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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.

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Dr. Matthieu Guitton Editor *Computers in Human Behavior*

January 8, 2018

Dear Dr. Guitton:

We are pleased to submit an original research article entitled "The Enjoyment of Shooting Games: Exploring the Role of Perceived Realism" by Rowan Daneels, Steven Malliet, Joyce Koeman and Wannes Ribbens for consideration for publication in *Computers in Human Behavior*. We previously uncovered the multidimensional concept of perceived realism in digital shooting games (Ribbens, Malliet, Van Eck, & Larkin, 2016), and this manuscript builds on this by studying the relationship between perceived realism and the enjoyment of shooting games.

In this manuscript, we present an online survey with 728 university students, who played a shooting game, to study the link between perceived game realism as a multidimensional concept and the enjoyment of shooting games. We show that the perceived realism dimensions of perceptual pervasiveness (i.e. the sensory intensity of digital games, which includes but is not limited to graphical realism) and character involvement (i.e. the embodiment within the game world through engagement with an avatar) were found to positively and significantly relate to game enjoyment, while the three other dimensions (simulational realism, freedom of choice, and social realism) did not.

We believe that this manuscript is appropriate for publication in *Computers in Human Behavior* because it examines a theoretical link between realism, present in the game content and perceived by human players, and its effect on players, in this instance the hedonic emotion of enjoyment.

This manuscript has not been published and is not under consideration for publication elsewhere. We also have no conflicts of interest to disclose.

Thank you for your consideration!

Sincerely,

Rowan Daneels, MSc. PhD Researcher, Department of Communication Sciences University of Antwerp

Dear Reviewer 1,

First of all, the co-authors and myself would like to thank you to take the time reading our submitted manuscript and providing us with the necessary feedback to improve our submission.

In the text below, we will address the provided feedback step-by-step by giving an answer on any potentially unclear aspects of the manuscript and each time clearly indicating where we made adjustments in the revised manuscript based on the feedback. In the revised manuscript, all changes are also highlighted.

1.The importance of the enjoyment of shooting game does not explain well, and the contribution of this manuscript is not highlighted. Author(s) should tell us why this topic (the enjoyment of shooting game) is so important and who should pay attentions to this topic.

Within the abstract, we added one line to frame the importance of the enjoyment of violent games (in particular shooting games) as its enjoyment is rather paradoxical (also present in the Introduction section). The concept of perceived realism can be important (earlier studies already indicated this; also in Introduction) to explain this paradoxical nature more.

In the Introduction section, we also pose that a better understanding of the enjoyment of violent games is needed first in order to gain more insight in the underlying psychological processes that explain several digital game effects, which are often poorly understood (Elson & Ferguson, 2014).

Finally, we also mention in the Introduction that this study investigates whether the multidimensional model of perceived realism (Ribbens, Malliet, Van Eck, & Larkin, 2016) can function to unify the fragmented explanations of enjoyment of violent digital games into one theoretical framework.

Although the importance of shooting game enjoyment and the contribution of this study were already mentioned in the manuscript, we **highlighted the contribution** of the study in the last paragraph of the Introduction section by explicitly mentioning how this paper (with the arguments above) contributes to the academic field.

2.Many theories and models including disposition theory, transportation theory, attitude, cognition, parasocial interaction and flow have been developed to explain media enjoyment. Author(s) should completely review literature on enjoyment.

We absolutely concur with this point of feedback: our original manuscript only provided a superficial overview of media enjoyment and theoretical frameworks that explain it, primarily focusing on potential antecedents of digital game enjoyment. Based on the overview article "Enjoyment: At the heart of media entertainment" by Vorderer, Klimmt and Ritterfeld (2004), the revised manuscript looks to provide a more inclusive overview on the literature of media enjoyment by adding insights on **mood management theory, affective-disposition theory, sensation seeking, parasocial interactions, escapism**, and the notions of **transportation/presence/flow**.

3.Author(s) adopted the realism perspective to explore the antecedents of enjoyment. However, this theoretical framework may be not solid enough. Many aspects which may impact on enjoyment are ignored. Thus, the potential for contributions is rather limited.

The main goal of the current study was to examine whether players' perceptions of game realism, as defined by the multidimensional concept of Ribbens, Malliet, Van Eck and Larkin (2016, Computers in Human Behavior), influence the enjoyment of playing shooting games. As we describe in the manuscript, the definition of perceived game realism is more than just audiovisual realism and contains many aspects that show similarities with antecedents of game enjoyment from previous studies (e.g., control, agency and freedom of choice; identification with in-game characters/game world; etc.).

The contribution of this study is therefore to explore if the multidimensional concept of perceived realism can 1) take all these explanations/antecedents of game enjoyment and integrate them into one theoretical framework (being 'perceived realism'), and 2) reconcile two opposing perspectives that link realism and enjoyment, namely the presence/immersion theory and moral disengagement approach.

4.Previous studies have verified the relationship between perceptual pervasiveness, and the relationship between freedom of choice and enjoyment which are H1 and H2 proposed in this manuscript. What's new in H1 and H2 and what's the contribution in H1 and H2. Author(s) should provide detailed explanations.

Previous studies have indeed found a positive relationship between perceptual pervasiveness and freedom of choice on the one hand and game enjoyment on the other hand. We also mention some of these studies on which we base our current hypotheses.

However, the **novelty and contribution** of these hypotheses is that it investigates the relationship between perceptual pervasiveness and freedom of choice on the one hand, and the **enjoyment of virtual violence** (here defined as playing **shooting games**) on the other hand. So it is a specific type of media enjoyment that can be experienced through players either feeling present in the game environment or being morally disengaged, both because of the potentially realistically perceived game content.

To highlight the novelty of both hypotheses, we added an extra line saying that we have no info on whether there is a relationship present in the case for either shooting games (the case for perceptual pervasiveness, H1) specifically or the enjoyment of virtual violence (the case for freedom of choice, H2).

5.The lack of the reasonable inferential reasons in H3. On page 4, Author(s) indicated that "Caroux and colleagues (2015) find, applying a systematic literature review, that enjoyment is higher when....., i.e. when there is an increased sense of social realism." This study seems against H3. More information should be provided.

We absolutely concur with this point of feedback: the study by Caroux and colleagues (2015) indeed suggests that players with a heightened perception of social realism will enjoy playing a game more often. However, from an escapist point of view, there is also a counterargument: game events and characters that resemble the real world (i.e. social realism) can lead to less enjoyment, as players often want to escape to a more fantasy virtual world that totally differs from the actual reality.

We therefore changed the **hypothesis** into a **research question** (like we did with the dimensions of 'character involvement' and 'simulational realism'), as we do not know in which way social realism perceptions would affect the enjoyment of virtual violence (in shooting games).

6.This study focuses on "any offline shooting game". However, the display, the media content, and the challenges and problems may be different in these shooting games and then cause biases. The experiences of participants in playing a level from these shooting games may twist the data. The design of data collecting may be not strong enough.

The initial procedure of this study was to let the participants choose (based on their preferences) which offline shooting game they wanted to play, which is based on the published study by Ribbens, Malliet, Van Eck & Larkin (2016, Computers in Human Behavior). This study showed that this procedure/design was strong enough to validate the perceived realism scale of shooting games.

However, in the Sample section (3.2.) of the methodology, we describe the division of subgenres the participants played. Overall, these were either military shooter games, science-fiction shooter games, or a third category consisting of a number of different smaller subgenres (e.g., horror, adventure, etc.). We also mention that the leading researcher of the study categorized the specific games in these subgenres (based on genre descriptions of the games) in order to determine whether there would be differences in perceived realism and enjoyment experiences between the subgenres.

As the results show, there are some differences between the subgenres (on for instance simulational realism, social realism, and also enjoyment). In the regression model, however, we did not take up the type of shooter game as a control variable. For this revision, we performed a new linear regression with the added control variable. The new results in the table show that there were no real changes (β , T-test scores and p-values remained almost the same) on the dimensions of perceived realism as the predictors of enjoyment, and that there thus are no differences between the types of shooting games when it comes to perceived realism predicting the enjoyment of these shooting games.

7.Because introduction, literature review, theory, and design of data collection are not well explained, the results and conclusions are weaknesses.

For the **results**, we added a control variable of 'type of shooter' (based on point 6 of the feedback) to the regression model that predicts enjoyment of shooting games using the perceived realism dimensions. However, there were no real changes (β , T-test scores and p-values remained almost the same) on the dimensions of perceived realism as the predictors of enjoyment. This means that differences in types of shooting games do not contribute in the connection between perceived realism and the enjoyment of shooting games.

For the **discussion/conclusion**, we made some adjustments/additions also based on the feedback from the other reviewer:

- In the revised manuscript, the discussion and conclusion section are split up as they address separate aspects of the study
- The discussion section has not been altered that much, as it contains 1) a discussion of the findings, explaining the findings and comparing them to previous studies and theoretical frameworks, and 2) limitations of the present study and suggestions for future research
 - However, we added a third section on the practical implications of our study's results, which **include...**
- The conclusion section has been separated from the discussion, and deals with summarizing the paper as a whole, and how this also contributes to the academic field

Dear Reviewer 2,

First of all, the co-authors and myself would like to thank you to take the time reading our submitted manuscript and providing us with the necessary feedback to improve our submission.

In the text below, we will address the provided feedback step-by-step by giving an answer on any potentially unclear aspects of the manuscript and each time clearly indicating where we made adjustments in the revised manuscript based on the feedback. In the revised manuscript, all changes are also highlighted.

This is an interesting paper that seeks to explore how a multidimensional conceptualization of perceived realism can reconcile the seemingly contradictory perspectives in literature. There is depth within the literature review. However, the authors should consider splitting the discussion and conclusions into standalone sections. Such an approach would ensure that within the 'standalone' conclusion section, the authors summarizes the whole discussion as presented in the paper whereas the 'discussion' section would be restricted to discussing of all the findings emergent from conducting the investigation.

In the revised manuscript, the discussion and conclusion section are split up as they indeed need to address separate aspects of the paper. The discussion section has not been altered that much, as it contains 1) a discussion of the findings, explaining the findings and comparing them to previous studies and theoretical frameworks, 2) limitations of the present study and suggestions for future research, and 3) implications for practitioners (see next feedback point).

The conclusion section has been separated from the discussion, and deals with summarizing the paper as a whole, and how this also contributes to the academic field.

Implications: the authors are encouraged to split these four pages by having sub-sections around 'researchers' and 'practitioners' implications. If possible, the specific implication(s) could equally have individual subsection as opposed to limiting these just to the abstract. Please consider extending these implications within the conclusions section and finally, it would be appropriate to link these implications through the cross referencing to the actual findings as reported.

The discussion of the revised manuscript has been split up into practitioners' implications and researchers' implications (which we see as the limitations of the study and suggestions regarding future research). For the practitioners' implications, we linked the findings of the study (for instance, the relatively unimportance of social and simulational realism in shooter games) to the suggestion that game designers should look to focus more on audiovisual qualities and engaging characters to make an enjoyable game.

Enhancing the quality of Tables: please consider having additional explanatory notes to Table 3 to provide some definitions of the variables as reported within the headings of columns 2 through 6.

Within Table 3, we made some changes. First, we removed the p-value column and added it to the Tscore column using the asterisk (*) from Table 2 (used more commonly in results sections), also providing explanation below the table. Furthermore, we added explanatory notes below the table to define B and SE B (unstandardized coefficients, respectively the estimator and standard error), and β -value (standardized estimator – beta).

Hopefully, this revision is in the direction of the reviewer's intended way.

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

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

Authors:

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Short bio's:

- **Rowan Daneels**, MSc in Communication Studies at the University of Antwerp (2014) and Ghent University (2015), and former Teaching Assistant at the Institute for Media Studies, KU Leuven, is now a PhD Researcher at the MIOS research group, University of Antwerp. His research interests include digital games, virtual reality, and other immersive media.
- **Steven Malliet**, PhD in Communication Sciences at KU Leuven (2007) is an Associate Professor at the University of Antwerp (Belgium) and a Lecturer/Researcher at the LUCA School of Arts in Genk (Belgium). His research topics include digital game effects, player experiences, serious games and game realism.
- **Joyce Koeman,** PhD in Communication Sciences at KU Leuven (2011) is a Tenure-track Professor at the Institute for Media Studies, KU Leuven (Belgium). Her research interests include media representations, advertising, ethnic marketing, etc.
- Wannes Ribbens, PhD in Communication Sciences at KU Leuven (2013) is a Researcher at the Department of Media & Communication at the Erasmus University Rotterdam (The Netherlands) and Research Advisor at KU Leuven (Belgium). His research topics include digital games, game realism, and digital gameplay styles.

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. 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 coauthorship 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 ingame 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 ad 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 (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.

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

		Military shooters		Science-fiction shooters		Other shooters	
	F-score	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

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

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

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

Table 3: Stepwise Regression Model Perceived Realism & Enjoyment

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)