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Effect of violent video games on recognising facial emotion

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Abstract

The effects of violent video games include processing biases. A happy face advantage - the preference for happy faces, is typically observed while recognising facial emotions. The aim of the study is to assess whether exposure to violence in the form of a video game affects reaction time to recognising positive and negative facial emotions. Participants played either a violent or non-violent video game and were given a face perception task. The facial emotion recognition task was based on pictures of faces morphed from neutral to happy and from neutral to angry. The participants were asked to make a prompt recognition of the emotion and their reaction time was measured. The results showed no statistical difference between reaction times to recognising happy or angry emotions. The findings are consistent with the happy face advantage showing violent video games do not induce a processing bias in regards to face perception. The results are discussed in relation to previous studies with contradictory findings, providing a critique of their rationale. The evaluation of methodology includes limitation of game choice and suggestions to how to avoid it in the future studies.

Introduction

Violent Video Games

In the last 30 years, gaming has become increasingly popular as a leisure activity for both children and adults. Gaming has expanded its territory from dedicated consoles, PC gaming, to tablet and mobile gaming and it is readily available for everyone owning a smartphone. In 2013, it was estimated that 1.2 billion people around the world were gamers (Spilgames, 2013). According to NPD group, a market research company, 91% of US children aged 2 to 17 play video games regularly. The strongest gains were in 2-5 year old group, 17 percent points more compared to the year 2009 (The NPD Group, 2012). The stereotype of only boys playing video games is far from true; Pew Research Center has found that 99% of boys and 94% of girls play video games (2008). That means almost all children are playing games, some from the age of 2, and their parents want to know whether this has any negative effect on them.

Potential harmful effects of exposure to violent media has been scrutinised for over six decades. A lot of research has been focused lately on the negative effects of playing video games. While there exists evidence of positive influence of video games on personality, like increasing prosocial behaviour (Gentile et al., 2009) and several studies have found no negative effect of violent video games on aggressive behaviour (Ferguson and Kilburn, 2009), the majority of studies have reported harmful effects of exposure to violence in video games and some found them associated with higher levels of aggressive behaviours. Compared to television, video games give more freedom and direct control over the character in a game than watching violence on a television screen and therefore children playing video games display higher levels of violent behaviour compared to those only watching television (Polman, Orobio de Castro and Van Aken, 2008).

The newest generation of video games is extremely realistic in terms of both graphics and storytelling and portrays different aspects of life such as human interactions, sex or violence, which makes them feel like real life. In Grand Theft Auto III, the graphics made the violence in the game very realistic; the player can pay the prostitutes and then kill them to get their money back (Gibson, 2004). The effects of playing violent video games, both short- and long-term, have been researched recently. Violent games have been linked to the accessibility of antisocial thoughts (Anderson et al., 2004), dehumanising the victim (Greitemeyer and McLatchie, 2011) or even physical violence (Gentile, Lynch, Linder & Walsh, 2004). Bushman and Huesmann (2006) argue short-term effects can be explained by priming existing

knowledge structures. Longitudinal studies also point out to long-term consequences of playing violent games; research shows children who played more violent video games early in the school year are less helpful later in the school year (Anderson, Gentile and Buckley, 2007). Moreover, a recent meta-analysis of 130 studies with over 130,000 participants in total has found violent video games are a risk factor for increased aggressive behaviour and affected cognition, emotions and arousal systems (Anderson et al., 2010).

General Aggression Model

In 2002, Anderson and Bushman proposed a general aggression model (GAM), which integrates mini-theories of aggression into a single framework. The authors propose an explanation to both increasing levels of aggression after playing a video game and individual differences in sensitivity to violence presented by video games. The theory takes into account both internal and situational factors and according to GAM, a persons internal state consists of cognitions, thoughts and arousal, which all influence each other and have an effect on perception of violence (Anderson & Bushman, 2002; DeWall & Anderson, 2011).

One of the most important presumptions of GAM is that violent video games have both short-term and long-term effects. Immediate, short-term effects are activated if the person has had prior exposure of any violence in video games, as they require prior knowledge structures to exist. Anderson et al. (2010) argue in order for the player to exhibit aggressive behaviours, there is no need for close similarity in the game and in real life. Therefore, playing violent games result in increased aggression levels in real life even though the characters, type of violence and duration of play are entirely different. The authors propose that the players game character and violent acts do not need to be similar to real-world targets or aggression types. According to GAM, the existing knowledge paths would still form a connection between the game and aggressive behaviours.

Long-term effects of repeated exposure to violent media include measurable changes in the accessibility of aggression-related knowledge and responses to seeing or thinking about violence. According to GAM, long-term effects involve a learning process. When a person is being continuously exposed to violence in the media, like video game violence, it resembles a rehearsal of information. Therefore, with increasing number of violent acts observed, both in the media and in the family, these knowledge structures become more complex and difficult to change. The authors argue chronic exposure to violence in the form of video games may lead to lack of empathy or physiological desensitisation (Anderson et al., 2010).

Aggressive cognitions

One of the internal states GAM attempts to explain, along aggressive feelings and arousal, is aggressive cognition. Aggressive thoughts, being a primal reaction to enemies and dangerous situations, are a particularly interesting topic in regards to violent video games. Video games can be a source of many

emotions such as excitement or fun; they can be repetitive, boring or frustrating. Those emotions can then result in the emergence of aggressive cognitions. Even non-violent games can trigger those aggressive thoughts. Certain racing or sports games can result in arousal; even motor skill games that require concentration and quick decision-making processes increase heart rate and blood pressure. What is more, aggressive cognitions may be triggered by frustration or anger caused by playing a particularly difficult game (Greitemeyer and Osswald, 2009). Violent video games require such aggressive thoughts in order for the player to fully experience the story, however it is not necessary in non-violent video games. One of the ways to assess aggressive cognitions is the speed of recognising facial emotions; other methods include word fragment completion, Stroop interference (Kirsh et al., 2005) or story completion (Anderson et al., 2010). Strack and Deutsch (2004) argue the repetition of aggressive thoughts, especially in children, may lead to permanent behaviour and personality changes. According to GAM, those aggressive thoughts may then turn into aggressive behaviours under right circumstances like prior exposure to violence (Anderson et al., 2010). Therefore, aggressive cognitions are necessary predicaments for violence and thus more research is needed to establish what induces them.

Emotional face processing

Humans analyse facial expressions to detect and react to emotions of others. Face recognition is a particularly important skill as it is a vast source of information about other peoples emotions, mood or even feelings. Some expressions signal potential harm, like anger, disgust or fear; others, like happiness, express potential benefit. Processing facial emotions is therefore a crucial skill in order to succeed in day-to-day interactions between people and it is also one of the first acquired by infants (McClure, 2000). Impaired facial emotion recognition can be seen in children displaying higher levels of aggression (Kimonis et al., 2006). Chronic exposure to violence or abuse and neglect can also lead to abnormalities in normal processing of facial information (Pollak, 2008). In research, happy expressions have been found to be identified faster and more accurately than others (Leppnen, Tenhunen & Hietanen, 2003; Tottenham et al., 2009). However, from an evolutionary point of view it would be more beneficial to quickly process angry face expressions in order to make a fight or flight decision. In some circumstances, the ability of instantaneously identifying and responding to danger means a survival advantage and there exists some evidence to support that theory. It was shown angry faces are more readily identified among happy faces (Pinkham, Griffin, Baron, Sasson, & Gur, 2010) and seeing pictures of angry faces conveyed more brain activity than seeing happy faces (Schupp et al., 2004).

Processing bias

Violent media consumption may result in identifying angry faces faster compared to happy faces. This finding suggests there is a negative processing bias in processing facial emotional expressions (Kirsh, 2006). Bushman (1998) found that participants exposed to violent media (a violent video tape) listed aggressive associations like kick or hit to a neutral word wall, as well as could remember a greater

number of aggressive words as opposed to those in the non-violent video tape condition. The author argues exposure to violent media increases the accessibility of aggressive cognitions. Building on this study, Kirsh, Olczak, and Mounts (2005) compared Stroop task results of participants playing a violent or a non-violent game. The researchers also measured trait hostility score. A greater Stroop interference for negative words in participants playing violent video game and those high in trait hostility was found which suggested violent video games can result in a processing bias in the same way as trait hostility. This evidence supports the notion that exposure to violent media induces aggressive biases. Hence, violent video game play primes aggressive cognitions and therefore can induce an affect-processing bias.

Kirsh and Mounts (2007) have conducted a study trying to determine if playing violent video games led to a reduction in the happy face advantage, thus resulting in processing bias. The authors measured reaction time to recognising a correct response to see whether playing violent video game affects the speed of processing facial emotion information. Results indicated that playing a violent game does affect the speed of recognising positive emotions and it reduces the happy face advantage in particular. However, there are several limitations to this study. The main flaw of this piece of research is that the authors used a racing game as their non-violent condition. As mentioned before, Greitemeyer and Osswald (2009) argue racing games raise the level of frustration which then can be a trigger for violent behaviours. Additionally, the violence in the other game was not realistic; although it was a first-person shooter, the enemies were zombies and the violent acts were intended for fantasy characters. Atkin (1983) has found that realistic violence tends to produce greater effects on aggression than fantasy violence therefore it might have had an effect on the results. Both studies, Kirsch et al. (2005) and Kirsh and Mounts (2007) use the same two games with each being flawed in a different way (racing game and fantasy violence).

Rationale for current study

It may seem that violent media, and video games in particular, have an effect on short and long-term aggression levels. There is, however, not a lot of research on processing bias inducted by violent video games. Face recognition is one of the first skills acquired in infancy and there seems to be a preference for happy faces (as displayed by infants or in happy face advantage). As violent media consumption can result in processing bias, the relationship between facial emotion recognition and violent video games has not been studied enough and existing research is flawed. Therefore, there exists a need for further examining the relationship. The purpose of this study is to determine whether playing violent video games induces a processing bias in facial emotion recognition. In the current study, participants will make a speedy recognition of an emotion displayed by a face on a screen (happiness or anger). Furthermore, the issue of flawed game choice was addressed in the current study by choosing two similar-looking, realistic games with different violence levels. It is hypothesised that participants in the violent video game condition will have shorter reaction times to angry emotions than happy and participants in the non-violent video game group will have shorter reaction times to happy faces than angry faces (hypothesis 1). It is also hypothesised that the violent video game group will have longer reaction times of recognising both facial expressions compared to non-violent condition (hypothesis 2).

Methods

Design

The study was a between-subject design. The participants were randomly assigned to play either the violent or non-violent video game (the independent variable). The dependant variable was the reaction time (RT) to correctly recognise the emotion (either happy or angry) in faces morphed from neutral to happy or neutral to angry.

Participants

Participants were 40 undergraduate students and did not receive any form of payment for participation. The participants in this study were recruited using a social networking site as well as subject pool and flyers. Participants were 57.5% female and their ages ranged from 18 to 30 years of age with a mean age of 22.8.

Materials and stimuli

Video games

Both violent and non-violent games were played on PlayStation 3 connected to a Dell All-In-One computer. Both of the games used the same PlayStation 3 controller.

The violent video game was *Soldier of Fortune: Payback*. It is a war first-person shooter in which the objective of the game is for the player to perform a given task while defeating enemies using various weaponry including machine guns or grenades. The participants had an unlimited number of lives. The game contains excessive gore, blood, and violent acts like exploding heads. The game has British Board of Film Classification (BBFC), an independent film and video game rating body, rating of 18 indicating it is only suitable for adults. BBFC advises the game contains strong, bloody violence (BBFC, 2007).

The non-violent video game was *Minecraft*. It is an open-world game in which the player builds their own world by using gathered material such as wood or sand. The game is rated by Pan European Game

Information (PEGI), a European video game rating body, as suitable for persons over 7 years old. PEGI advises the game contains some violence however set in cartoon setting that might be upsetting to very young children only (PEGI, 2014). This game presents the player in the first person, similarly to the violent games setting.

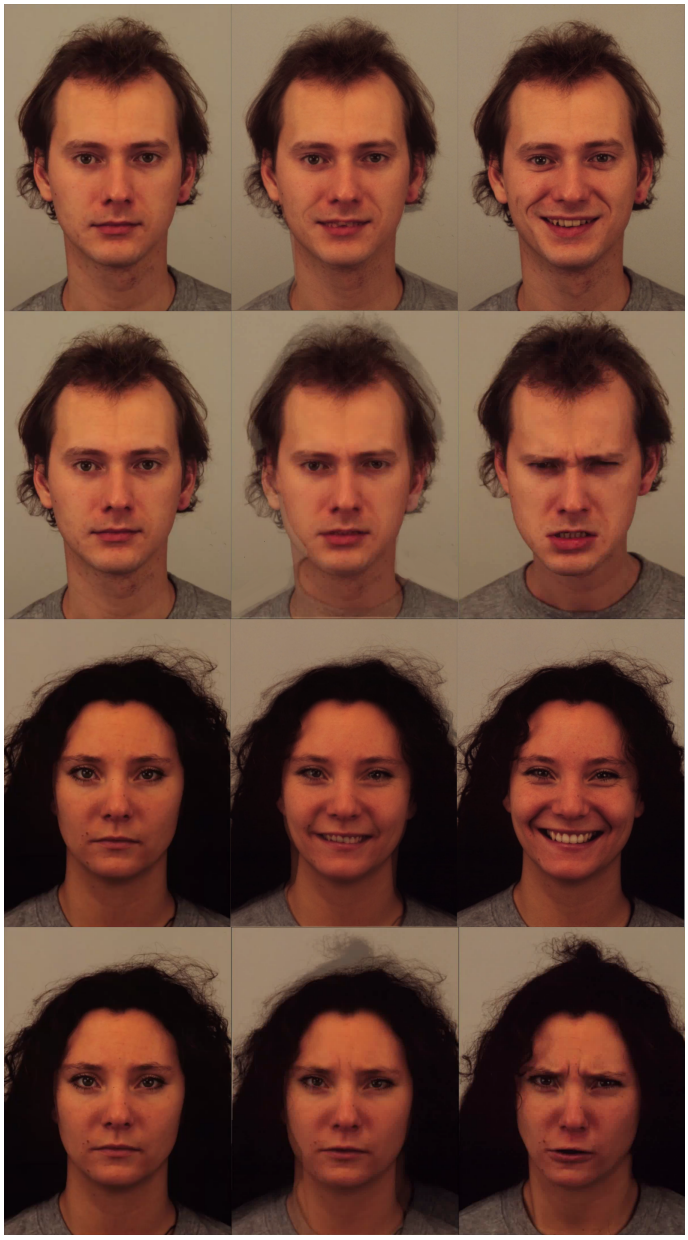
Questionnaire

Participants rated the game on a 7-point unipolar scale on its level of difficulty, enjoyment, frustration, excitement and violence. The participants were also asked how many hours per week they spend playing video games. For full questionnaire, see Appendix 1.

Facial stimuli

For this study, facial expressions were taken from Karolinska Directed Emotional Faces database of standardised facial images. The head-shot pictures showed models in frontal position with no piercings, glasses, or beards, wearing grey T-shirts. 4 facial expressions were used for the trial phase and 36 expressions (18 happy and 18 angry) were used for the experimental phase. 20 different models expressed neutral, happy and angry emotions resulting in 40 expressions in total. 20 of the models were male and 20 were female and all of them were Caucasian. The expressions were created by changing neutral picture to either happy or angry emotion using morphing software, Magic Morph. The neutral and target emotion were matched using feature points (i.e. corner of left eye in neutral emotion was matched to the corner of left eye in the target emotion). The software then interpolated the points and as a result produced a 6.5 second video showing a person with neutral expression gradually smiling or becoming angry. This technique was applied to all 40 expressions resulting in 20 videos of people changing facial expression from neutral to happy and 20 videos of people changing facial expression from neutral to angry Figure 1 shows the morphed images in 100% neutral, 50% neutral morphed with 50% target emotion and 100% target emotion.

Figure 1: Facial expressions morphed from neutral to angry and happy; showed as 0%, 50% and 100% morphed.



Experimental task

Presentation of the stimulus and response collection was performed using E-Primes custom script. The experimental task consisted of a trial phase and testing phase. In trial phase, the participants were asked to observe the changing emotion presented on the screen. In the testing phase the participants were asked to recognise the emotion and press the q key if he emotion was morphed from neutral to happy and press the p key if they recognised the emotion as changing from neutral to angry. The order of presenting stimulus was random. Reaction times between the keyboard response and the presented emotion were recorded in milliseconds.

Procedure

The study began with informing the participant about the purpose and procedure (see Appendix 2 for information form) and after they signed consent forms (see Appendix 3 for consent form), the participants were invited to play either a violent or non-violent video game (assigned randomly) for 25 minutes. After the gameplay, they were asked to complete the questionnaire regarding their opinion on the game. Following that, the participants have begun the experimental task on the computer. The instructions for the trial phase were presented on the screen asking them to observe the following 4 emotions carefully. The aim of the trial phase was to make he participants familiar with the stimuli of morphing images. After the trial phase, the test phase has begun. The participants were presented with a series of 36 morphed moving images and asked to make a speedy recognition of the emotion, pressing q for an image morphing from neutral to happy and p for an emotion morphing from neutral to angry. Each clip was exactly 6.5 seconds long. When a clip appeared on the screen (filling approximately half of a computer screen), the participant made a speedy recognition of the emotion by pressing the correct key and the clip would then stop. Each clip was followed by a 3 second break (a blank screen). The reaction time of recognising the correct response, i.e. the time (in ms) from the beginning of the clip to a keyboard response, was measured in this experiment.

Results

It was hypothesised that participants in the violent video game condition will exhibit shorter reaction times to recognising angry faces and those in non-violent video game group will have shorter reaction times to recognising happy faces (hypothesis 1). It was also hypothesised participants in the violent video game group will have longer reaction times to recognising both emotions compared to those in the non-violent group (hypothesis 2).

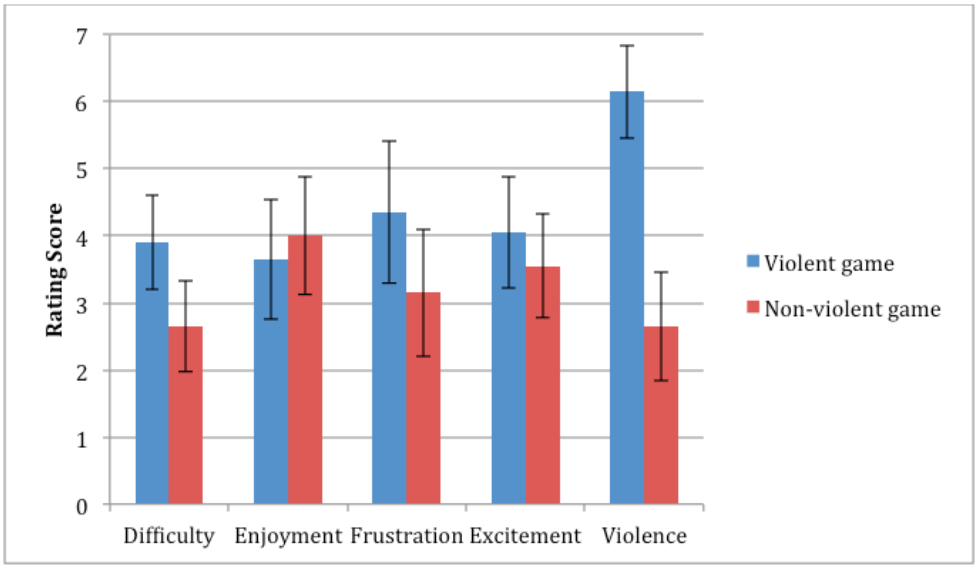
Exclusion criteria

The responses of two participants had to be excluded from the results as their error rate was over 10%. Altogether, 3.4% of all responses were incorrect and those were excluded from the results. Furthermore, reaction times longer than 6.5 seconds were excluded from the analysis as the stimuli presented (clips of morphs) were exactly 6.5 seconds long. There were 101 responses with reaction times longer than 6500 ms. Altogether, 14.8% of responses had to be excluded from the analysis. The exclusion criteria were: incorrect responses or reaction time over 6500 ms.

Questionnaire

The main rating scores for all questions from the questionnaire are presented on a graph (Figure 2).

Figure 2: Mean rating scores of difficulty, enjoyment, frustration, excitement and violence.



The participants have rated *Soldier of Fortune: Payback* (Mean score (M): 6.15, standard deviation (SD) = 1.39) and *Minecraft* (M = 2.65, SD= 1.63) with the former being significantly more violent than the latter ($t(37) = 7.31$, $p < 0.05$). The only other significant result is in difference in the scores for difficulty scores. There was a significant difference in difficulty scores in violent (M = 3.9, SD = 1.41) and non-violent (M = 2.65, SD = 1.35) conditions; $t(37) = 2.86$, $p < 0.05$.

The differences in enjoyment scores in violent (M = 3.65, SD = 1.79) and non-violent (M = 4, SD = 1.75) conditions ($t(37) = 0.63$, $p = 0.53$), frustration scores in violent (M = 4.35, SD = 2.11) and non-violent (M = 3.15, SD = 1.9) conditions ($t(37) = 1.89$, $p = 0.07$) and excitement scores in violent (M = 4.05, SD = 1.67) and non-violent (M = 3.55, SD = 1.54) conditions ($t(37) = 0.99$, $p = 0.33$) are all not significant.

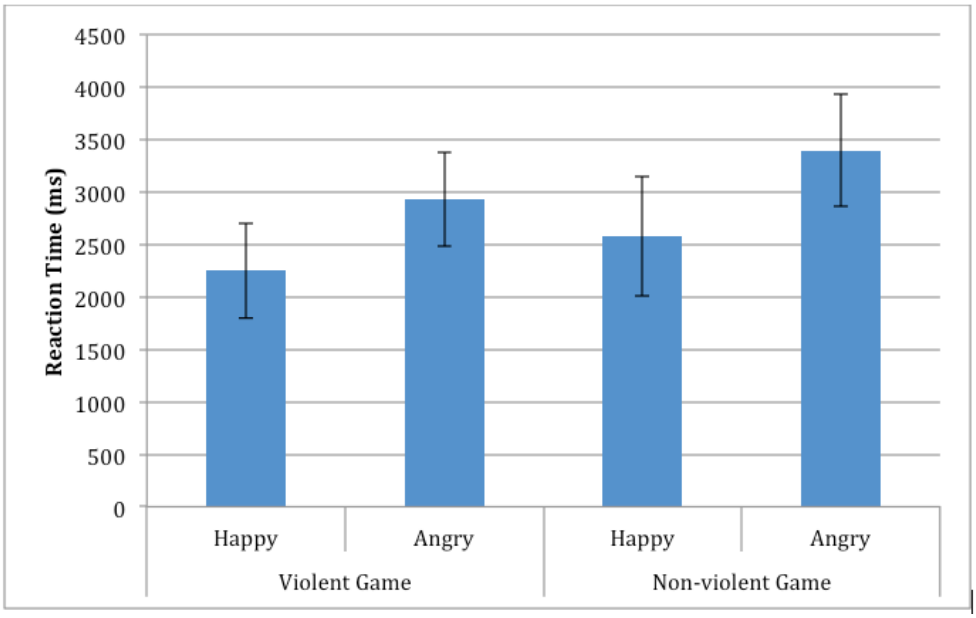
The average number of gameplay per week in the violent game condition was 3.8 (median 1.5) and in the non-violent game condition was 3.15 (median 0).

Hypothesis 1

A repeated measures ANOVA was used to compare within-subjects conditions (reaction time to faces morphed from neutral to angry and from neutral to happy). The results show no significant effect on the condition (playing violent or non-violent game), $F(1, 34) = 0.544$, $p = 0.466$. There is also no significant effect of the gender variable ($F(1, 34) = 0.557$, $p = 0.461$). The effects of both variables,

condition and sex on the reaction time ($F(1,34) = 0.417$, $p = 0.523$) were also non-significant. Mean reaction times can be seen on the graph (Figure 3).

Figure 3: Mean reaction times for recognising happy and angry emotions in violent and non-violent video game conditions.



Hypothesis 2

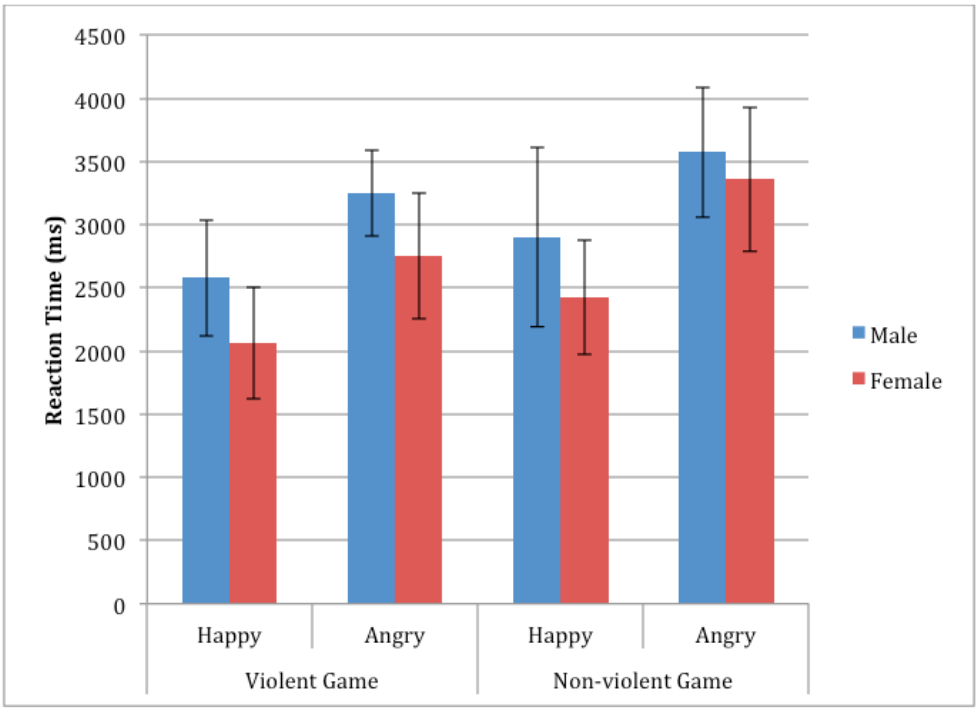
In the violent video game group, main reaction time for recognising happy emotions was M=2253 and angry M=2934. In the non-violent video game group main reaction time for recognising happy emotions was M=2582 and angry M=3399. Those results can be also seen on a graph (Figure 4).

Figure 4: Mean reaction times for violent and non-violent video game conditions.

Gender differences

On Figure 5 there are presented main reaction times for both genders in violent and non-violent game conditions. To see whether the gender of the face presented as stimulus has had any effect on the results, a repeated measures ANOVA was conducted. Mauchlys test of sphericity determined there are significant differences between the variance of differences, therefore GreenhouseGeisser correction was used. There is no significant effect of the gender of the stimulus face on reaction time in the sex of the participant ($F(1.957, 32) = 0.401$, $p = 0.667$), the condition of violent or non-violent game ($F(1.957, 32) = 0.651$, $p = 0.522$) or both gender and condition ($F(1.957, 32)$ 0.411, $p = 0.661$).

Figure 5: Gender differences in main reaction times in recognising happy or angry emotions for both conditions.



Discussion

Summary of results

The aim of this study was to examine whether playing violent video games has an effect on processing facial emotion. The results show neither Hypothesis 1 nor Hypothesis 2 are supported and the results from the main analysis are non-significant. There was no significant effect of playing violent video games on reaction time to recognising emotions therefore no processing bias was detected, in contrast to a recent study. Additionally, the data follows the trend of females recognising emotions faster than males, which is consistent with previous research.

The participants have rated *Soldier of Fortune: Payback* as significantly as more violent than *Minecraft*; however, the non-violent game still achieved a notably high score. This high score might stem from the fact that the participants in this condition, even though the main scores of gameplay per week were similar across groups, were less frequent gamers than in the violent condition. By comparing medians, it can be seen many of the participants that played *Minecraft* were new to the world of video games. The game contained mild violence towards animals and it was the gamers choice to be involved in it or not however, it might have been the reason some participants (those inexperienced in gaming) rated this game as violent. This implies that participants who do not play games perceive mild violence very strongly whereas experienced gamers have rated *Soldier of Fortune* as moderately violent because they have played more violent games before. This might be an interesting point that supports the theory that video games desensitise to violence, a theory that seems to be supported by some studies. Nevertheless, this phenomenon does not correlate with real life violence such as homicide. Markey, Markey and French (2015) have even found that an increase in video gaming is negatively correlated to the amount of violent crime.

The participants have also rated the violent game as more difficult and frustrating than the non-violent game. Difficulty level, frustration and violence can present themselves in similar physiological responses (like increased heart rate), even though they are different emotions. According to Greitemeyer and Osswald (2009), both the difficulty of the game and the frustration can be the real reasons of rising aggression levels, ultimately leading to violent behaviours. Therefore, it might be the reason why the results are not significant; as the aggression levels were not raised enough to induce a processing bias but instead were just triggered by the difficulty of the game.

The main analysis did not produce any significant results which means this study have not found a difference in processing facial emotions after playing a violent game compared to a non-violent game. There were only minor differences in between both groups in mean reaction times. Both groups seemed to recognise happy emotions faster than angry. What is interesting, as seen in Figure 5, in all conditions and emotions women had shorter reaction times than men (however, the results are not statistically significant either).

Relation to other studies

The results from this study show a trend consistent with the happy face advantage. The advantage of happiness is not only limited to facial expressions; it was also found in experiments regarding tasks of categorising words. Feyereisen et al. (1986) have found this advantage is greater while happy faces are presented with contrasting stimuli of sad faces. In light of this evidence, a further study examining violent video games could benefit from comparing two groups: one with happy faces mixed with angry faces and another with happy faces and emotionally neutral facial expressions, like surprise.

Playing violent video games does not seem to have any impact on recognising facial emotion. The results from the current study are therefore not consistent with the findings of Kirsh et al. (2007). The authors have found that video game violence does play part in recognising facial emotions, reducing the happy-face advantage. The authors have also found that violent media consumption also reduces the happy-face advantage in facial processing. They argue their findings are consistent with Anderson and Bushmans (2002) General Aggression Model theory, in which prior exposure to violent media primes an individuals cognitive aggression and thus resulting in aggression. However, Penton-Voak et al. (2013) suggest bias in emotional face processing might elicit aggressive behaviour and only previously aggressive individuals would exhibit a bias in emotional processing. It might lead to a vicious circle where aggressive individuals misinterpret neutral facial expressions as angry and it enhances aggressive cognitions, ultimately leading to violent acts. Empirical evidence exists to support the argument facial emotion recognition is associated with antisocial or aggressive behaviour among children and adolescents. Antisocial children are less accurate in decoding sad or angry expressions (Bowen & Dixon, 2010). Hence the relationship between playing violent video games and aggression levels might be completely different in individuals with prior aggressive behaviour, who are prone to violent outbursts. Ferguson et al. (2009) have conducted a study with controlled variables of domestic violence, family conflict, neighbourhood quality, depression level, exposure to television violence and violent video game play. They found that exposure to media violence had no effect on aggression or rule-breaking behaviour. The risk factors were peer pressure, antisocial personality traits, depression and psychological abuse; violent video games or television violence had no effect on antisocial behaviours or aggression levels whatsoever.

In light of this evidence it is not possible to simply state video games induce aggressive behaviour without taking into account previous aggression levels. To assess the relationship, an extensive longitudinal study should be designed; they are, however, costly and often ineffective. The meta-analysis conducted

by Anderson and colleagues (2010) found that there indeed exist long-term effects of playing violent video games. Ferguson and Kilburn (2010) have criticised said meta-analysis by pointing out several methodological flaws. According to the authors, Anderson et al. (2010) have included in their meta-analysis a biased sample, consisting mostly of unpublished studies, and the aggression measures were not valid. Even then, the observed estimate for violent video game effects (r = .15) is still not large enough. The results of the current study are consistent with Ferguson and Kilburns (2010) findings that the effects of playing violent games on facial emotion recognition are simply very small or insignificant.

Additionally, there was no significant effect of gender on reaction times, however in both conditions females did recognise both angry and happy facial expressions faster than males. This trend in the data is consistent with other research observing a female advantage in processing facial emotions (Hoffmann, Kessler, Eppel, Rukavina & Traue, 2010). Females do recognise rapidly presented emotions faster than males as well as they are better in perceiving facial emotions on the verge of consciousness (Donges, Kersting & Suslow, 2012).

Evaluation of methodology

In the current study, there was a high error rate and a relatively large percentage of participants responses had to be removed from analysis as they did not meet the inclusion criteria (reaction time less than 6500 ms and a correct recognition of an emotion). Two participants had a very high error rate and it can be assumed they have pressed the wrong keys (q for angry and p for happy). Responses with long reaction times were distributed randomly (i.e. do not belong to a particular participant or particular stimulus); it can be assumed the participants lost their attention while completing the task.

A possible limitation of the study might be the effect of adaptation to a particular stimulus, which occurs after a prolonged exposure to a certain view. Just as seeing a line continuously tilted to the left may let a straight line look like it is also tilted to the right, prolonged exposure to aggressive facial features results in bias towards processing angry faces faster. Hsu and Young (2004) have found an after effect; they morphed faces from neutral to various expressions and found that adaptation decreases the sensitivity to the expression. The effect of adaptation may affect all facial emotion processing experiments that are reaction time-based, including the present one as well as Kirsh et al. (2005; 2007).

The games for this study were chosen to be as similar as possible, differing in violence level only. Both violent *Soldier of Fortune* and non-violent *Minecraft* are a first-persons perspective, with realistic gameplay, people or animals as enemies (no fantasy characters). However, the participants have rated the violent game as more difficult and more frustrating (although the difference in frustration scores was not significant, the participants have rated the violent game as more difficult). According to Greitemeyer and Osswald (2009), both difficulty and frustration can elicit the same kind of aggressive cognitions as violence, ultimately leading to aggressive behaviours. Therefore, the choice of games is a limitation of the study; ideally, the games would differ in the ratings of violence only, however it is practically impossible to achieve.

Another limitation of the study is generalizability of the findings. The participant sample included only young, Caucasian university students. Some video game research has been conducted in Eastern countries, especially Japan, that shows similar results to Western countries (Anderson et al., 2010). However, no research has been conducted on effects of playing violent video games on facial emotion recognition comparing different cultures yet, therefore it cannot be said with certainty the results can be extended to the East countries.

Some of the participants were new to the world of gaming; they did not play any games weekly and some have not played any games ever. Even though *Minecraft* is a game suitable for persons over 7 years old and includes very mild violence towards cartoon characters, the participants with no prior gaming experience have rated the game quite highly in the violence question on the questionnaire because they simply had no reference point of previous games more violent than *Minecraft*. This discrepancy in non-violent video game ratings can be a potential limitation of the study. On the other hand, *Soldier of Fortune* has received a much higher violence score from all participants: both gamers and non-gamers.

Further research suggestions

There exists no research on violent video games affecting facial emotion recognition that would consider prior aggression levels in gamers and non-gamers. Ferguson and Kilburns (2010) study suggests here is no effect of violent media on aggressive behaviours in individuals displaying non-social and violent behaviours. It would be worth extending the research to processing of facial emotions to see whether individuals environment, proven to influence aggressive behaviour, plays a role in the speed and accuracy of recognising facial emotions.

Another way of improving the study would be examining the effect of violent video games on processing facial emotion with the number of hours spending playing games as an independent variable. The current sample was too small to include previous exposure to violent video games as a variable. Desensitisation to violence showing in a facial emotion processing bias occurring both short-term and long-term is a topic that was not studied previously and it would be an extension of the current study as well as Kirsch et al. (2005; 2007) research.

A limitation of the current study was the choice of games. Even though they were carefully selected to be as similar as possible, differing in violence levels only, there still were differences regarding frustration and difficulty levels that could affect the results. There is no easy solution to the problem of choosing the correct video games. The ideal situation for a further study tackling the problem of violent video games would be a custom-made mod. A mod is an alteration of video game content (Scacchi, 2010), that would allow for the same game be played in very similar conditions, leaving the same genre, graphic or characters, but differing in the violence levels alone. When the participants have to do the same tasks, their frustration levels or perceived difficulty of the game would stay more or less the same; the only thing that distinguish those two conditions would be a more advanced weapon, excessive gore (i.e. chopping limbs or heads off) or the sight of blood.

Conclusion

To conclude, the current study investigates the relationship between playing violent video games and the speed of recognising positive and negative facial emotions. There exist numerous studies confirming the harmful effect of playing violent video games. Researchers argue violent games lead to aggressive behaviours, processing biases, delinquency, desensitisation and many more. However, there are also critiques of those studies finding negative effects of playing violent games, pointing out flaws in the game choice and methodology or small effect sizes. The current study certainly found no evidence that playing violent video games induce a bias in facial emotion processing, as opposed to previous research that found playing violent games reduces the happy face advantage. This study is consistent with numerous findings proposing that humans have preference for happy faces and recognise positive expressions faster than negative. It is also consistent with the notion that females perceive emotions faster than males. However, the current study also has flaws. One limitation can be expanded to almost all video game studies the choice of games for the research is of the highest importance and at the same time it is a very difficult task, as there exist no games identical in every aspect but the violence level. Other aspects of the game, such as difficulty or inducing frustration, can in fact enhance the negative effect of playing violent games. Therefore, a future study should be conducted with the highest level of control of those variables as being frustrated raises aggression levels with the same effectiveness as observing violence on screen.

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Appendices

Appendix 1. Video game rating questionnaire

Video game rating form

Are violent video games affecting perception of emotion in faces?

Instructions: Please respond to each of the following statements by circling the number that best expresses your own opinion regarding that statement.

1. The video game I played was difficult.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

2. The video game I played was enjoyable.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

3. The video game I played was frustrating.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

4. The video game I played was exciting.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

5. The video game I played was violent.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

How many hours per week do you play video games on any platform (PC, Xbox, PlayStation, mobile or tablet)? Please write the number in the box.

Appendix 2. Information sheet.

University of Glasgow

School of Psychology

Information form

Are violent video games affecting perception of emotion in faces?

Researcher: (Removed)

Email: 1107487p@student.gla.ac.uk

Supervisor: Dr Larissa Szymanek

Email: Larissa.Szymanek@glasgow.ac.uk

You are being invited to take part in a research study. The aim of the following information is to let you know what the study is about and to outline your involvement in this research. Please read the information carefully and do not hesitate to ask the researcher for clarification of any of the following points.

The aim of the study is to assess whether playing violent video games affects the perception of facial emotions. This study is conducted by a final year Psychology student at the University of Glasgow as a part of a research project. As a participant, you will be asked to play a game for 30 minutes and then complete a short questionnaire about the game and your gaming habits. Afterwards, you will be asked to complete a face perception task, in which you will see videos of faces morphed from neutral expressions to displaying happy or angry emotions and assess the emotion as soon as you will recognise it.

Please note that your participation is entirely voluntary and you have the right to not reply to a question or to withdraw from the study at any point without an explanation. If you take part in the experiment but change your mind about it afterwards, you may withdraw your consent and you do not need to state the reason to the researcher.

All of the data will be kept confidential and anonymous. You will not be personally identifiable in any public display of the results of this experiment.

If you wish to receive further information about the outcome after completion of the study, feel free to contact the researcher (information available at the top of the page).

Appendix 3. Consent form.

University of Glasgow
School of Psychology

Consent Form

Are violent video games affecting perception of emotion in faces?

Researcher: (Removed)
Supervisor: Dr Larissa Szymanek

Email: 1107487p@student.gla.ac.uk
Email: Larissa.Szymanek@glasgow.ac.uk

Overview:

Participants will be asked to play either a violent or non-violent video game for approximately 25 minutes. Participants then will be asked to complete a face perception task in which they will see video of faces morphed from neutral expressions to displaying happy or angry emotions and they will press a button as soon as they will recognise the emotion. Participants will also be asked to complete a questionnaire rating the enjoyment, excitement, level of difficulty, frustration and violence level of the game and state their gaming habits.

By signing this form I understand that:

- This study is being conducted by a student of the University of Glasgow and is under the supervision of Dr Larissa Szymanek in the School of Psychology.
- My participation is voluntary.
- I am free to withdraw from the study at any time and for any reason and I do not need to state my reason to the experimenter.
- I can withdraw consent retrospectively if I do not want my data to be included in this study.
- I have the option of omitting questions I do not want to answer.
- My data and details will be kept completely confidential at all times and will be made anonymous.
- I will not be personally identifiable in any public display of the results of this experiment.
- I am free to contact the researcher/supervisor of this study at anytime for more information ar to request a summary of the results.

Signed: _____

Printed: _____

Date: _____