

This item is the archived peer-reviewed author-version of:

The enjoyment of shooting games : exploring the role of perceived realism

Reference:

Daneels Row an, Malliet Steven, Koeman Joyce, Ribbens Wannes.- The enjoyment of shooting games : exploring the role of perceived realism
Computers in human behavior - ISSN 0747-5632 - 86(2018), p. 330-336
Full text (Publisher's DOI): <https://doi.org/10.1016/J.CHB.2018.04.053>
To cite this reference: <https://hdl.handle.net/10067/1523750151162165141>

Accepted Manuscript

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PII: S0747-5632(18)30224-3
DOI: 10.1016/j.chb.2018.04.053
Reference: CHB 5508
To appear in: *Computers in Human Behavior*
Received Date: 08 January 2018
Revised Date: 21 March 2018
Accepted Date: 30 April 2018

Please cite this article as: Rowan Daneels, Steven Malliet, Joyce Koeman, Wannes Ribbens, The Enjoyment of Shooting Games: Exploring the Role of Perceived Realism, *Computers in Human Behavior* (2018), doi: 10.1016/j.chb.2018.04.053

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The Enjoyment of Shooting Games: Exploring the Role of Perceived Realism

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Abstract

The enjoyment of violent digital games (e.g., shooting games) is paradoxical in the sense that players often enjoy shooting and killing people in the virtual world, even though they would reject this in the real world. Earlier studies indicated that perceived realism is an important concept to understand this paradox. However, no consensus exists on the nature of the relationship between perceived realism and game enjoyment. On the one hand, the enjoyment players experience when engaging with virtual violence can be initiated by an increased sense of realism which causes the player to feel present in the virtual world. On the other hand, a decreased sense of realism can allow players to justify and take moral distance from in-game violence. This study explores how a multidimensional conceptualization of perceived realism can reconcile these seemingly contradictory perspectives. We distinguish five dimensions of perceived game realism that may impact game enjoyment: simulational realism, freedom of choice, social realism, character involvement, and perceptual pervasiveness. Based on survey data of 728 college students who played a shooting game, perceptual pervasiveness and character involvement were found to positively and significantly relate to game enjoyment, while the other three dimensions did not. This study provides clarification on a theoretical level, contributing to the integration of research on the enjoyment of virtual violence.

Word Count: 216

Key Words: **digital games ; perceived realism ; enjoyment ; shooting games**

1. Introduction

Shooting games are a popular genre of digital games. The Entertainment Software Association reported in 2016 for the United States that 27.5% of sold games, with 9 out of the top 20 best-selling games, were shooting games (ESA, 2017). Despite the criticism on shooting games for simulating violence in a realistic manner (Anderson et al., 2010; Greitemeyer & Mügge, 2014) and the predominantly negative media coverage of violent game effects (Sørensen, 2013), a string of research suggests that harmful effects can only occur with players who actively select and enjoy playing violent shooting games (Ribbens & Malliet, 2015; Slater, 2015).

The enjoyment of violence in both media in general (Vorderer, Klimmt, & Ritterfeld, 2004) and digital games in particular (Mekler, Bopp, Tuch, & Opwis, 2014) is a complex concept. Vorderer and colleagues (2004) define media enjoyment as an individual's positive response towards media technology and its content, a "pleasant" experiential state. The enjoyment of violent media content is paradoxical (Bartsch et al., 2016; Bartsch & Mares, 2014): for instance in shooting games, players enjoy engaging in activities, such as shooting and killing opponents, one would reject in the real world (Jansz, 2005). A body of research has been dedicated to unravel the antecedents of digital game enjoyment, and various factors such as control (Kim et al., 2015), competition (Caroux, Isbister, Le Bigot, & Vibert, 2015), and identification (Hefner, Klimmt, & Vorderer, 2007) are presumed to have an impact. This has resulted in diverse and fragmented conceptualizations of digital game enjoyment (Lin & Peng, 2015).

When examining the enjoyment of virtual violence, several authors have implicitly asserted the relevance of game realism (e.g., Caroux et al., 2015; Hartmann & Vorderer, 2010; Lin & Peng, 2015). This study contributes to the academic field by providing a better understanding of why people enjoy violent games, as the underlying psychological processes that explain differential digital game effects are to date poorly understood (Elson & Ferguson, 2014). Furthermore, this study aims to provide a first empirical exploration of the theoretical realism-enjoyment connection by empirically exploring how a multidimensional understanding of perceived realism, which has been validated in previous research (Ribbens, Malliet, Van Eck, & Larkin, 2016; Ribbens & Malliet, 2013b), can function as an underlying explanatory factor in reconciling contrasting conceptualizations of enjoyment of virtual violence and explaining the paradoxical nature of virtual violence enjoyment. More specifically, we examine which

dimensions of perceived realism are either positively or negatively related to shooting game enjoyment by performing an online survey among 728 university students.

2. Theory

2.1. Perceived game realism: How real are the bullets?

As technology is continuously evolving, games are increasingly accurate in representing reality and in many studies, perceived realism is defined in terms of audiovisual aspects (e.g., Anderson et al., 2010, McGloin, Farrar, & Krcmar, 2011). However, several authors argue for a multidimensional conceptualization of perceived realism that accounts for other aspects besides graphical qualities (e.g., Lin & Peng, 2015), suggesting that a game can come across as realistic in terms of graphics, yet simultaneously be perceived as unrealistic, for instance for not accurately representing social interactions (Malliet, 2006; Popova, 2010; Ribbens et al., 2016).

Several scholars have suggested to include a range of dimensions of perceived game realism, including virtual experience (Popova, 2010), behavioral realism (Breuer, Festl & Quandt, 2012), and simulational realism (Ribbens & Malliet, 2010). These studies indicate that interactivity is an important factor to take into account when talking about perceived game realism, as players are able to make various realism judgements during a play session (Ribbens, 2013b).

Few multidimensional conceptualizations of perceived game realism have been used in empirical research. One of the exceptions is the scale developed by Ribbens and colleagues (2016), which has been validated in the context of shooting games. In previous studies (Ribbens, 2013b; Ribbens & Malliet, 2010) six dimensions of perceived game realism have been determined: *simulational realism* (i.e. the degree to which believable behavior types are made possible within the programmed game rules), *freedom of choice* (i.e. the feeling of co-authorship one has while playing, by comparison to the freedom of choice one has in real life), *character involvement* (i.e. the embodiment within the game world through engagement with an avatar), *perceptual pervasiveness* (i.e. the sensory intensity of digital games, which includes but is not limited to graphical realism), *social realism* (i.e. the degree to which in-game occurrences and characters are considered similar to occurrences and people in the actual world), and *authenticity* (i.e. the credible and consistent integration of mechanics, narrative

elements and visual elements within the digital game world). Ribbens (2013b) validated this structure for the shooting game ‘Half-Life 2’ employing a confirmatory factor analysis.

In more recent work, Ribbens and colleagues (2016) validated the proposed dimensional operationalization of perceived game realism in several studies and populations. They reduced the six-dimensional structure to five dimensions, as ‘authenticity’ cross-loaded on the dimensions of ‘perceptual pervasiveness’ and ‘social realism’. This five-dimensional model was validated using both military themed and science-fiction shooting games with Belgian and American college students. In the current study, we will employ the five-dimensional validated structure as described in **Table 1**.

Table 1: Multidimensional conceptualization of perceived game realism (source: Ribbens et al., 2016)

[Insert **Table 1** here]

[2.2. Media and digital game enjoyment: What makes players enjoy \(shooting\) games?](#)

Enjoyment is a complex concept that has been studied extensively in the fields of media psychology and entertainment research (Lin & Peng, 2015). It has been conceptualized as an emotion (Vorderer et al., 2004), whereby perspectives such as the mood management theory (Zillmann, 2000, 1988) and affective-disposition theory (Zillmann & Cantor, 1977, 1976) describe media enjoyment in terms of pleasure through positive affect. While the first theory presents media use as a mood regulator to optimize a media user’s positive mood (Zillmann, 2000), the latter relates to the selection of entertainment for pleasure seeking and pain avoidance, whereby enjoyment is experienced when beloved characters receive just rewards or when hated villains meet their demise (Raney, 2006). Media enjoyment has also been described, using Self-Determination Theory, as the satisfaction of intrinsic needs, more specific competence, autonomy, and relatedness (Ryan, Rigby, & Przybylski, 2006; Tamborini, Bowman, Eden, Grizzard, & Organ, 2010), and as the seeking of sensation when heightened arousal through novel and intense situations cause media enjoyment (Zuckermann, 1994). Furthermore, there are other affective and cognitive processes underlying media entertainment and enjoyment. Literature on parasocial interactions suggests that media users tend to experience enjoyment when they feel addressed by a media character as if it were a real person (Horton & Wohl, 1956; Rubin, Perse, & Powell, 1985). The concept of escapism explains how media content and narratives provide users a way out of daily routines or real world issues,

which can lead to enjoyment (Henning & Vorderer, 2001; Katz & Foulkes, 1962). However, the concept does not explain whether media users either run from reality or towards the virtual world, or both at the same time. Finally, the experience of transportation, presence, or flow can also lead to media enjoyment (Lee, 2004; Lombard & Ditton, 1997; Sherry, 2004). The similarity between these concepts is that they describe the experience of “being present” in a virtual media environment (i.e. presence), being transported to a virtual world (i.e. transportation), and being totally absorbed to the point that everything else is forgotten, for instance when consuming media content (i.e. flow).

Based on one or more of these overarching theories, research has identified a multitude of specific reasons why players enjoy shooting games, including motives such as competition (Caroux et al., 2015), control (Kim et al. 2015), and identification with the game character (Hefner et al., 2007). Most of these antecedents of game enjoyment can be theoretically linked to the dimensions of perceived game realism identified by Ribbens and colleagues (2016). Caroux and colleagues (2015), for instance, show that enjoyment is higher when players engage with or against a human player instead of a computer-controlled one, and that this is even stronger when the opponent is a friend rather a stranger, i.e. when there is an increased sense of social realism. Furthermore, as a sense of control and agency leads to enjoyment (Kim et al., 2015), this corresponds with the extent to which a game offers choices similar to choices in the real world, directly connecting to the perceived realism dimension of freedom of choice (Ribbens et al., 2016). Finally, monadic identification (i.e., where players and avatars merge through character identification; see Cohen, 2001), which is closely related to the dimension of character involvement (Ribbens et al., 2016) has been connected to an enhanced enjoyment of digital game play (Hefner et al., 2007).

These identified antecedents of digital game enjoyment appear to co-occur and operate simultaneously (Klimmt, Roth, Vermeulen, Vorderer, & Roth, 2012). Furthermore, on a theoretical level, different perspectives exist on the relationship between the potential antecedents of enjoyment, perceived realism, and on the enjoyment of virtual violence. The first perspective notes that the enjoyment of virtual violence can be initiated by an increased sense of game realism, causing the player to feel immersed and present in the virtual world (Elson, Breuer, & Quandt, 2014; Lee, 2004). The second perspective indicates that game realism prevents players from mentally (and often morally) distancing themselves from virtual violence, which lowers the enjoyment of playing violent games (Hartmann, 2017; Hartmann & Vorderer, 2010).

2.3. Connecting the dots between perceived realism and enjoyment

We propose that a multidimensional approach to perceived realism (Ribbens et al., 2016) can reconcile contrasting conceptualizations on how game enjoyment relates to experiencing virtual violence, by drawing up specific hypotheses that predict how each dimension of perceived realism relates to the enjoyment of virtual game violence.

In previous studies, perceptual pervasiveness has been shown to positively affect game enjoyment (McGloin, Farrar, & Krcmar, 2013). Even when graphics in games become increasingly realistic, the study by Whitty, Young and Goodings (2011) found that players can easily distinguish the virtual space from the real world, enabling them to distance from, and subsequently, enjoy violent digital games. To replicate these findings when playing shooting games, we hypothesize that:

***H1:** 'Perceptual pervasiveness' is positively related to the enjoyment of virtual violence*

Related to freedom of choice, more choice adds to perceived control (Kim et al., 2015). When players feel they have control and agency over the game, they will experience more enjoyment (Kim et al., 2015). However, whether this is also the case when playing violent digital games is not yet known. We therefore hypothesize that:

***H2:** 'Freedom of choice' is positively related to the enjoyment of virtual violence*

Looking at social realism, Caroux and colleagues (2015) suggest that engagements with human instead of computer-controlled players leads to higher enjoyment. This links to a higher sense of social realism, as a game character controlled by a human player is likely to resemble people in the real world more strongly. However, from an escapism perspective, players can also experience less enjoyment when game events resemble real world events too strongly, which they wanted to escape from in the first place (Sherry, 2004). If players experience high social realism, it also becomes harder to distance themselves from violent activities (Hartmann & Vorderer, 2010; Young & Whitty, 2010). As research provides no unanimous perspective to predict how social realism influences virtual violence enjoyment, we propose the following research question:

***RQ1:** Is 'social realism' positively or negatively related to the enjoyment of virtual violence?*

Hefner et al. (2007) suggest that monadic identification processes cause stronger feelings of enjoyment. However, higher game character involvement could also lead to more difficulty distancing oneself from virtual acts of violence (Hartmann & Vorderer, 2010). Again there exists no consensus regarding the relationship with enjoyment of virtual violence, so we propose the following research question:

***RQ2:** Is ‘character involvement’ positively or negatively related to the enjoyment of virtual violence?*

A similar rationale can be elaborated regarding simulational realism. On the one hand, the related concept of perceived utility has been positively linked to an enhanced motivation to play (Popova, 2010), suggesting a positive relationship between simulational realism and enjoyment. On the other hand, research indicates that an increased complexity of game rules is not always compatible with players limited capacities to process in-game information, and can result in increased levels of frustration (Weber, Behr, Tamborini, Ritterfeld, & Mathiak, 2009). Accordingly we formulate the following research question:

***RQ3:** Is ‘simulational realism’ positively or negatively related to the enjoyment of virtual violence?*

3. Methods

3.1. Procedure

Bachelor-level and master-level students in communication sciences at the University of Leuven (Belgium) received course credit for playing a level from any offline shooting game they preferred for 20 minutes or until the level was completed as well as recruiting one other participant who was enrolled in higher education in Flanders. There were no restrictions regarding location or platform, with the exception that handheld gaming was not allowed. In this study, shooting games were defined as “games that revolve around combat in which, from a first-person or third-person perspective, a gun, rifle, bow, or other projectile weapon is put at the disposal of the player to attain goals the player is required to aim for by using a mouse or a controller” (Ribbens, 2013a, p.59). Shooting games provide an excellent base to study the relationship between perceived realism and enjoyment of virtual violence for several reasons. First, it conveys a popular genre which attracts lots of players (ESA, 2017). In addition, shooting games contain considerable amounts of violence (Greitemeyer & Mügge, 2014),

enabling players to act out violent behavior in a realistic way (Breuer et al., 2012; Ribbens & Malliet, 2015). Finally, the first-person viewpoint present in many shooting games is an important reason why players perceive game content as more realistic (Denisova & Cairns, 2015).

The participants completed an online survey with measures on socio-demographic characteristics, digital game playing habits, perceived game realism and game enjoyment (see 3.3.). We decided to have respondents play a game and immediately assess their game perceptions and experiences afterwards, as research suggests realism judgements are ideally measured during or immediately after the game (Popova, 2010; Ribbens & Malliet, 2010). Also, realism perceptions were measured at the level of the game, as this affects realism judgments (Popva, 2010; Ribbens et al., 2016).

3.2. Sample

The sample consists of 728 participants, with an almost equal gender distribution (46% female; 54% male) and a mean age of 21,5 years ($M= 21,68$; $SD= 1,92$). Frequency of playing digital games in general is almost 4 hours per week on average ($M= 3,85$; $SD= 6,41$), while the frequency of playing shooting games is 1,5 hours per week on average ($M= 1,55$; $SD= 3, 33$). From 728 participants, 525 chose to play a military-themed shooting game, 117 a science-fiction themed shooting game, and 86 played another type of shooting game (e.g., horror and action-adventure shooters). This genre distinction is important, as research indicates that game realism could be assessed differently across different (sub)genres (Popva, 2010; Ribbens, 2013; Ribbens et al., 2016). Accordingly, games played by the participants were categorized in the aforementioned genres by the lead researcher and used in our analysis on perceived realism and enjoyment of virtual violence (see 4.1.).

3.3. Measurements

Perceived realism was measured using the multidimensional tool developed by Ribbens and colleagues (2016), which was tested for reliability and validity in the same study. The five dimensions within this scale are scored using a 5-point Likert scale and all reached overall satisfactory reliability scores using Cronbach's alpha values: *Character Involvement* (4 items, $\alpha = 0.84$), *Perceptual Pervasiveness* (3 items, $\alpha = 0.85$), *Social Realism* (3 items, $\alpha = 0.86$), *Freedom of Choice* (5 items, $\alpha = 0.86$), *Simulational Realism* (5 items, $\alpha = 0.86$).

Experienced enjoyment was measured using the frequently used interest/enjoyment subscale as part of the Intrinsic Motivation Inventory scale (Ryan, 1982), which was adapted to the activity of playing digital games for this study. This 7-item scale, using a 5-point Likert scale, includes questions such as “Playing the game was fun to do” and “While I was playing the game, I was thinking about how much I enjoyed it”. The Cronbach’s alpha value reached a satisfactory 0.91 rating.

Finally, questions on socio-demographic characteristics (such as gender, age, race, and educational level) and digital game play habits (the play history and frequency of digital games in general and shooting games specifically) were also included.

4. Results

In this section, we explore differences in shooting game subgenres through mean scores of the dimensions of perceived realism and enjoyment. In a second step, we present a stepwise hierarchical regression model using game enjoyment as a function of the different dimensions of perceived realism.

Without making any distinctions regarding subgenres, participants considered shooting games the most realistic when it comes to *perceptual pervasiveness* (M= 3.77; SD= .86). The dimensions of *freedom of choice* (M= 3.11; SD= .80) and *character involvement* (M= 3.08; SD= .84) score just above average, while *social* (M= 2.99; SD= .97) and *simulational realism* (M= 1.82; SD= .64) perceptions score below average.

4.1. Differences in shooting games on perceived realism & enjoyment

To compare the means between the three shooting game genres (military, science-fiction, and other shooters), we performed an one-way ANOVA using the genres as the grouping variable and both the five dimensions of perceived realism and the experienced enjoyment as the dependent variables.

4.1.1. Dimensions of perceived realism

As can be seen in **Table 2**, participants playing the three types of shooting games scored significantly different in the cases of ‘*simulational realism*’ ($F(2,725) = 3.908, p = .021$), ‘*perceptual pervasiveness*’ ($F(2,725) = 9.248, p < .001$), and ‘*social realism*’ ($F(2,725) = 138.974, p < .001$). To determine which conditions were different, post-hoc tests were applied: Games-Howell tests for ‘*perceptual pervasiveness*’ and ‘*social realism*’ as their Levene’s test

proved to be significant ($p < .05$) and equal variances were not assumed, and Bonferroni corrections for '*simulational realism*' of which the Levene's test was non-significant and equal variances were assumed.

The Bonferroni post-hoc test revealed that for '*simulational realism*', there was a significant difference between military and science-fiction shooters ($p = .034$), with mean scores showing that military shooters score higher on simulational realism ($M = 1.86$; $SD = .63$) than science-fiction shooters ($M = 1.70$; $SD = .63$). There was no difference between military ($p = .358$) or science-fiction shooters ($p = 1$) and other shooters. The Games Howell tests revealed that for both '*perceptual pervasiveness*' and '*social realism*' differences between all types of shooters were significant ($p < .001$), with mean scores indicating that 1) for '*perceptual pervasiveness*', military shooters score higher ($M = 3.84$; $SD = .80$) on average than science-fiction shooters ($M = 3.80$; $SD = .89$) and other shooters ($M = 3.32$; $SD = 1.06$); and 2) for '*social realism*', military shooters score higher ($M = 3.27$; $SD = .82$) on average than other shooters ($M = 2.60$; $SD = .96$) and science-fiction shooters ($M = 1.95$; $SD = .79$).

4.1.2. Experienced enjoyment of virtual violence

As **Table 2** also shows, participants playing the three types of shooting games scored significantly different in the experienced enjoyment of virtual violence ($F(2,725) = 5.567$, $p = .004$). To determine which conditions were different, a Bonferroni post-hoc test was used, as the Levene's test was non-significant and equal variances were assumed. The Bonferroni post-hoc test revealed that for enjoyment, there was a significant difference between military and science-fiction shooters ($p = .003$), with mean scores showing that participants playing science-fiction shooters score higher ($M = 4.37$; $SD = .78$) on average than players who played military shooters ($M = 4.10$; $SD = .81$). There was no difference between military ($p = 1$) or science-fiction shooters ($p = .287$) and other shooters.

Table 2: Differences in shooting game genres on Perceived Realism dimensions and Enjoyment

[Insert **Table 2** here]

4.2. Perceived realism as a predictor of shooting game enjoyment

The stepwise regression model proposes game enjoyment as a function of the different dimensions of perceived realism, as seen in **Table 3**, which explains 46% of variance in game enjoyment (while the highest VIF value is 1,85, suggesting no multicollinearity problems). The analysis shows that the dimensions of '*perceptual pervasiveness*' ($\beta = 0.202$; $p < 0.001$) and

character involvement ($\beta = 0.203$; $p < 0.001$) are good predictors of enjoyment. Similar results were obtained when ‘frequency of play’, ‘gender’, and ‘genre of shooter’ were included as control variables. This indicates that the multiple dimensions of perceived realism explain a moderate amount of enjoyment in shooting games.

The first hypothesis, regarding perceptual pervasiveness, can be confirmed. Audiovisual realism does positively relate to enjoyment. The second hypothesis, regarding freedom of choice being positively related to the enjoyment of virtual violence cannot be confirmed: its predicting capability of enjoyment was small and not significant ($\beta = 0.049$; $p = 0.117$). Regarding the other three dimensions, we observed a significant connection with enjoyment in the case of character involvement ($\beta = 0.203$; $p < 0.001$), but not in the case of social ($\beta = 0.023$; $p = 0.486$) and simulational realism ($\beta = 0.045$; $p = 0.169$).

Table 3: Stepwise Regression Model Perceived Realism & Enjoyment

[Insert **Table 3** here]

5. Discussion

5.1. Perceived realism of shooting games

The goal of this study was to explore the role of perceived realism as a multidimensional concept in relation to the enjoyment of virtual violence. First of all, it is remarkable that overall, graphic realism is the highest scoring realism dimension, while a multidimensional approach proves to be a better fit to explain all aspects of perceived digital game realism and not just audiovisual realism (Ribbens et al., 2016; Ribbens, 2013b).

Second, differences within the shooting game genre exist regarding both perceived realism and enjoyment. The ANOVA’s and multiple comparison tests indicated that the military themed shooters scored higher on three out of the five dimensions of realism (i.e. perceptual pervasiveness, simulational realism and social realism) compared to either/or science-fiction and other shooters (see 4.1.1.), while science-fiction shooters scored higher on enjoyment than military shooters (see 4.1.2.). As military shooters often depict military conflicts as they could occur in the real world, it is natural that military shooters score higher on social and simulational realism. However, these differences were not found in the regression model as the genre of shooter was controlled for in the prediction of shooting game enjoyment, resulting in similar

results. This indicates that, on a general level, it is indeed worth the effort to examine the link between perceived realism and enjoyment.

5.2. Relationship between perceived realism and enjoyment

Results from the regression model confirm that, in line with previous research, the dimensions of perceptual pervasiveness (Skalski & Whitbred, 2010) and character involvement (Hefner et al., 2007) are positively and significantly related to shooting game enjoyment. Furthermore, the limited explanatory power of simulational realism, freedom of choice and social realism may be attributed to the lingering debate on game enjoyment of virtual violence with the contradicting immersion and moral disengagement arguments. The former argument supports several studies stating that players experience more enjoyment when they feel immersed in the virtual world (Elson et al., 2014; Lee, 2004). This occurs for instance through high audiovisual quality of the game (cf. perceptual pervasiveness) or certain similarities between the real and the virtual world (cf. simulation/social realism) (Skalski & Whitbred, 2010). The latter argument suggests that game realism works the other way around: realism perceptions prevent players from mentally distancing themselves from virtual violence, which is required to actually enjoy yourself playing violent digital games (Hartmann & Vorderer, 2010). Regarding social realism, the absence of a significant relationship with enjoyment can be explained by the fact that we included different types of shooter games, with science-fiction shooters representing fictional events while military shooters often draw from existing conflicts (Breuer et al., 2012), as seen in the differences in mean scores in the social realism dimension. Another explanation lies within the notion that moral justification is more common among male players, who already have a tendency to consider virtual violence as purely fictional (Hartmann, Möller, & Krause, 2015). This means that realism does not hinder their capacity to morally disengage from violent behavior in the game, and does not negatively impact enjoyment.

Finally, results from the regression model indicated that the control variable gender was the strongest predictor of enjoyment of virtual violence in shooting games. Previous research already indicated that, in general, male players prefer and enjoy violent games such as first person shooters more than female players (e.g., Lucas & Sherry, 2004), as men tend to experience less anticipated guilt and morally justify violence (Hartmann et al., 2015) or are more competitively motivated (Vermeulen & Van Looy, 2016) when playing a shooter game.

5.3. Practitioners' Implications

In this study we only looked at hedonic or pleasurable outcomes of game play. A recent strand of research suggests that, given their increasing popularity, entertainment media such as digital games also have the responsibility to provide players with more meaningful and thought-provoking gratifications beyond mere enjoyment (Oliver et al., 2016; Rogers, Woolley, Sherrick, Bowman, & Oliver, 2017), even in the context of violent media content (Bartsch et al., 2016; Bartsch & Mares, 2014). Based on our results, and more specifically the observation that social and simulational realism are, in general, rated below average, we cannot conclude that shooting games currently have a strong emphasis on such 'eudaimonic' gratifications (Oliver & Raney, 2011). On the contrary, our results reflect that quality of audiovisuals and the construction of engaging characters mark the main ingredients of contemporary shooting games, rather than building a credible or plausible game world. An important question that our results leave open is therefore whether new generations of shooting games could effectuate differential levels of enjoyment by including different types of settings or by making more critical references to our socio-political reality. While this can be considered an important challenge for developers of future shooting games, such games could additionally enable us to obtain a clearer view on the relationship between simulational and social realism and positive affect.

5.4. Limitations & Future Research

An important first step was taken in examining the relationship between perceived realism and the enjoyment of virtual violence. However, this study has some limitations to take into account when interpreting the results. For one, an unbalance between played subgenres of shooting games could explain differences in genres on both perceived realism and the enjoyment of virtual violence. As participants were free to choose a shooting game to assess, most players chose the popular military-themed shooter (ESA, 2017), in a majority of cases this being a game in the popular Call of Duty franchise. Future research should therefore set one specific (popular) game per subgenre and equally divide participants across subgenres, as has been suggested by Ribbens (2013b). However, players that choose their own game to play and discuss in the study will most certainly have enjoyed this game on a certain level.

Secondly, the immersion and moral disengagement arguments discussed in the previous paragraph in the discussion could have been incorporated in the questionnaire. This way, we

could have explicitly determined whether either or both of these arguments mediate the relationship between realism evaluations and the enjoyment of virtual violence. Future research should therefore inquire further into the role of perceived realism as a multidimensional concept to reconcile both perspectives on shooting game enjoyment.

Thirdly, another distinction that might enhance future work encompasses internal versus external realism evaluations (Bilandzic & Busselle, 2011; Popova, 2010). A better understanding of this distinction in relationship to virtual violence enjoyment and the opposition of immersion and moral disengagement might shed new light on game effects and can crop valuable implications for game design and developments.

6. Conclusion

The goal of this study was to empirically explore the theoretical relationship between perceived realism and enjoyment in the case of violent digital games, more specifically shooting games. The importance of this study is that it can reconcile contrasting conceptualizations of virtual violence enjoyment as well as explain the rather paradoxical nature of this type of enjoyment. Based on an online survey with 728 university students, only some dimensions of perceived realism are found to be positive and significant predictors of shooting game enjoyment: *perceptual pervasiveness* (i.e., the degree to which a digital game “text” creates a compelling audiovisual illusion, independent of the degree to which the content of the text may relate to real-world experiences) and *character involvement* (i.e., the extent to which players feel embodied in the digital game world via the experienced engagement with their avatar and the digital game world). These findings are also obtained when controlling for background variables such as play frequency, gender, and played shooter genre.

Despite several limitations, this study accomplishes to explain certain elements on a theoretical level. It makes a contribution towards integrating fragmented results from studies on various conceptualizations of digital game enjoyment, using a multidimensional approach towards perceived game realism.

Bibliography

- Anderson, C., Shibuya, A., Ihori, N., Swing, E., Bushman, B., Sakamoto, A., Rothstein, H., & Saleem, M. (2010). Violent video game effects on aggression, empathy, and prosocial behavior in Eastern and Western countries. *Psychological Bulletin*, *136*(2), 151-173. doi: [10.1037/a0018251](https://doi.org/10.1037/a0018251)
- Bartsch, A., Mares, M., Scherr, S., Kloss, A., Keppeler, J., & Posthumus, L. (2016). More Than Shoot-Em-Up and Torture Porn: Reflective Appropriation and Meaning-Making of Violent Media Content. *Journal of Communication*, *66*(5), 741-765. doi: [10.1111/jcom.12248](https://doi.org/10.1111/jcom.12248)
- Bartsch, A., & Mares, M. (2014). Making Sense of Violence: Perceived Meaningfulness as a Predictor of Audience Interest in Violent Media Content. *Journal of Communication*, *64*(5), 956-976. doi: [10.1111/jcom.12112](https://doi.org/10.1111/jcom.12112)
- Bilandzic, H., & Busselle, R. W. (2011). Enjoyment of films as a function of narrative experience, perceived realism and transportability. *Communications*, *36*(1), 29-50. doi: [10.1515/comm.2011.002](https://doi.org/10.1515/comm.2011.002)
- Breuer, J., Festl, R., & Quandt, T. (2012). Digital war: An empirical analysis of narrative elements in military first-person shooters. *Journal of Gaming & Virtual Worlds*, *4*(3), 215-237. doi: [10.1386/jgvw.4.3.215_1](https://doi.org/10.1386/jgvw.4.3.215_1)
- Caroux, L., Isbister, K., Le Bigot, L., & Vibert, N. (2015). Player–video game interaction: A systematic review of current concepts. *Computers in Human Behavior*, *48*, 366-381. doi: [10.1016/j.chb.2015.01.066](https://doi.org/10.1016/j.chb.2015.01.066)
- Cohen, J. (2001). Defining identification: A theoretical look at the identification of audiences with media characters. *Mass Communication & Society*, *4*(3), 245-264. doi: [10.1207/S15327825MCS0403_01](https://doi.org/10.1207/S15327825MCS0403_01)
- Denisova, A., & Cairns, P. (2015, April). *First person vs. third person perspective in digital games: Do player preferences affect immersion?*. Paper presented at the 33rd Annual ACM Conference on Human Factors in Computing Systems, Seoul, Republic of Korea.
- Elson, M., Breuer, J., & Quandt, T. (2014). Know Thy Player: An Integrated Model of Player Experience for Digital Games Research. In M. Angelides & H. Agius (Eds.), *Handbook of Digital Games* (pp. 362-387). Hoboken, NJ: John Wiley & Sons.
- Elson, M., & Ferguson, C. J. (2014). Twenty-five years of research on violence in digital games and aggression: Empirical evidence, perspectives, and a debate gone astray. *European Psychologist*, *19*(1), 33-46. doi: [10.1027/1016-9040/a000147](https://doi.org/10.1027/1016-9040/a000147)

- Entertainment Software Association ESA (2017). Essential Facts about the Computer and Video Games Industry. Retrieved from <http://www.theesa.com/about-esa/essential-facts-computer-video-game-industry/>
- Greitemeyer, T., & Mügge, D. O. (2014). Video games do affect social outcomes: A meta-analytic review of the effects of violent and prosocial video game play. *Personality and Social Psychology Bulletin*, 40(5), 578-589. doi: [10.1177/0146167213520459](https://doi.org/10.1177/0146167213520459)
- Hartmann, T. (2017). The “Moral Disengagement in Violent Games” Model. *Game Studies*, 17(2). Retrieved from <http://gamestudies.org/1702/articles/hartmann>
- Hartmann, T., Krakowiak, K., & Tsay-Vogel, M. (2014). How violent video games communicate violence: A literature review and content analysis of moral disengagement factors. *Communication Monographs*, 81(3), 310-332. doi: [10.1080/03637751.2014.922206](https://doi.org/10.1080/03637751.2014.922206)
- Hartmann, T., Möller, I., & Krause, C. (2015). Factors underlying male and female use of violent video games. *New Media & Society*, 17(11), 1777-1794. doi: [10.1177/1461444814533067](https://doi.org/10.1177/1461444814533067)
- Hartmann, T., & Vorderer, P. (2010). It's Okay to Shoot a Character: Moral Disengagement in Violent Video Games. *Journal of Communication*, 60(1), 94-119. doi: [10.1111/j.1460-2466.2009.01459.x](https://doi.org/10.1111/j.1460-2466.2009.01459.x)
- Hefner, D., Klimmt, C., & Vorderer, P. (2007). Identification with the player character as determinant of video game enjoyment. In L. Ma, M. Rauterberg, & R. Nakatsu (Eds.), *Entertainment Computing–ICEC 2007* (pp. 39-48). Berlin: Springer Berlin Heidelberg.
- Henning, B., & Vorderer, P. (2001). Psychological escapism: Predicting the amount of television viewing by need for cognition. *Journal of Communication*, 51, 100–120. doi: [10.1111/j.1460-2466.2001.tb02874.x](https://doi.org/10.1111/j.1460-2466.2001.tb02874.x)
- Horton, D., & Wohl, R. R. (1956). Mass communication and para-social interaction: Observation on intimacy at a distance. *Psychiatry*, 19, 185–206. doi: <https://doi.org/10.1080/00332747.1956.11023049>
- Jansz, J. (2005). The Emotional Appeal of Violent Video Games for Adolescent Males. *Communication Theory*, 15(3), 219-241. doi: [10.1111/j.1468-2885.2005.tb00334.x](https://doi.org/10.1111/j.1468-2885.2005.tb00334.x)
- Katz, E., & Foulkes, D. (1962). On the use of mass media for escape: Clarification of a concept. *Public Opinion Quarterly*, 26, 377–388. doi: <https://doi.org/10.1086/267111>
- Kim, K., Schmierbach, M., Bellur, S., Chung, M-Y., Fraustino, J., Dardis, F., Ahern, L. (2015). Is it a sense of autonomy, control, or attachment? Exploring the effects of in-game customization on game enjoyment. *Computers in Human Behavior*, 48, 695-705. doi: [10.1016/j.chb.2015.02.011](https://doi.org/10.1016/j.chb.2015.02.011)

- Klimmt, C., Roth, C., Vermeulen, I., Vorderer, P., & Roth, F. (2012). Forecasting the experience of future entertainment technology: "Interactive Storytelling" and media enjoyment. *Games and Culture*, 7(3), 187-208. doi: [10.1177/1555412012451123](https://doi.org/10.1177/1555412012451123)
- Lee, K. (2004). Presence, explicated. *Communication theory*, 14(1), 27-50. doi: [10.1111/j.1468-2885.2004.tb00302.x](https://doi.org/10.1111/j.1468-2885.2004.tb00302.x)
- Lin, J-H., & Peng, W. (2015). The Contributions of Perceived Graphic and Enactive Realism to Enjoyment and Engagement in Active Video Games. *International Journal of Technology and Human Interaction*, 11(3), 1-16. doi: [10.4018/ijthi.2015070101](https://doi.org/10.4018/ijthi.2015070101)
- Lombard, M., & Ditton, T. (1997). At the heart of it all: The concept of presence. *Journal of Computer mediated Communication*, 3(2). doi: [10.1111/j.1083-6101.1997.tb00072.x](https://doi.org/10.1111/j.1083-6101.1997.tb00072.x)
- Lucas, K., & Sherry, J. (2004). Sex Differences in Video Game Play: A Communication-Based Explanation. *Communication Research*, 31(5), 499-523. doi: <https://doi.org/10.1177/0093650204267930>
- McGloin, R., Farrar, K., & Krcmar, M. (2011). The Impact of Controller Naturalness on Spatial Presence, Gamer Enjoyment, and Perceived Realism in a Tennis Simulation Video Game. *Presence: Teleoperators and Virtual Environments*, 20(4), 309-324. doi: [10.1162/PRES_a_00053](https://doi.org/10.1162/PRES_a_00053)
- McGloin, R., Farrar, K., & Krcmar, M. (2013). Video Games, Immersion, and Cognitive Aggression: Does the Controller Matter? *Media Psychology*, 16(1), 65-87. doi: <https://doi.org/10.1080/15213269.2012.752428>
- Mekler, E. D., Bopp, J. A., Tuch, A. N., & Opwis, K. (2014, April). *A systematic review of quantitative studies on the enjoyment of digital entertainment games*. Paper presented at the 32nd annual ACM Conference on Human Factors in Computing Systems, Toronto, Canada.
- Muthén, B., & Kaplan, D. (1992). A comparison of some methodologies for the factor analysis of non-normal Likert variables: A note on the size of the model. *British Journal of Mathematical and Statistical Psychology*, 45(1), 19-30. doi: [10.1111/j.2044-8317.1992.tb00975.x](https://doi.org/10.1111/j.2044-8317.1992.tb00975.x)
- Oliver, M., Bowman, N., Woolley, J., Rogers, R., Sherrick, B., & Chung, M. (2016). Video games as meaningful entertainment experiences. *Psychology of Popular Media Culture*, 5(4), 390-405. doi: <http://dx.doi.org/10.1037/ppm0000066>
- Oliver, M., & Raney, A. (2011). Entertainment as Pleasurable and Meaningful: Identifying Hedonic and Eudaimonic Motivations for Entertainment Consumption. *Journal of Communication*, 61(5), 984-1004. doi: [10.1111/j.1460-2466.2011.01585.x](https://doi.org/10.1111/j.1460-2466.2011.01585.x)
- Popova, L. (2010). *Perceived Reality of Media Messages: Concept Explication and Testing* [Unpublished doctoral dissertation]. University of California, Santa Barbara.

- Raney, A. (2006). The psychology of disposition-based theories of media enjoyment. In J. Bryant & P. Vorderer (Eds.), *Psychology of Entertainment* (pp. 137-150). Mahwah, NJ (USA): Erlbaum.
- Ribbens, W. (2013a). *In search of the player: Perceived realism and playing styles in digital game effects* [Unpublished doctoral dissertation]. Leuven: KU Leuven. Retrieved from <https://lirias.kuleuven.be/handle/123456789/414856>.
- Ribbens, W. (2013b). Perceived Game Realism: A Test of Three Alternative Models. *Cyberpsychology Behavior and Social Networking*, *16*(1), 31-36. doi: [10.1089/cyber.2012.0212](https://doi.org/10.1089/cyber.2012.0212)
- Ribbens, W., & Malliet, S. (2010). Perceived Digital Game Realism: A Quantitative Exploration of its Structure. *Presence-Teleoperators and Virtual Environments*, *19*(6), 585-600. doi: [10.1162/pres_a_00024](https://doi.org/10.1162/pres_a_00024)
- Ribbens, W., & Malliet, S. (2015). How male young adults construe their playing style in violent video games. *New Media & Society*, *17*(10), 1624-1642. doi: [10.1177/1461444814530821](https://doi.org/10.1177/1461444814530821)
- Ribbens, W., Malliet, S., Van Eck, R., & Larkin, D. (2016). Perceived realism in shooting games: Towards scale validation. *Computers in Human Behavior*, *64*, 308-318. doi: [10.1016/j.chb.2016.06.055](https://doi.org/10.1016/j.chb.2016.06.055)
- Rogers, R., Woolley, J., Sherrick, B., Bowman, N., Oliver, M. (2017). Fun versus meaningful video game experiences: A qualitative analysis of user responses. *The Computer Games Journal*, *6*(1-2), 63-79. doi: <https://doi.org/10.1007/s40869-016-0029-9>
- Rubin, A., Perse, E., & Powell, R. (1985). Loneliness, parasocial interaction, and local television news viewing. *Human Communication Research*, *12*, 155–180. doi: <https://doi.org/10.1111/j.1468-2958.1985.tb00071.x>
- Ryan, R., Rigby, C., & Przybylski, A. (2006). The motivational pull of video games: A self-determination theory approach. *Motivation and Emotion*, *30*(4), 344-360. doi: <https://doi.org/10.1007/s11031-006-9051-8>
- Ryan, R. (1982). Control and information in the intrapersonal sphere: An extension of cognitive evaluation theory. *Journal of Personality and Social Psychology*, *43*(3), 450. doi: [10.1037/0022-3514.43.3.450](https://doi.org/10.1037/0022-3514.43.3.450)
- Sherry, J. (2004). Flow and Media Enjoyment. *Communication Theory*, *14*(4), 328-347. doi: [10.1111/j.1468-2885.2004.tb00318.x](https://doi.org/10.1111/j.1468-2885.2004.tb00318.x)
- Skalski, P., & Whitbred, R. (2010). Image versus Sound: A Comparison of Formal Feature Effects on Presence and Video Game Enjoyment. *PsychNology Journal*, *8*(1), 67-84. Retrieved from

[http://www.psychology.org/File/PNJ8\(1\)/PSYCHOLOGY_JOURNAL_8_1_SKAL_SKI.pdf](http://www.psychology.org/File/PNJ8(1)/PSYCHOLOGY_JOURNAL_8_1_SKAL_SKI.pdf)

- Slater, M. (2015). Reinforcing spirals model: Conceptualizing the relationship between media content exposure and the development and maintenance of attitudes. *Media Psychology*, 18(3), 370-395. doi: [10.1080/15213269.2014.897236](https://doi.org/10.1080/15213269.2014.897236)
- Sørensen, E. (2013). Violent computer games in the German press. *New Media & Society*, 15(6), 963-981. doi: [10.1177/1461444812460976](https://doi.org/10.1177/1461444812460976)
- Tamborini, R., Bowman, N., Eden, A., Grizzard, M., & Organ, A. (2010). Defining media enjoyment as the satisfaction of intrinsic needs. *Journal of Communication*, 60(4), 758-777. doi: [10.1111/j.1460-2466.2010.01513.x](https://doi.org/10.1111/j.1460-2466.2010.01513.x)
- Vermeulen, L., & Van Looy, J. (2016). "I Play So I Am?" A Gender Study into Stereotype Perception and Genre Choice of Digital Game Players. *Journal of Broadcasting & Electronic Media*, 60(2), 286-304. doi: <https://doi.org/10.1080/08838151.2016.1164169>
- Vorderer, P., Klimmt, C., & Ritterfeld, U. (2004). Enjoyment: At the heart of media entertainment. *Communication Theory*, 14(4), 388-408. doi: [10.1111/j.1468-2885.2004.tb00321.x](https://doi.org/10.1111/j.1468-2885.2004.tb00321.x)
- Weber, R., Behr, K., Tamborini, R., Ritterfeld, U., & Mathiak, K. (2009). What do we really know about First-Person-Shooter games? An event-related high resolution content analysis. *Journal of Computer-Mediated Communication*, 14(4), 1016-1037. doi: [10.1111/j.1083-6101.2009.01479.x](https://doi.org/10.1111/j.1083-6101.2009.01479.x)
- Whitty, M., Young, G., & Goodings, L. (2011). What I won't do in pixels: Examining the limits of taboo violation in MMORPG's. *Computers in Human Behavior*, 27, 268-275. doi: <https://doi.org/10.1016/j.chb.2010.08.004>
- Young, G., & Whitty, M. (2010). Games without frontiers: On the moral and psychological implications of violating taboos within multi-player virtual spaces. *Computers in Human Behavior*, 26, 1228-1236. doi: [10.1016/j.chb.2010.03.023](https://doi.org/10.1016/j.chb.2010.03.023)
- Zillmann, D. (1988). Mood management: Using entertainment to full advantage. In L. Donohew, H. E. Sypher, & E. T. Higgins (Eds.), *Communication, Social Cognition, and Affect* (pp. 147-171). Hillsdale, NJ (USA): Erlbaum.
- Zillmann, D. (2000). Mood management in the context of selective exposure. *Annals of the International Communication Association*, 23(1), 103-123. doi: <https://doi.org/10.1080/23808985.2000.11678971>
- Zillmann, D., & Cantor, J. (1976). A disposition theory of humour and mirth. In A. Chapman & A.J. Foote (Eds.), *Humour and Laughter: Theory, Research, and Applications* (pp. 92-115). London: Wiley.

Zillmann, D., & Cantor, J. (1977). Affective responses to the emotions of a protagonist. *Journal of Experimental Social Psychology*, *13*, 155-165. doi: [10.1016/S0022-1031\(77\)80008-5](https://doi.org/10.1016/S0022-1031(77)80008-5)

Zuckermann, M. (1994). *Behavioral expressions and biosocial bases of sensation seeking*. Cambridge: Cambridge University Press.

Research Highlights:

- Relationship between perceived realism (multidimensional concept) and game enjoyment
- Shooting game subgenres (military and science-fiction) differ on realism and enjoyment
- Graphic realism and character involvement predict game enjoyment
- Freedom of choice (autonomy) and social/simulational realism do not predict enjoyment

Table 1: Multidimensional conceptualization of perceived game realism (source: Ribbens et al., 2016)

Dimensions	Description
Character involvement	The extent to which players feel embodied in the digital game world via the experienced engagement with their avatar and the digital game world.
Simulational realism	The extent to which behavior in the digital game simulates behavior in the real world in a believable manner; how the programmed rules and different types of behavior in the game credibly simulate the real world.
Freedom of choice	The extent to which the number and nature of choices in the digital game reflect choices a player has in the real world.
Social realism	The extent to which the events and characters in the digital game resemble events and people in the real world.
Perceptual pervasiveness	The extent to which a digital game “text” creates a compelling audiovisual illusion, independent of the degree to which the content of the text may relate to real-world experiences.

Table 2: Differences in shooting game genres on Perceived Realism dimensions and Enjoyment

	F-score	Military shooters		Science-fiction shooters		Other shooters	
		Mean	SD	Mean	SD	Mean	SD
Character involvement	.722	3.06	.84	3.17	.83	3.07	.86
Simulational realism	3.908*	1.86	.63	1.70	.63	1.74	.74
Freedom of choice	1.455	3.09	.79	3.10	.81	3.24	.89
Social realism	138.974***	3.27	.82	1.95	.79	2.60	.96
Perceptual pervasiveness	9.248***	3.84	.80	3.80	.89	3.32	1.06
Enjoyment	5.567**	4.10	.81	4.37	.78	4.18	.80

Significance: *p < .05; **p < .01; ***p < .001

Table 3: Stepwise Regression Model Perceived Realism & Enjoyment

	B^1	$SE B^1$	β^2	T -score
Predictors ‘Perceived Realism’				
• Perceptual Pervasiveness	.189	.030	.202	6.374***
• Freedom of choice	.049	.031	.049	1.570
• Social realism	.019	.028	.023	.697
• Character involvement	.196	.032	.203	6.202***
• Simulational realism	.057	.042	.045	1.376
Control				
• Frequency of play (shooter games)	.243	.027	.334	8.878***
• Gender	.308	.060	.190	5.174***
• Genre of shooter game	.127	.036	.108	3.530***
Model fit				
• R^2	0.413			

Note: dependent variable is ‘enjoyment’ ; Significance: * $p < .05$; ** $p < .01$; *** $p < .001$; 1: unstandardized coefficients with estimator (B) and its standard error (SE B); 2: standardized coefficient estimator (β)