Tunnel Vision or Desensitization? The Effect of Interactivity and Frequency of Use on the Perception and Evaluation of Violence in Digital Games

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Abstract. Most of the studies on violence in digital games have investigated its effects on arousal or aggression. Little attention has been paid to how in-game violence is actually perceived and evaluated. To investigate this issue we conducted two experimental studies (N = 30 and N = 74) in which participants either played or watched a violent shooter game and reported how they perceived and evaluated the violent content. Results showed that playing the games led to an increased awareness for in-game violence, but also to less-negative subjective evaluations of the violent content. Gaming frequency had a negative effect on both the perception and evaluation of in-game violence, suggesting a desensitization effect. The results of our studies illustrate that individual perceptions and evaluations of violence in digital games have to be taken into account when studying their effects. Implications for further research and the system of age ratings are discussed based on our findings.

Keywords: video games, interactivity, media violence, desensitization, tunnel vision

Despite the growing number of studies on the effects of violence in digital games, there is a continuing debate about this issue both in academia (see Bushman & Huesmann, 2014; Elson & Ferguson, 2014a, 2014b; Krahé, 2014; Warburton, 2014) and by the public (see, e.g., Bertin, 2013; Pozios, Kambam, & Bender, 2013). The continuation of this debate – and its intensity – can be attributed to the contradictory nature of the literature. Reports by the Australian (Australian Government Attorney-General's Department, 2010) and Swedish governments (Statens Medieråd, 2011), and the advocacy group Common Sense Media (2013), for example, found the research evidence for the effect of digital games on aggression to be inconclusive. There are many reasons for this inconsistency in the literature, which has promoted the ongoing debates, such as publication bias (Ferguson, 2007) or methodological problems with the assessment of aggression (e.g., Ferguson & Rueda, 2009; Tedeschi & Quigley, 1996).[1] The list of reasons for these different results also extends to those factors that are typically treated as independent variables. Most experimental studies simply distinguish between violent and nonviolent games (Adachi & Willoughby, 2011). However, whether a game is considered to be violent strongly depends on the definition of violence that is used. While violent behavior in general can be loosely defined as ‘‘acts which are intended to cause serious physical harm" (Ferguson & Rueda, 2009, p. 121), the application of this definition to digital games is problematic in several ways. As video game characters are virtual by nature, there is no actual physical harm involved. Most – if not all – players of digital games are aware of this and, hence, likely able to frame the violence in games as devoid of any real-world consequences (Bennerstedt, Ivarsson, & Linderoth, 2011). Even if this problem is ignored for the definition of in-game violence, there are still various types of violence that are likely to differ in their impact on the player.[2]

The purpose of the present study was to take a step back from the debate about the effects of digital games on aggression and investigate differences between players' perceptions and evaluations of in-game violence and the impact of interactivity on those. Uncovering differences in how displays of violence in digital games are perceived and evaluated not only can help to explain the inconsistent findings on the effects of computer and video games, but also can shed some light on the conflicting views of players and nonplayers concerning the issue of in-game violence (Przybylski, 2014; Williams, 2005). Since a study on violence in television shows by Potter and Tomasello (2003) revealed that subjective interpretations of violent content were much better predictors of the judgments of the degree of violence than objective measures of quantity, we expected these individual perceptions and evaluations to be of equal importance for violence in digital games. To investigate the processes behind these

[1] Similar criticism has also been directed at media violence research in general by several authors (see, e.g., Ferguson & Kilburn, 2009; Savage, 2004).

[2] An example that illustrates the problems associated with the definitions of violence in digital games is the categorization of the popular platform game (series) *Super Mario Bros.* While one group of researchers considers these games to be violent (Anderson & Dill, 2000), another publication lists them as examples of nonviolent games (Griffiths, 1999).

differences, we conducted two exploratory experimental studies in which we looked at the impact of modality (interactive versus noninteractive) and gaming frequency on the perception and evaluation of violence in digital games.

Interactivity and Violence in Digital Games

In research on digital games, interactivity has received special attention, as it is commonly expected to increase any effect on the user. Especially research based on social cognitive theories of learning and aggression tends to stress the role of interactivity in games, as it combines observing and performing. While the exclusive focus on social cognitive theories has recently been criticized as insufficient to explain aggression (Ferguson & Dyck, 2012; Kutner & Olson, 2008), these theories are still the main framework in many studies on media effects. Social cognitive models, such as the general aggression model (GAM; Anderson & Bushman, 2002), would predict a stronger effect of interactive media. However, the empirical results are far less clear.

The role of interactivity for the effect of media violence on aggression has already been recognized in some of the earliest experimental studies on digital games. Cooper and Mackie (1986) found little to no difference in free play behavior between children who watched or played a highly aggressive video game (Missile Command), a slightly aggressive game (Pac Man), or a nondigital maze-solving game. Another early study on this subject compared the effects of a violent cartoon (Road Runner) and a violent video game (Space Invaders) on children's play behavior (Silvern & Williamson, 1987). While the study found an increase in aggressive play from the baseline to the second phase of observation, there was no difference between the two conditions. In a study by Tamborini, Eastin, Skalski, and Lachlan (2004), participants played a violent video game using a virtual reality headset or a standard controller or observed either a violent or a nonviolent video game. Although there was an increase of hostile thoughts after exposure to violent media, the mode of presentation had no effect. A study by Polman, de Castro, and van Aken (2008) showed that playing had a stronger effect on aggressive behavior in a free play session than watching, but only for boys. There was, however, no difference between the violent and nonviolent games. Research by Ferguson (2011) that compared TV and video game violence found no evidence that either one led to an increased youth aggression, in prospective analyses. A recent study by Lin (2013) was able to show that playing a violent video game led to higher increases in aggressive affect, cognition, and physiological arousal compared with watching a recording of the game or a similar sequence from a movie. The participants who watched a movie sequence with similar content, however, did not differ from those who watched a recorded playing session of the game. Another line of research that investigates the role of interactivity looks at the (moderating) effects of controller types on aggression. Again, the results of individual studies have differed from one another, but it seems that at least motion controls – which are assumed to add to the interactivity – do not increase aggression (e.g., Charles, Baker, Hartman, Easton, & Kreuzberger, 2013; Markey & Scherer, 2009) compared with traditional controls. In sum, the review of the existing literature supports what Sherry (2001) noted in his meta-analysis: The overall evidence for the interactivity hypothesis in previous research on media violence and aggression is mixed at best.

All of the previous studies primarily looked at the effects of different modes of use (typically playing versus watching). However, none of them systematically assessed whether the violence was actually perceived differently in the various conditions. A study by Tamborini et al. (2004) showed that participants in the playing conditions experienced greater telepresence than those in the watching condition, suggesting that interactive and noninteractive media require different levels of attention. Such differences in the allocation of attention might also have an influence on the perception, processing, and evaluation of violent content.

Digital Games and Attention

Digital games are interactive and multimodal media that challenge their players' cognitive and motor skills and require the allocation of substantial attentional resources. Due to the limitations of attention capacity in humans (Kahnemann, 1973), as described by the bottleneck models of attention (Broadbent, 1958; Deutsch & Deutsch, 1963; Treisman, 1964), information that is irrelevant or less relevant than competing stimuli in a given situation is filtered out before it is processed consciously.

In modern action games, many different stimuli compete for the players' attention. Players of shooter games, for example, have to identify potential threats in the game from visual and/or auditory signals, distinguish between friendly and hostile characters, and react adequately within seconds or even microseconds. There is a substantial body of research on the connection between the use of digital games and the performance at attentional and

perceptual tasks (e.g., Achtman, Green, & Bavelier, 2008; Castel, Pratt, & Drummond, 2005; Dye, Green, & Bavelier, 2009; Green & Bavelier, 2003, 2006), suggesting that digital games, especially action games, can improve aspects of visual perception and attention. The authors of these studies mention the need to discriminate between relevant and irrelevant stimuli and the necessity to quickly react to on-screen changes, as possible explanations for such effects.

When playing (repeatedly), players learn what elements of the game they need to pay attention to in order to succeed (Linderoth & Bennerstedt, 2007). At the same time, they also learn which objects or stimuli in the game are less relevant or even irrelevant for their progress. Thus, they develop an equivalent of what Goodwin (1994) called ‘‘professional vision." Or, to use a term with a more negative connotation, players are prone to developing a “déformation professionnelle" – that is, a distorted view due to the demands of one's occupation or, in this case, a highly involving and potentially time-consuming hobby. As this ‘‘professional gamer vision" necessitates a focus on the game in general and specific game elements in particular, one could also speak of tunnel vision when referring to the attentional process in the actual playing phase.

Much of the violent content of digital games that has been researched as a potential cause of aggressive behavior, however, is not directly relevant for progress or success in a game. While graphical displays of violence in games are likely to attract attention, especially if seen for the first time, a repeated exposure to these stimuli can lead to a decrease in attention. This is especially likely to occur, if the players focus (more) on their performance and realize that in-game signs of violence, such as spraying blood or dead enemies, are not important for their success. Anecdotal evidence from reports by professional gamers who turn off all displays of gore in first-person shooter games to improve their performance supports the assumption that a shift in attention from spectacular visual elements to those that are relevant to one's performance (e.g., the movement of characters, their lines of sight, or auditory cues from approaching opponents) can occur when players progress through the game or gain more experience.

The masking of irrelevant or even distracting (visual) information can, of course, not only be achieved via technological means, such as turning off blood in the game settings. As mentioned above, players can also learn to ignore or pay less attention to individual elements in a game. In digital games, players have specific tasks, and these tasks define the relevance and salience of game elements. Depending on the genre and game, tasks can range from shooting alien monsters to collecting gems or winning a car race. As the examples illustrate, the task-relevant objects or elements vary substantially between and even within games. If, on the other hand, a player just watches a game without interaction, there is no task that directs her/his attention. When watching the game, the player can, hence, attend to details of the game that she/he would have otherwise missed, paid less attention to, or ignored.

Based on the research on the differences between interactive and noninteractive media violence and the studies on playing digital games and the allocation of attentional resources, we expected a difference between playing and watching a digital game in the perception of violent content in our studies. Specifically, we assumed that the need to focus on other game elements while playing would cause a reduction of attention paid to in-game violence. This tunnel vision hypothesis suggests that actively playing a digital games requires players to focus their attention on beating the challenges presented in the game, thus limiting the attentional and cognitive resources available for attending to and processing the violent content. The first hypothesis for our studies, therefore, also addressed the question raised by Tamborini, Weber, Bowman, Eden, and Skalski (2013) of whether ‘‘actively playing video games" can ‘‘influence perceptions of violence" (p. 114) as compared with just watching.

> Hypothesis 1 (H1): Playing a digital game will lead to a reduced perception of violent content compared with watching a video recording of the same game.

If a player gets accustomed to the displays of in-game violence and starts to filter them out, this is likely to also alter subjective evaluations of the violent content. Put simply, if less violence is perceived, the violent content should also be rated as less severe. In addition to this indirect effect of modality (watching versus playing) on subjective evaluations of violent content via the perception of this content, however, there might also be a direct effect of playing on the subjective rating.

> Research Question 1 (RQ1): Is there a direct effect of modality (playing versus watching) on the subjective evaluation of in-game violence?

Desensitization to Media Violence

Although the present study focused on short-term effects of playing versus watching violent digital games, we did not want to rule out alternative explanations for differences in the perception and evaluation of violent game content. Another process that might explain interindividual differences with regard to the perception and evaluation of in-game violence is desensitization. Desensitization is typically defined as a long-term process in which the repeated or continuous exposure to media violence leads to a decrease in physiological, affective, or cognitive reactions to violence (Anderson et al., 2010). A number of studies provide evidence for a desensitization to (media) violence through the repeated use of violent digital games (Bartholow, Bushman, & Sestir, 2006; Engelhardt, Bartholow, Kerr, & Bushman, 2011; Funk, Baldacci, Pasold, & Baumgardner, 2004; Funk, Buchman, Jenks, & Bechtoldt, 2003). However, the neuropsychological measures used in the studies by Bartholow et al. (2006) and Engelhardt et al. (2011) are not clearly and exclusively linked with aggression, and ‘‘physiological desensitization" cannot be easily equated with emotional or cognitive desensitization, as it might, for example, also indicate boredom or a lack of interest. In addition, a recent study by Ramos, Ferguson, Frailing, and Romero-Ramirez (2013) found no effect of violent games on empathy toward victims of real-life violence.

The results of the study by Ramos et al. (2013) suggest that desensitization cannot be easily generalized to real-life violence, as the methods used to measure desensitization in

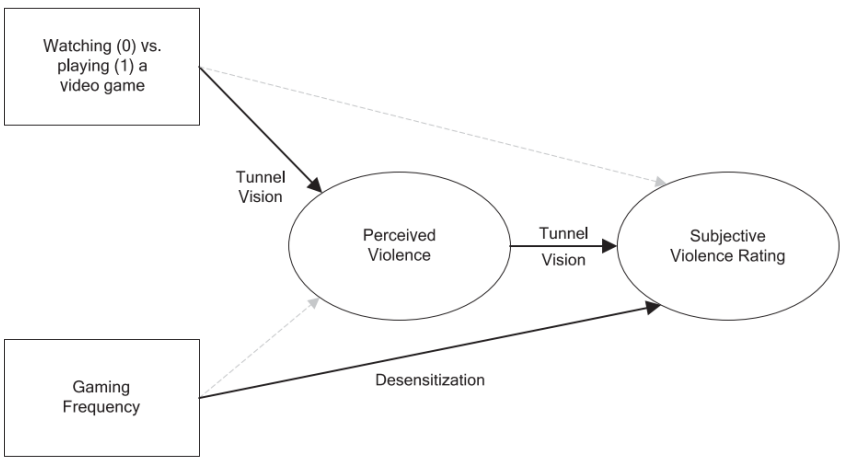

Figure 1. Theoretical model comparing the tunnel vision hypothesis (H1) and the desensitization hypothesis (H2).

most studies assess the reaction to fictional (e.g., story vignettes) or at least mediated violence (e.g., photos or videos). This is backed by data from an functional magnetic resonance imaging (fMRI) study by Regenbogen, Herrmann, and Fehr (2010) showing that the reaction to images of real violence does not differ between gamers and nongamers. Nonetheless, the concept of desensitization can help to understand the habitualization effect in responses to in-game violence. Since desensitization is unlikely to occur during a single playing session, we would expect a relationship between the frequency of computer game use and desensitization. As the study by Ramos et al. (2013) indicated that the potential desensitization effect does not generalize to real-life violence and we were not interested in the effects of in-game violence, but in how it is perceived, we intentionally limited our second hypothesis to desensitization effects for fictional violence in the same medium.

> Hypothesis 2 (H2): Frequent use of video games leads to a less negative subjective evaluation of in-game violence.

In parallel to the tunnel vision hypothesis, there may equally be a direct effect of frequent video game use on the perception of violence and an indirect effect on the subjective ratings of in-game violence.

> Research Question 2 (RQ2): Is there an effect of frequency of play on the perception of in-game violence?

To test our hypotheses and to find answers to the additional research questions, we conducted two exploratory experimental studies in which we investigated, whether the violence in digital games is perceived and evaluated differently when it is watched instead of being played, and whether the frequent use of digital games affects the per-

ception and evaluation of in-game violence. A summary of our theoretical model can be found in Figure 1.

Study 1

Method

Participants

We recruited 30 participants for the study via posters and leaflets on the campus of a university in the southwest of Germany. Participants signed up for the experiment using the Cortex online recruiting tool (Elson & Bente, 2009). All participants were either high school or university students between age 18 and 25 (M = 22.23, SD = 1.89), and 15 participants (50%) were women. About two thirds (n = 19) of the participants played computer games at least occasionally, and 26 (86.7%) reported knowing the computer game used in the study.

Materials and Procedure

Depending on the experimental condition, participants either played the game Counter-Strike: Source (CSS; Valve, 2004) or watched a pre-recorded match for 15 min. In the playing condition, groups of four participants played in a team against computer-controlled opponents (bots) on an easy level. Both the actual gameplay and the recorded video were displayed in full screen, high-definition resolution on a 22" TFT monitor. After 15 min of watching or playing, participants were asked to fill out an online questionnaire that was displayed on the same computers used in the experiment. All participants were debriefed directly after completing the questionnaire.

Measures

Perceived violence was measured with four items on a 5-point Likert-type scale. The items form a unidimensional scale with acceptable internal consistency (Cronbach's α = .66). Subjective violence ratings were measured wit

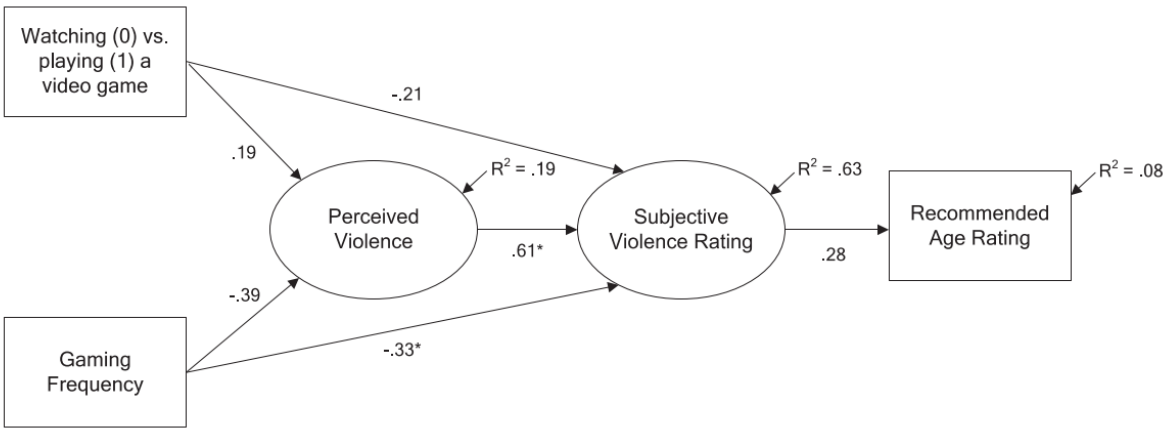

Figure 2. Effects of playing versus watching Counter-Strike: Source and gaming frequency on perceived violence and subjective violence rating. N = 30, MLM estimation. $x^2(11) = 19.7$, p = .05, comparative fit index (CFI) = .91, root mean square error of approximation (RMSEA) = .16, standardized root mean square residual (SRMR) = .08, *p < .05.

two items using the same scale as for perceived violence. The internal consistency of the latent variable was excellent (Cronbach's α = .95). As an additional outcome, we asked the participants to recommend an appropriate age rating for the game. The response options were taken from the German USK game rating system (see http://www.usk.de), with six response options (1 = all ages, 2=6+, 3=12+,4=16+,5=18+,6=no clearance). Gaming frequency was measured with one item asking the participants how often they play computer or video games with answers ranging from 0 = never to 4 = every day.Asa manipulation check, the questionnaire also included three items on the allocation of attention and one item asking how thrilling the game was. The attention items showed a good internal consistency (Cronbach's α =.78) and were combined into an attention sum score for further analysis. Descriptive statistics for all items used in our analyses and the corresponding descriptives for Studies 1 and 2 can be found in Appendix A (Tables A.1 and A.2)

Analysis

To test both direct and indirect effects while accounting for measurement error, we used structural equation modeling with manifest (condition, gaming frequency, recommended age rating) and latent variables (perceived violence, subjective violence rating), as displayed in Figure 2. To reduce the complexity of the latent variable model, we used item parceling (Matsunaga, 2008) with two items per indicator for the perceived violence factor. The structural equation model was estimated with the lavaan package (Rosseel, 2012) for R. As our data was slightly skewed and kurtotic (univariate skew and kurtosis for all variables < 2), we used MLM estimation with Satorra-Bentler scaling correction. While the age ratings and the measure of gaming frequency were ordinal, Finney and DiStefano (2006) suggest that the use of ML estimation methods yields valid results, if the ordinal variables have at least five levels. Model fit was assessed using the chi-square test, the comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR), with cutoff criteria according to Hu and Bentler (1999).

Results

A t test for the attention score showed that there was no significant difference in the allocation of attention between the two experimental conditions. Respondents in the playing condition, however, found the game significantly more thrilling (M = 3.67, SD = 1.03) than those who watched the recording, M =2.5, SD = 0.67, t(28) = 3.45, p <.01, r =.55.

Our structural equation model (see Figure 2) fit the data well, as indicated by a nonsignificant chi-square value and acceptable indices of model fit. Turning to our research questions, the analysis showed that perceived violence had a strong positive effect on the subjective violence rating, which, in turn, led to a higher recommended age rating. Regardless of whether they watched or played the game in our study, participants who played digital games more frequently gave lower subjective ratings of the violent content. While the estimated effect of gaming frequency on perceived violence was negative – that is, more frequent gamers did not notice as much on-screen violence – this effect and, subsequently, the indirect effect on subjective violence ratings were not significant. Contrary to our expectations, the analysis showed a (nonsignificant) positive effect of playing on perceived violence, but a (nonsignificant) negative effect on subjective violence ratings. Accordingly, data from Study 1 did not lend support to the assumption that players perceive less violence (H1), but provided tentative evidence for a desensitization effect to media violence (H2). Based on the results from Study 1,

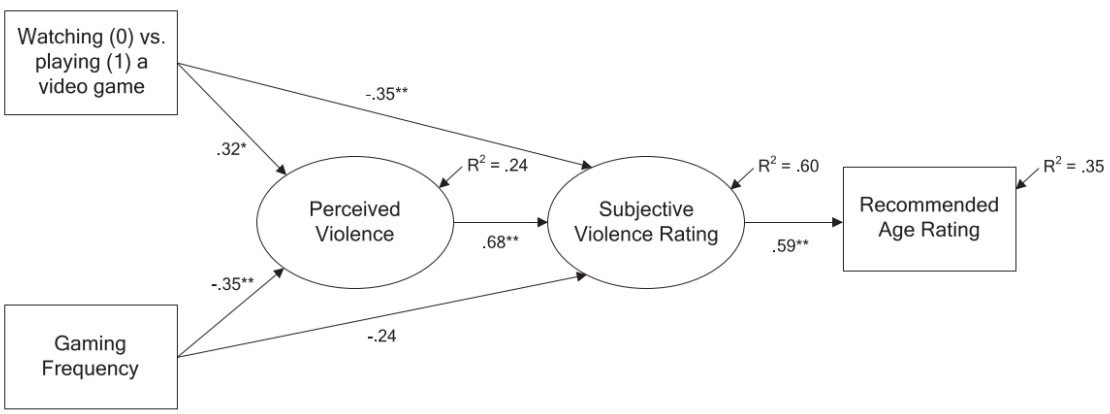

Figure 3. Effects of playing versus watching Gears of War 3 and gaming frequency on perceived violence and subjective violence rating. N = 74, MLM estimation. $x^2(10) = 4.4$, p = .93, comparative fit index (CFI) = 1.0, root mean square error of approximation (RMSEA) = .00, standardized root mean square residual (SRMR) = .03, *p < .05, **p < .01.

the answer to RQ1 has to be positive as there was a small but significant direct negative effect of modality (playing) on subjective ratings of violence. The direct effect of playing frequency on the perception of violent content (RQ2) was equally small, and failed to reach significance.

Discussion

The results from Study 1 show that people who played the game noticed more in-game violence, but evaluated it

as less deterrent. The negative effect of gaming frequency on the subjective evaluation of in-game violence can be seen as an indicator of desensitization to violent game content. However, these findings have to be taken with a grain of salt as the evidence from Study 1 is far from conclusive. This is due to several constraints of the study:

1. The sample contained a high proportion of gamers, and most participants knew the game. This problem was also reflected in the age ratings that the partici¬pants assigned to the game. The majority of partici¬pants (20) picked the actual USK rating of 16+ which is also likely to have caused the low multivar¬iate coefficient of determination (R^2) for the age rec¬ommendation (see Figure 2). CSS is very popular and well-known even among nongamers, as the game has been mentioned in most public debates about video game violence and has repeatedly appeared in the context of news reports on school shootings.
2. Compared with other first-person shooter games, the degree of graphical violence is rather low in CSS, as the German version of the game that we used is a low violence version that does not include any visual displays of blood. This is due to the very strictnational regulations on media violence, forcing game producers and publishers to adapt their titles to be able to sell on the German market.
3. The sample size and therefore the statistical power for the analysis was too small to reliably detect medium-sized effects in the order of .2.
4. Participants played together with others in this study. This could also have affected the perception and evaluation of violent content. Several studies suggest that playing cooperatively has an impact not only on the player experience but also on potential effects of gameplay (Ewoldsen et al., 2012, Greitemeyer, Traut-Mattausch, & Osswald, 2012; Velez, Mahood, Ewoldsen, & Moyer-Guse, 2012).

For these reasons, we conducted a second study with the same design and measures, but a different game and a larger sample. In Study 2, we tried to replicate the findings of the first study, while accounting for the previously mentioned limitations.

Study 2

Method

Participants

Students from an introductory communication class signed up for the study via the Cortex online recruiting tool (Elson & Bente, 2009) and received course credit for their participation. The participants (N = 74) were between 18 and 31 years old (M = 22.09, SD = 3.02), and 51 were women (68.9%). Twenty-four participants (32.4%) reported that they played computer games at least occasionally, and only three respondents (4.1%) knew the game used in this study.

Materials and Procedure

The design and procedure of the second experiment were identical to those for Study 1. The only difference was that we used the game Gears of War 3 (GoW3; Epic Games, 2011) instead of CSS. Similar to CSS, GoW3 is a popular military-themed shooter game, but it is set in a sci-fi world, contains more graphic violence, and is played from the third-person perspective. Since GoW3 was developed for the Xbox 360 console, every participant played the game on this console, using the standard Xbox 360 controller and the same 22-in. screens that were used in Study 1. Unlike in the first study, participants in the playing condition did not play the multiplayer mode, but the first 15 min of the single-player campaign. With regard to the three dimensions of media violence as described by Potter and Tomasello (2003), the violence in GoW3 is more graphic, but less realistic than in CSS. Unlike the multiplayer matches in CSS, the single-player campaign of GoW3 also employs a narrative that provides a justification for the violence exerted by the player character.

Measures

We used the same measures as in Study 1. The internal consistencies of the scales were similar to those in Study 1 with Cronbach's α of .59 for perceived violence, .88 for subjective evaluations of violent content, and .71 for allocated attention. The descriptives for all variables used in our analyses for Study 2 can be found in Table A.2 in Appendix A.

Analysis

The analysis procedure was the same as in Study 1.

Results

The manipulation checks revealed that the differences between the two conditions were more pronounced in Study 2. Participants who played the game found it to be significantly more exciting ($M = 2.84$, $SD = 1.15$) than those who watched a prerecorded playing session, $M = 2.06$, $SD = .98$, $t(72) = 3.15$, $p < .01$, $r = .35$. Participants in the watching condition also reported that they paid less attention to the game ($M = 8.22$, $SD = 2.21$) than the participants who played the game, $M = 9.5$, $SD = 2.46$, $t(72) = 2.35$, $p < .05$, $r = .27$.

As in Study 1, participants who played the game perceived significantly more in-game violence than those who watched a recorded game, but gave lower subjective ratings of the violence and recommended a lower age rating for the game (see Figure 3). Since the positive indirect effect of playing, on the subjective violence rating was statistically significant ($r = .22$, $p < .05$), our findings showed a typical case of suppression: The increased attention paid to violent content led to stronger subjective violence ratings and higher recommended age limits, but at the same time, playing significantly reduced the subjective violence rating – that is, players noticed more in-game violence than viewers, but evaluated it as less disturbing. Accordingly, the data from Study 2 also did not lend support to the idea of tunnel vision as formulated in H1. Again, participants who played digital games more frequently gave lower subjective ratings of the violent content, regardless of whether they watched or played, but this effect was not statistically significant ($p = .08$). The estimated effect of gaming frequency on perceived violence was negative, which also led to a negative indirect effect on the subjective violence ratings ($r = -.24$, $p < .01$). Looking at the total effect of gaming frequency on subjective violence ratings, our second study provides some further evidence for a desensitization to in-game violence (H2) and a positive answer to RQ2.

Discussion

Corroborating our findings from Study 1, the results of Study 2 showed indications of a desensitization of frequent gamers to violent game content: Participants who played computer games more frequently perceived less violence, rated it as less deterrent, and, as a consequence, were willing to give the game a lower age rating. For all participants, perceived violence and the subjective ratings were clearly related, and the subjective violence rating strongly influenced the recommended age rating. The effects of the conditions were very similar to those found in Study 1, except that the larger sample size caused the group differences to become significant. The same was true for the relationship between the subjective evaluation of violence and the recommended age rating. Since GoW3 had just been released when the second study was conducted, fewer people knew the game, which led to a greater variation in the age ratings. In line with the findings from Study 1, the results of Study 2 did not support the assumption that playing a game leads to a reduced perception of the violent content, but provided additional evidence for a desensitization to in-game violence. However, the co-occurrence of a positive effect of playing, on the perception of violence and the parallel negative impact on subjective evaluations of the violent content in both studies warrants some further explanation.

General Discussion

Taken together, the results from our two studies did not support our first hypothesis that playing a digital game would lead to a reduced perception of in-game violence compared with just watching it. In fact, in both studies the effect of playing on the perception of violent content was positive, meaning that people who played the game also noticed more in-game violence than those who watched a recording of the game. The reason for this might be quite trivial: Watching a recording of a game session is not as engaging as playing the game and might cause participants to become bored. The significantly lower excitement ratings in the watching conditions and the differences in the self-reported allocation of attention in the second study support this notion. If participants pay less attention to the stimulus material, they are less likely to perceive and consciously process any type of content, including violence. Another explanation could be that, contrary to our assumptions, the visual signs of violence (e.g., blood) are relevant for the in-game tasks, as they might serve as a feedback cue to show if an opponent has been hit or if the player character is being attacked.

More interesting than the positive effect of playing on the perception of violence, however, was the simultaneous negative effect on the subjective evaluation of the violent content. Although this finding might seem somewhat counterintuitive at first, we see three different mechanisms that might explain this: ex post rationalization, implicit cognitive defense processes, and limited cognitive resources. As the data from the present study cannot be used to properly assess whether these explanations are valid, they have to remain speculative at this point. It is also possible that more than one of these mechanisms work in conjunction, as they are not mutually exclusive.

An ex post rationalization process that could lead to a more positive evaluation of the violent content is moral disengagement. There are several studies that have investigated moral disengagement as a means to rationalize and justify in-game violence (e.g., Greitemeyer & MacLatchie, 2011; Hartmann & Vorderer, 2010; Klimmt, Schmid, Nosper, Hartmann, & Vorderer, 2006). While we did not assess this, moral disengagement may have occurred in our studies; especially in the second study that used a single-player game with a narrative framing that involved clear moral distinctions between good (player character) and evil (enemies). A cognitive process that is associated with moral disengagement is the identification with a character. Although the effects of modality on aggression were not mediated by character identification in a study by Lin (2013), both narrative framing and identification might influence how in-game violence is perceived and evaluated.

A different explanation for the results we obtained would involve the suppression of aggression- or violence-related constructs after playing a violent game. The studies by Kneer, Munko, Glock, and Bente (2012) and Kneer, Glock, Beskes, and Bente (2012) found that young people who have grown up with digital games apply cognitive defense strategies when confronted with the topic of digital games and violence or aggression. Both studies used lexical decision tasks to show that negative associations are suppressed while positive ones are emphasized, after being primed with digital game content. This effect could be demonstrated for gamers as well as nongamers. As our samples were also composed of younger individuals belonging to the group of ‘‘digital natives" (Prensky, 2001a, 2001b), there might have been similar processes at work.

Thirdly, it may also be that the tunnel vision approach does not have to be dismissed altogether, but can be integrated into a broader perspective of resource allocation. The limited capacity model of motivated mediated message processing (LC4MP; Lang, 2000) proposes that the allocation of attentional resources that determine the processing of media content are influenced both by media and user characteristics. As attention is a limited resource, differences between media and users also lead to a differential processing of contents.[3] In line with the results from our manipulation checks (especially for Study 2), it might have been that participants in the viewing condition simply had more cognitive resources available to (consciously) evaluate the violent content. Conversely, the affordances of the games may have required the players to perceive and process the violence (e.g., because they had to react to it), but not to evaluate it. Ultimately, this would mean that there is some sort of ‘‘tunnel vision," but that it is limited to evaluative processing, while it does not affect the perception of violent stimuli, as suggested by our original hypothesis.

Although findings from both Study 1 and 2 indicate that desensitization is likely to be involved in the differential perception and evaluation of in-game violence, these results have to be interpreted with caution. Not only for methodological reasons, as we did not sample for gamers and nongamers a priori, but also because desensitization is, in this case, strictly limited to violence in shooter games. Any generalization of our results, even to other game genres, can only be speculative. Getting used to violence in digital games does not necessarily lead to a desensitization to other types of media violence (e.g., in nonfictional formats) or even to violence in real life. As the work by Ferguson and Dyck (2012), Ramos et al. (2013), and Regenbogen et al. (2010) shows, media users are typically able to distinguish real and fictional contents and process them differently.

As with all empirical studies, ours had several limitations that have to be considered when interpreting the results. First of all, we only used shooter games in our studies. Results might differ, if other violent games or genres, such as fighting games, were used. In addition, the items used to rate in-game violence would have to be adjusted for other genres. The items we used to assess the perceptions and evaluations of in-game violence were ad hoc items and not very detailed. The same was true for our attention items. The relatively low Cronbach's alpha for the perceived violence scale indicates that these measures are in need of some refinement. It is important to note that these two studies were exploratory in nature, and future studies should ideally ask more detailed questions about the specific contents of the game(s) in question. Following the tripartite characterization of violence along the lines of graphicness, realism, and justification according to Potter and Tomasello (2003), scales meant to assess the perception and evaluation of violent media content should attempt to cover all of these dimensions. The conjoint analysis by Tamborini et al. (2013) suggests that the attribute of justification is most important for shaping the perceptions of violence in both video games and films, whereas the degree of realism best predicted the viewer/player preference for violent content in both media. There are also more tangible characteristics than the somewhat abstract categories of realism, justification, and graphicness that can influence the perception,

[3] The LC4MP has also been applied to digital games (Lang, 2006) to explain the preferences and motivations of their users.

evaluation, and impact of violence in digital games. In a study that combined an in-depth content analysis with a longitudinal survey, Shibuya, Sakamoto, Ihori, and Yukawa (2008) identified the attractiveness of the aggressor; the availability of weapons, rewards, or punishments for violent acts; the depiction of pain and suffering; and the use of humor, as additional influential factors.[4] In an earlier content analysis of fictional television violence, Potter and Smith (2000) used a similar coding scheme that, for example, included the portrayal of consequences, humor, realism, use of weapons, justification, and reward/ punishment. The study found that many of these attributes are related. Looking at the games used in our studies, it becomes obvious that they differed on more than one of those dimensions. To get a more detailed picture of the specific characteristics of the portrayals of violence and their effects, further studies should consider using content analysis as a complimentary method, similar to Shibuya et al. (2008).

Another limitation of the present study may be that our measure of gaming frequency was somewhat simplistic. The number of hours per week or month and the exposure to specific genres (e.g., action games or first-person shooter games) could serve as a more precise predictor of desensitization to violent video game content. However, data from content analyses of digital games suggest that most gamers experience some form of violence in the games they play (Smith, 2006). For example, Dietz (1998) found that 80% of the games analyzed in her study contained at least one type of violence, and Smith, Lachlan, and Tamborini (2003) found portrayals of violence in 68% of the games in their sample.[5]

In addition to video game use, other variables related to the player, such as trait aggression or mood state, might further help to explain differences in the perception and evaluation of violent game contents (Tamborini, Eden, Bowman, Grizzard, & Lachlan, 2012). Our assumption that playing is more cognitively taxing than watching was based solely on our literature review and the attention items we used for a manipulation check. Future studies on the tunnel vision effect should also consider including measures of task demand or cognitive load, such as secondary task paradigms.

Another potential caveat is the relatively short time of exposure of 15 min. Although Valadez and Ferguson (2012) found no differences in the effects of playing duration in their study on hostile feelings, depression, and visuospatial cognition, the authors note that real gaming sessions typically last longer and that it might take more than 45 min for any noticeable effect to occur. The artificial situation of watching a recording of a playing session adds to the potential concerns regarding ecological validity. However, using exactly the same content in different modalities is necessary to manipulate interactivity while at the same time controlling for all other potentially influential variables (Lin, 2013). Regardless, for our study and previous studies that follow a similar approach (e.g., Polman et al., 2008), this means that the results should not be interpreted as evidence for a difference between media (e.g., television and digital games).

Finally, our samples were rather small, especially in Study 1, and composed mostly of university students. That some of the effects that were not significant in Study 1 became significant in the second study can be attributed, at least in part, to the higher number of participants. Considering the studies on cognitive defense mechanisms mentioned above (Kneer, Glock, et al., 2012; Kneer, Munko, et al., 2012), the results of our study may not be generalizable to an older sample. Research by Ivory and Kalyanaraman (2009) also showed that people are less concerned about games they have personal experience with, and a recent survey study by Przybylski (2014) demonstrated that older respondents – who typically have less personal experience with this medium – are more likely to believe that digital games have an effect on real-world aggression. This suggests that a bias exists on both sides: Individuals who are unfamiliar with the medium might overestimate the amount or graphicness of violence in digital games, whereas those who are highly involved may tend to underestimate them. What Tamborini et al. (2012) found for textual stimuli is, therefore, also likely to be true for digital games – namely, that different ‘‘morality subcultures" (Zillmann, 2000) differ in their perception and evaluation of media violence.

Conclusion

The findings from our two exploratory studies suggest that whether a digital game is being played or just watched can affect the perception and evaluation of violent content. These findings also have practical implications for

[4] It should be noted, however, that the findings on the relationship between the use of (violent) digital games and aggression in the study by Shibuya et al. (2008) were somewhat ambiguous. For instance, they found a negative relationship of exposure to violent games for boys and no relationship at all for girls.

[5] Again, the underlying definition of violence is a problem with content analyses of digital games that makes them difficult to compare (see introductory section of this paper).

institutions such as rating boards. Ideally, rating boards should always have their raters play the game they rate. For most rating boards, this is common practice, but many decisions, especially in policy making, are still based on information coming from selectively sampled video recordings or even just hearsay. Of course, this does not mean that every professional who regulates the sale of digital games needs to play every game in question. However, it does mean that watching a recording of a game cannot replace actually playing it in a review process. This also means that involving at least one expert who has actually played the game under review should be required as a minimum standard. An ideal composition of review boards would include both video game players and nonplayers to get a balanced perspective. Although rating boards for digital games typically have well-defined criteria for the evaluation of game content, these evaluations are ultimately based on subjective impressions of individual raters. Our results indicate that these might differ substantially and that parts of these differences can be attributed to (previous) personal experiences with the medium and the way in which the content is presented.

Another implication that is more related to academic research on digital games is that researchers should ask their participants or respondents about their personal perception and evaluation of the games or genres that are being studied. The responses to these questions should, then, not only be used as treatment checks, as is already the case in many studies, but also treated as potential moderators of the effects in-game violence might have on arousal, cognition, emotions, or behavior. In line with what Potter and Tomasello (2003) found for television shows, simply coding for the quantity of violent actions in a game is not sufficient to properly understand its potential effects on the player. There are various types of media violence, and their evaluation can differ substantially between individuals. These differences are rooted not only in personality traits and attributes of the violent content, but also in previous experiences with the medium and the way in which the contents are consumed. Accordingly, the addition of what Potter and Tomasello (2003) call ‘‘interpretation variables" to experimental designs can improve the understanding of any effects media violence may have on the viewers or players. And, on a final note, although they are certainly related, the perception and the subjective evaluation of in-game violence are different processes and should be measured accordingly.

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Appendix

Table A.1. Study 1: Descriptives

Item (scale)	*M*	*SD*	Scale
How violent was the game? (perceived violence)	3.8	0.85	1-5
The game featured realistic depictions of violence (perceived violence)	2.93	1.02	1-5
I hardly noticed the violence in the game (perceived violence)[a]	2.6	1.46	1-5
You had to kill human beings in the game (perceived violence)	4.1	1.32	1-5
The game was too brutal for my taste (subjective rating of violence)	2.17	1.34	1-5
I was put off by the violence in the game (subjective rating of violence)	2.2	1.16	1-5
I focused completely on the game world (attention)	3.53	1.14	1-5
I devoted my full attention to the game (attention)	3.9	0.8	1-5
The game made me forget my real-world surroundings (attention)	2.17	1.15	1-5
The game was thrilling	3.2	1.06	1-5
Which age rating would you assign to the game?	4.2	0.55	1-6
How often do you play computer games?	1.43	1.38	0-4

Note. [a]Reverse-coded.

Table A.2. Study 2: Descriptives

Item (scale)	*M*	*SD*	Scale
How violent was the game? (perceived violence)	3.88	0.66	1-5
The game featured realistic depictions of violence (perceived violence)	2.07	1.14	1-5
I hardly noticed the violence in the game (perceived violence)[a]	1.92	0.96	1-5
You had to kill human beings in the game (perceived violence)	2.3	1.35	1-5
The game was too brutal for my taste (subjective rating of violence)	3.2	1.4	1-5
I was put off by the violence in the game (subjective rating of violence)	2.93	1.34	1-5
I focused completely on the game world (attention)	3.15	0.89	1-5
I devoted my full attention to the game (attention)	3.43	1.02	1-5
The game made me forget my real-world surroundings (attention)	2.3	1.11	1-5
The game was thrilling	2.46	1.14	1-5
Which age rating would you assign to the game?	4.59	0.55	1-6
How often do you play computer games?	0.86	1.33	0-4

Note. [a]Reverse-coded.