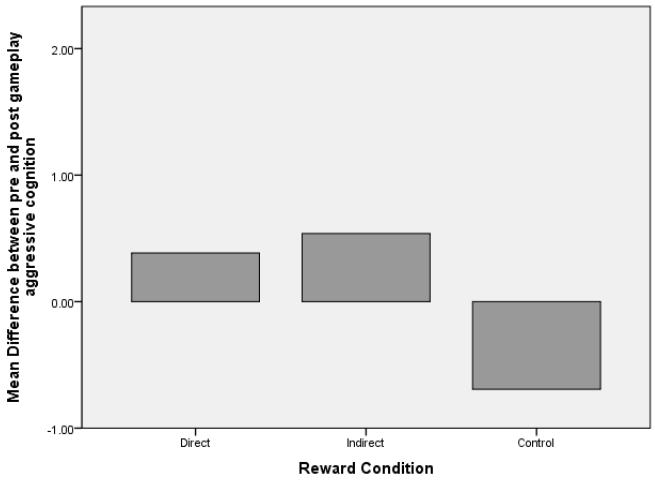

Figure 1b: **The mean differences in aggressive cognition scores between the pre-gameplay and post-gameplay for the direct, indirect and reward conditions**

Figure 1a and Figure 1b show two bar charts representing the mean differences for aggressive affect and cognition across the direct, indirect and control conditions. Figure 1 and 2 shows that both aggressive affect and aggressive cognition, the direct and indirect conditions appear to be reasonably equal. The t-test used to compare the aggressive affect scores between the direct and indirect conditions produced a non-significant result ($t(24) = .395$, $p > 0.05$). The t-test used to compare the aggressive cognition scores between the direct and indirect conditions produced a non-significant result ($t(24) = -.209$, $p > 0.05$). There was no statistically significant difference between the aggressive affect and cognition scores between the Direct and Indirect reward conditions.

Figure 1a and 1b also show direct and indirect conditions have higher mean differences for aggressive affect, though the mean differences in aggressive cognition are very small. The t-test used to compare the aggressive affect scores between the reward condition and the control produced a non-significant result ($t(37) = -1.264$, $p > 0.05$). The t-test used to compare the aggressive cognitive scores between the reward condition and the control condition had non-significant produced a non-significant result ($t(37) = -1.804$, $p > 0.05$). Two paired sample t-tests showed that there was a significant increase in aggressive affect scores across all three conditions ($t(38) = -4.421$, $p < 0.01$), while there was no significant change for aggressive cognition ($t(38) = -.238$, $p > 0.05$). There was no statistically significant difference between the mean differences in aggressive affect and cognition scores for the reward conditions and the control condition.

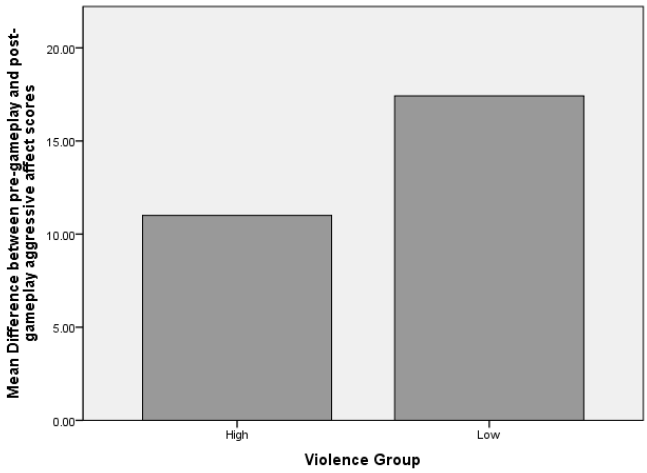

Figure 2a: **The mean differences in aggressive affect scores between the pre-gameplay and post-gameplay for the high and low violent video game exposure conditions**

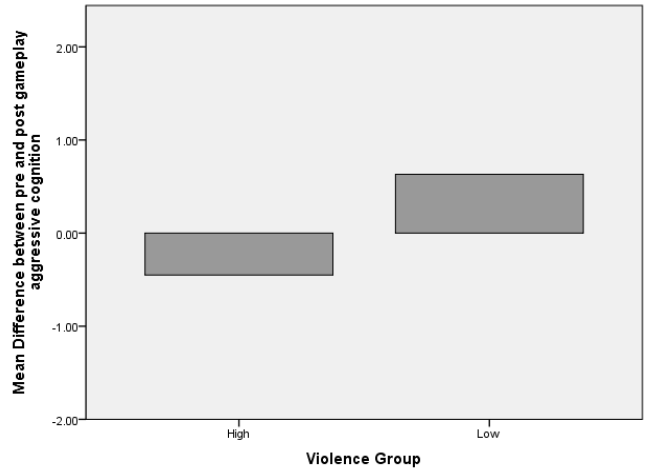

Figure 2b: The mean differences in aggressive cognition scores between the pre-gameplay and post-gameplay for the high and low violent video game exposure conditions

Figure 2a and Figure 2b show two bar charts that represent the mean differences between the pre and post video game scores for aggressive affect and cognition for the High and Low VVG exposure conditions. Figures 2a and 2b show that participants with low VVG exposure had higher increases in aggressive affect than those with high VVG exposure. Aggressive cognition showed very small difference in scores between the high and low VVG conditions. The t-test used to compare the aggressive affect scores between the high and VVG exposure produced a non-significant result ($t(37) = -1.004$, $p > 0.05$). The t-test used to compare the aggressive cognition scores between the high and VVG exposure produced a non-significant result ($t(37) = -1.792$, $p > 0.05$). There was no statistically significant difference between the mean differences in aggressive affect and cognition scores between the High and Low VVG exposure conditions. All t-tests conducted in this analysis had a non-significant Levene's test of equality of variance, so equal variances were assumed.

Figure 3a and Figure 3b show two scatter plots showing the relationship between the previous VVG scores and initial aggressive affect and cognition scores. Initial aggressive Initial aggressive affect and previous VVG exposure appear to have no relationship. The Pearson correlation used to examine the relationship between VVG exposure and initial aggressive affect scores produced a one-tailed non-significant result ($p > 0.05$).The Pearson correlation used to examine the relationship between VVG exposure and initial aggressive affect scores produced a one-tailed significant result ($p < 0.05$). There was a positive correlation between VVG exposure and higher initial aggressive cognition scores. There was no statistically significant relationship between initial aggressive affect scores and previous VVG exposure, although there was a statistically significant relationship between initial aggressive cognition scores and previous VVG exposure was found.

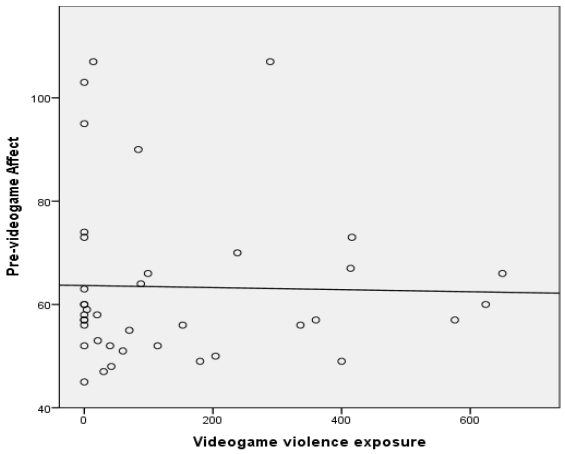

Figure 3a: The relationship between initial aggressive affect scores and previous violent video game exposure

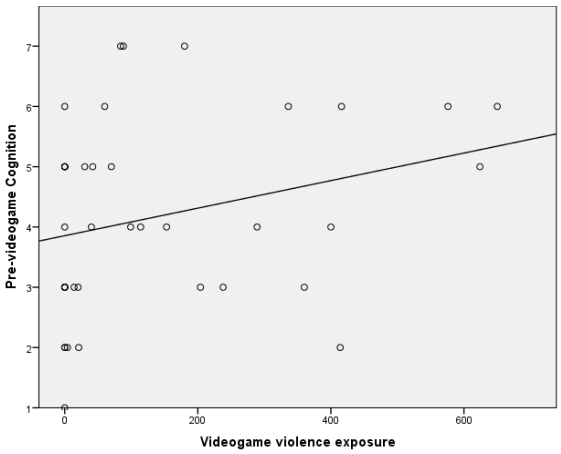

Figure 3b: The relationship between initial aggressive cognition scores and previous violent video game exposure

Discussion

Only one of the formulated hypotheses was supported by this study. Rewarding the player with points or including blood and gore led to equal increases in aggressive affect and cognition. However, there was no statistically significant difference in aggressive increases between the reward conditions and the control condition. Therefore, changing how players are rewarded for violent in-game behaviours did not determine player's increases in aggression, participants in the control condition increased in aggressive thoughts and feelings just as much as the direct and indirect conditions. There was a significant overall increase in aggressive mood across all conditions. Overall there was no significant change in aggressive thoughts across all conditions. Previous VVG exposure was not found to have a significant effect on the increase of aggressive thoughts and feelings. A positive relationship was found between previous VVG initial aggressive cognition scores, though there was no relationship found between previous VVG exposure and initial aggressive mood scores. Individuals with a higher self-reported exposure to VVGs displayed significantly higher initial aggressive thoughts, though there was no significant difference in aggressive mood.

The first hypothesis that direct and indirect reward conditions will have an equal effect on a player's aggression was supported by this study, as the direct and indirect conditions had equal increases in both aggressive affect and cognition. However, the second hypothesis that direct and indirect rewards in VVGs will both have significantly higher increases in aggressive affect and cognition compared to the control condition was not supported. Although there was an increase in aggressive affect across all three of the conditions, there was no significant variation in the increases of aggression scores. Therefore, Carnagey and Anderson's (2005) claim that direct and indirect rewards are an explanation for increased aggressive thoughts and feelings after playing a violent video game continues to be unsupported

by research. This study also does not replicate past research which found that the inclusion of blood in games led to significantly higher scores of aggression (Farrar *et al*., 2006; Bartlett *et al*., 2008; Krcmar& Farrar, 2009). Though, it is possible that direct and indirect reinforcement were still present in the game, even with the removal of points and blood/gore for the control condition. Carnagey and Anderson (2005) also suggested that direct reinforcement could still be in the study in the form of level progression and verbal praise and indirect reinforcement may come from the sound of violence. Although like points and blood/gore there is a lack of research regarding these and a relationship with aggression. Overall, this study found changing the way that in-game violence is presented to the player did not cause significantly different increases in aggressive mood. Therefore, it could be argued that the amount of blood/gore and giving the player points for kills in a VVG has no influence on an individual mood or cognition, instead it could be more the acts of violence and urgency of the in-game situation that may lead to these increases.

The third hypothesis, that participants with higher previous exposure to VVGs will have lower increases in aggressive affect and cognition due to desensitisation, was also not supported by the current research. Although participants with low exposure to VVGs had a noticeably higher mean increase in aggressive affect than participants with high exposure, this difference was not significant. Therefore, the current findings do not support Carnegey, Anderson and Bushman's (2004) claims that frequent exposure to VVG will result in a long-term desensitisation effect to all forms of violence. In their study, they found that individuals who were exposed to a VVG had less of a physiological response to videos of real life violence. They stated that this was due to psychological desensitisation to violence due to the exposure to the game. However, in their study they exposed participants to the video immediately after the playing the violent video game, therefore this only represents short term desensitisation to violence. It is possible that this short-term desensitisation effect may have been due to priming/arousal from exposure to the VVG, instead of learning not to become affected by witnessing violence. In the current study, participants with low previous exposure may have had slightly higher increases in aggressive affect due to frustration of attempting to learn how to control a video game in a relatively short time span. Controls for modern video games are relatively universal, especially for games like 'Gears of War 3', frequent players of video games needed much less time to teach how to play than non-players. To non-players using a controller to control an in-game character may be more stressful and frustrating; also given the urgent nature of the gameplay this may have had some form of influence on aggressive affect. Overall, the present study found previous VVG exposure had no influence over player's increases in aggressive affect and fails to support the findings of the meta-analysis by Anderson et al (2010) about a desensitisation effect.

The fourth hypothesis that high previous exposure to video game violence will result in higher initial aggressive affect and cognition scores was partially supported by the findings of the current study. There was no relationship between VVG exposure and aggressive affect, however a relationship was found between VVG exposure and cognitive. This suggests that there may be a long term effect of VVG on an individual's cognition. This finding partly supports past research into the long-term effects of high exposure to VVG, though only aggressive cognition was related and this relationship was not particularly strong. This study suggests that high exposure to VVGs will not have a long-term influence on players affect, despite this being the

only type of aggression that increased significantly after gameplay in the study. Also the fact that aggressive cognition scores were unaffected by exposure to a VVG despite higher VVG exposure resulting in higher is a strange finding. However, this could be due to the measure used, as explained later. It could be that frequent VVG use can lead to higher aggressive cognitions or it could be the other way round, higher aggressive cognitions leads an individual to expose themselves to VVG exposure more often. Though, a recent study by Willoughby, Adachi and Good (2011) found high aggression scores failed to predict higher VVG use. Overall, this study's findings partly support the findings of Anderson *et al*.'s (2010), that there is a relationship between VVG and video game players aggressive thoughts, however it does not support previous findings that frequent VVG exposure can lead a long-term effect on the players mood.

These findings provide some support for the current theories of video game aggression. The social learning theory (SLT) is the most frequently cited mechanism by which games may result in aggressive behaviour (Sherry, 2007), which suggests that aggressive behaviour is learned through imitation of attractive and rewarded models. Carnegey and Anderson (2005) incorporated this theory into their study and suggested being rewarded points for violent actions could increase aggressive affect and mood. However, the findings of the present study have found little support for this theory as an explanation to video games increasing player's aggression. The theory predicts that witnessing a model (the player's avatar) being rewarded for aggressive behaviour (in this study with points and possibly blood/gore), thus the witness will be more prone to replicate these observed behaviours (reflected in this study by aggressive affect and cognition scores). However, there was no difference in increases of aggressive affect or cognition found across all three conditions. SLT also predicts that frequent exposure to VVG and repeating violent actions overtime can lead to long-term changes to the individual's aggressive tendencies. This was partly supported by the current study, as a relationship found between previous VVG exposure and initial aggressive cognition scores was found, however there was no such relationship with VVG exposure and initial aggressive affect scores. Though there is evidence that reinforcement takes place during gameplay (Keopp, 1998), however it is possible that the behaviour that is being reinforced by gameplay is actually pressing the buttons on the controller instead of the violent behaviour shown on the TV screen. Overall, there is little support for the SLT as being a model that effectively explains how VVGs can increase aggression. This finding supports a recent meta-analysis by Sherry's (2007), which found that SLT fails to fit the findings of video game research as well as other theories.

Berkowitz's (1984) cognitive neo-association theory, while not directly tested in the present study the findings fit this theory more appropriately than the SLT. This theory proposes that violent media can prime semantically related thoughts and feelings. The findings of this study support neo-association as all three conditions increased aggressive affect, because the exposure to the violent behaviour in 'Gears of War 3' regardless of condition triggered the same aggressive nodes. Therefore, exposure to the VVG primed individuals with a more aggressive mood. Conversely, aggressive cognition did not increase significantly across all three conditions, which goes against what cognitive neo-association predicts. It was expected that more aggressive answers would be provided in the word completion task as aggressive words would be easier to recall due to them being semantically linked by aggression.

However, the cognitive neo-association theory may also explain why there may be a significant relationship between previous VVG exposure and initial aggressive cognition scores. Berkowitz (1993) suggested that primed aggressive thoughts and feelings, while relatively short-term, can last for a longer length of time if in the right conditions. In this case, individuals with high previous exposure to VVGs can be assumed to have aggressive cognitions to be primed on a regular basis. It is possible that this regular aggressive priming may result in the player being able to retain aggressive cognitions for a longer length of time, thus aggressive words were more accessible for the word completion task.

Zillman and Bryant's (1974) theory of excitation-transfer, was also not directly tested by the present study, and like the neo-association theory the findings fit better than with the SLT. The fact that there was no significant difference between the increases of aggressive affect across the three conditions, suggests that viewing violent behaviour being rewarded is not what governs increases in aggression suggests that other mechanisms are in effect. The findings of the present study suggest that there is more of a short-term effect of exposure to VVG than a long-term effect, since aggressive affect increased post gameplay though frequent game players did not show a higher aggressive affect than non-gamers. The excitation-transfer theory suggests that when individuals are exposed to violent media it leaves them with a temporary aggressive tendency given certain circumstances. However, this theory cannot explain why there was a positive relationship found between VVG exposure and initial aggressive cognition scores, given that it predicts only a short-term increase in aggression.

The GAM incorporates the previously stated theories into a complex and solid model. The study partly supports the model, as increases in mood and a relationship between aggressive cognition and VVG exposure were observed. As previously stated the study partly supports the priming and excitation aspects of the model. There is also partial support for the core component, which is learning, rehearsal and reinforcement, coming from the relationship found between aggressive cognition and VVG exposure. However, short-term changes to aggressive cognition and long-term changes such as the individual's mood and desensitisation that the GAM predicts were not observed in the current study. The GAM has been deemed as being a too broader explanation to account for the details of game features (Krcmar & Farrar, 2009). Krcmar and Farrar stated that the GAM relies too much on using different theories to account for different effects of video games, thus leads to the GAM not being a coherent or effective model to apply to VVGs.

The findings in the current study are similar to the findings of Sherry's (2007) meta-analysis of VVG literature. He found that there was almost no support for the SLT, while the neo-association and the excitation-transfer theories have mixed support from research current at the time. He notes that there is no theory currently applied to VVGs that account for the types of changes in aggression observed post-gameplay. While the present study mainly focused on testing the SLT being applied to VVGs, the findings have little support for the theory and fit the predictions of the neo-association and excitatory theories better, but not perfectly. A major problem is previous researchers simply assume that video games are just a different type of television viewing, despite the fact that individuals engage with both forms of media in two completely different ways (Sherry, Greenberg, Lucas & Lachlan, 2006). Sherry

(2007) states that ‘theories designed to explain and predict the social influences of television are not adequate to account for video game effects’. None of the theories that have previously been applied to television have been fully supported by both Sherry’s meta-analysis and the present study.

A strength of this study is that it uses one videogame across all three conditions, instead of comparing two mechanically different games. As a lot of previous videogame research compares ‘violent video games’ and ‘non-violent video games’ which can differ greatly in areas as well as level of violence such as speed of gameplay, amount of input from player and difficulty. This design also allowed for studying how different features may have individual influences on aggression, while avoiding the risk of the results being influenced by extraneous variables if a different game was used in one of the conditions. This study also took the best possible area for participants to play to provoke the desired effect into consideration. ‘Gears of War 3’ has two types of enemies, one much more humanlike than the other. The level chosen for this study ensured that participants only fought the humanlike enemy. Also, it was made sure that the level was not too difficult for new players and had a peaceful area that allowed participants to become accustomed with the controls, as frustration may have had a significant effect on results.

A limitation of this study may have been the use of the word completion task, which may not have been an effective measure of aggressive cognition. This would explain the lack of change between before and after gameplay. A recent study has suggested the word completion task may be an inaccurate measure of aggressive cognition (Craighead *et al*., 2011). Craighead *et al*. suggest that Anderson’s word completion task may be inaccurate a its coding sheet may not account for all possible words, whether participants intend a word and misspells it and also the coding may be outdated as meanings of words change over time and some words may be more aggressive in other cultures. They acknowledge that a word completion task could a good measure of aggressive cognition; however Anderson’s measure of aggressive cognition has become out-dated and requires revision. It is also possible that some participants have lower range of vocabulary or English may not be their first language, thus resulting in them having less aggressive words at their disposal. This may explain why there was no significant difference found between pre and post gameplay in terms of aggressive cognition; aggressive cognition may have actually increased but the measure was unable to reflect this. Another limitation with the word completion task is that participants were only asked to complete the words as quickly as possible, instead of being given a time limit to provide answers.

Other limitations of this study include the relatively short amount of time for which participants were exposed to the VVG. Fifteen minutes may not have been a long enough amount of time to study the effects of reward in video games; it is possible that learning processes require more time in order for mood and cognition to be influenced in a more significant way. However, it is difficult to determine how long participants would have to play a VVG to see these effects. It could be possible for future research to attempt this study over the course of about an hour’s gameplay each day for a week to see if this yields any significantly different results. Another possible limitation is the measure of self-reported previous video game exposure as these scores could be influenced by the individuals differing perceptions of violence in video games. What one participant may have deemed as extremely violent

content may not be seen to be as violent by another participant. The same limitation can be applied about how participants rate how much time they spend playing certain games.

In terms of future research, as previously mentioned this study could be replicated to investigate whether there is an effect of playing a game that rewards violent action over a longer period of time, such as a week or so. There were visible differences between the reward conditions and increases of aggressive affect however this was not significant, it is possible that these differences may become more pronounced with longer exposure to the features of the game. This study could also be replicated using a revised version of the word completion task, with the issues mentioned in the limitations being addressed. This should provide a more accurate measure of aggressive cognition and can investigate whether VVGs have a significant influence. It is possible that future research could replicate the study with children as participants. Children could be more susceptible to the reinforcing nature of in-game reward features. Future research into VVGs should also be focusing on exploring the various different effects that different in-game features may or may not have over an individual's thoughts and mood. Sherry (2007) and Krcmar and Farrar (2009) suggest that the focus of video game research should not be on attempting to apply models that explain social influences of violent television to video games. But instead future research should be focused on developing a new model to be applied only to video games. Sherry (2007) suggests that future research in this field can look at the role of arousal and priming of video games on player's aggression as these two theories appear to be the best predictors of increased aggression.

This research partially supports previous research that exposure to violent video games is associated with heightened aggression. However, this evidence is not strong enough to support the popular media view that VVGs can have dramatic and long-term effects on an individual's mood, cognition and ultimately their behaviour. Video games do cause some form of increase in aggression in the short-term, however the effect seems to be less powerful than some researchers argue (Gentile & Anderson, 2003). The current study supports a viewpoint that much of the controversy over violent video games is due to moral panic, which can be triggered by the discussion of VVGs by media, politicians and social scientists (Ferguson, 2008). This public discussion of the influence that VVGs could potentially have over players may trigger a cycle of moral panic, which can lead to the effect of VVGs on aggression ultimately being over-estimated. Recent meta-analyses by Sherry (2007) and Ferguson (2007) suggest that VVGs have as much of an effect as viewing television and sports violence, which challenges the view that VVGs can have a dangerous effect on society. The current study found stronger support for a short-term effect of VVG exposure than long-term effects. It should be communicated to the public that video games do cause a rise in aggressive mood, however this rise does not appear to be permanent, regardless of how often an individual plays VVGs.

In conclusion, the present study investigated the effects that different reinforcing features in VVGs could have on increases in aggression, whether previous exposure to VVGs may desensitize an individual to the effects of VVGs and whether there is a relationship between initial aggression scores and previous VVG exposure. This study found an overall increase in aggressive mood, no difference between increases across the three reward conditions, no difference in increases between

high and low VVG exposure and a weak positive correlation between previous VVG exposure and initial aggressive cognition scores. These findings have little support for the application of SLT as an explanation for the effects of VVGs. While not the focus of the study, this study's findings actually provide support to the neo-associative priming and excitation-transfer theories. The dominant theories applied to VVGs are the same theories used to explain increases in aggression upon viewing violent television, despite interaction with both forms of media being completely different. Future research should be investigating what parts of VVG actually have an influence on aggression. Also future research should be focusing on the development of a new aggression model that applies only to video games. It has been previously stated that the debate whether VVGs cause aggression is over (Anderson and Bushman, 2002), while this is true, the debate has instead shifted to whether this aggression produced is actually harmful and worthy of public concern or not.

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