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Effect of cooperation on players' immersion and enjoyment

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EFFECT OF COOPERATION ON PLAYERS' IMMERSION AND ENJOYMENT

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ABSTRACT

This research examines the effect of cooperative versus non-cooperative game play on immersion and enjoyment in online games. It draws on the self-determination theory to generate the research hypotheses and explain the observed phenomenon. A within-subject experimental design (N=38) was used to evaluate the effects of cooperative versus non-cooperative game play on enjoyment and immersion by having participants play in a manipulated game mode in a controlled gaming environment. The participants' subjective responses were assessed to understand their user experience in cooperative and non-cooperative gaming environments. The results suggest that both immersion and enjoyment were significantly enhanced in cooperative game play.

Keywords: Cooperation, Immersion, Enjoyment, and Self-determination Theory

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1. INTRODUCTION

Research in the field of game science is emerging. Past research on digital games has concentrated mainly on the adverse effects of gaming, such as gaming addiction (Grüsser, Thalemann, & Griffiths, 2007) and violent content and its impact (Bushman & Anderson, 2002). The focus of the current research is to understand the critical aspects of gameplay experience (Takatalo et al., 2008). Understanding subjective user experience, such as immersion, has become an important aspect in gaming research (Jennett et al., 2008). One of the important requirements for any game to become a success is to draw people into the game, i.e., the game has to be immersive.

An increasing body of research is focusing on factors that contribute to enjoyment in video games, generally as a part of research based on motivations that can influence game play (Hartmann & Klimmt, 2006; Wood, Griffiths, Chappell, & Davies, 2004). As games are a common entertainment medium, it is important to understand the factors that make players' experience enjoyable, as they are essential for answering larger questions about why and when people play games. Despite the importance of identifying and understanding factors influencing players' enjoyment in online gaming, comparatively fewer research has focused specifically on the effects of multiplayer factors such as cooperation.

In this research, a laboratory experiment was conducted to understand the effect of cooperative versus non-cooperative game play on user experience in terms of immersion and enjoyment in the context of first person shooter gaming. Specifically, we are interested in studying if cooperation in online gaming increases players' sense of immersion and enjoyment. Non-cooperative first person shooter gaming served as the

control condition. In this research, we report our findings on the effect of cooperation on game immersion and enjoyment in the context of a first person shooter game.

This paper is organized as follows. First, the literature review is presented which is followed by the theoretical foundation and the hypotheses. Next, the research methodology is described, after which the findings are presented and discussed. Finally, the limitations and directions for future research are also highlighted.

2. LITERATURE REVIEW

2.1. COOPERATIVE PLAY AND ENJOYMENT

Cooperation, either with computer agents or human players to achieve a collective goal, has very little research devoted to it (Peng & Hsieh, 2012). In a cooperative play, subjects play collaboratively to achieve the collective task of outperforming an opponent (Schmierbach, Xu, Oeldorf-Hirsch, & Dardis, 2012). Players can also cooperate with a computer agent or environment in video games (Waddell & Peng, 2014). In this study, the focus is on understanding the players' experience in terms of immersion and enjoyment of individuals in a team. As cooperation is a part of our daily tasks, it is essential to examine user experience in such scenarios.

Numerous studies (Przybylski, Rigby, & Ryan, 2010; Tamborini et al., 2011; Yee, 2006b) have demonstrated that, whenever social elements are available, players are drawn to them and the kind of interaction that takes place is crucial for motivation (Schmierbach et al., 2012). According to self-determination theory, relatedness is a basic need that can provide enjoyment when it is fulfilled (Przybylski et al., 2010). A previous study has demonstrated that playing a game with a human player generated greater feelings of relatedness that in turn was associated with enjoyment (Reinecke et al., 2012). Also, social motivations are noted as key underlying reasons for playing massively multiplayer online games (MMOGs) (Yee, 2006b). Likewise, another study has demonstrated that social interaction is more prevalent in MMOGs and contributed to enjoyment (Cole & Griffiths, 2007).

However, no research has focused on understanding immersion and enjoyment in cooperation. This question is important to understand whether cooperation or non-

cooperation creates greater level of user experience. Specifically, the objective of this research is to study the effects of cooperation on online game players' immersion and enjoyment.

2.2. PRIOR RESEARCH ON IMMERSION

A primary motivation underlying playing video games is the pleasure of being immersed in a mediated world (Weibel & Wissmath, 2011). A survey based study conducted by (Yee, 2006a) evaluated experiences and motivations of 30,000 gamers. He found that people play video games because they like to be immersed in a fictional world.

When a player is immersed in a game, his or her connection with the outside world of the game vanishes and instead, his or her connection focuses within the magic circle boundaries in which the game is played as the present 'real world' of the gamer. Presence, which is the sense of being present in one environment when physically located in another environment (Witmer & Singer, 1998), is often used as a metric to assess this phenomenon in the case of computer games.

Immersion into a virtual environment is often described as presence; whereas flow refers to an experience of being completely involved in a certain task (Weibel, Wissmath, Habegger, Steiner, & Groner, 2008). The flow concept concentrates more on the characteristics of the task, but the presence concept is more focused on a medium's technological characteristics. An eye-tracking study has provided a more objective approach to study immersion by demonstrating that there is a decrease in eye movements when players are highly immersed (Jennett et al., 2008).

From the perspective of technology, the sense of immersion is closely related to presence. Presence is defined as the feeling of being present in a virtual environment (Slater, Usoh, & Steed, 1994). Such feelings can be generated through an individual's digital representation of himself/herself in a virtual environment. In the case of computer games, this would usually be a first-person shooter game, such as Call of Duty: Black Ops or Counter-Strike. In first-person shooter games, players perceive themselves to be immersed in a virtual environment (as if it were their physical environment) where they could navigate to explore it, search for enemies, and kill the enemies (Cairns, Cox, & Nordin, 2014).

3. THEORETICAL FOUNDATION & HYPOTHESES

The aim of this research is to understand the effects of cooperative gameplay on immersion and enjoyment. To generate hypotheses for this research, we draw on transportation theory to explain immersion in a cooperative gaming environment and self-determination theory to explain enjoyment. Our research model is shown at the end of this section in Figure 3.1.

3.1. TRANSPORTATION THEORY

Theoretically, transportation into a narrative world refers to being completely engaged in a task, resulting in the combination of imagery, attention and feelings (Green & Brock, 2002). Transportation theory proposes that the experience of intense involvement can alter a person's beliefs and attitudes (Green, Brock, & Kaufman, 2004). The underlying mechanism of transportation reduces individuals' negative cognitive responses. Hence, it is very unlikely that individuals counter-argue or disbelieve narrative claims, and thus their beliefs might be influenced (Ping, Goh, & Teo, 2010). Narrative experiences are led by transportation that seem like real experiences. Moreover, transportation has the capability to produce greater feelings concerning other characters in narratives that may have been enhanced.

Although transportation theory was proposed in the context of narratives or written materials, it has also been used in other contexts such as to understand participation in offering narrative information and the degree to which they are or can be comprehended from a range of media content including virtual reality simulations and video games (Green et al., 2004). The transformative potential of transportation also

applies in digital interactive media such as online digital games because players in such environments are given flexibility to place themselves in the context of interactive narration which allows players to go beyond their role as a passive audience (Ping et al., 2010). Previous research describes the achievement of transportation experience in the context of online virtual worlds as being similar to telepresence in the information systems literature where individuals focus on the mediated or virtual environment to the degree that their physical environment is forgotten and their stimulus field is narrowed only to the virtual environment (Nah, Eschenbrenner, & DeWester, 2011). Another research argued that transportation experience is an experience of much greater intensity than a telepresence experience, and that transportation is more than the sense of just being present in a virtual environment (Ping et al., 2010). Individuals who experience transportation are not only present but also extremely engaged and involved in a pleasurable manner with the narrative components in a virtual environment to the degree that the players may feel as if they are part of a narrative (Green et al., 2004).

3.2. SELF-DETERMINATION THEORY

The self-determination theory (SDT) states that motivation can be affected by certain social contexts that satisfy basic needs such as competence, autonomy, and relatedness (Ryan & Deci, 2000b). People tend to be motivated to carry out activities that fulfill these necessities. Research has shown that players' self-determination needs can be satisfied by videogames (Ryan, Rigby, & Przybylski, 2006). Videogames are intrinsically motivating. In SDT, intrinsic motivation is defined as performing an action or behavior because it is inherently enjoyable or interesting (Ryan & Deci, 2000a). Though

individuals may have tendencies for intrinsic motivation, conditions need to maintain its refinement and continuation (Ryan & Deci, 2000a).

3.3. HYPOTHESES GENERATION

This section will draw on the theoretical foundation reviewed earlier to generate hypotheses for this research.

3.3.1. Cooperation and Immersion. Individuals involved in an activity must be highly engaged to experience transportation (Wang & Calder, 2006). Consumption of media content such as playing games generally includes a higher engagement level in the entertainment process and this process is perceived as enjoyable and pleasurable by the game players (Brock & Livingston, 2004). As a result, players are kept in a situation that makes them more likely to be transported into the narrative world. Enabling a player to experience the feeling of "immersion" in the online gaming environment often described as presence is one of the most discussed and valued construct within the gaming industry (Ryan et al., 2006). Video games have the ability to offer a high level of immersive experience, enabling the gamer to perceive a strong sense of presence in the gaming environment where an illusion of nonmediation is created between the gaming context and the player through a sense of immersion. Thus, players get the sense of directly being present in the virtual environment (Lombard & Ditton, 1997).

The degree to which online games satisfy motivational needs is one of the major predictors of presence (Przybylski et al., 2010). Presence is associated with how a game play can satisfy psychological needs (Ryan et al., 2006). A study has shown that video games that have the ability to fulfill the needs for autonomy, competence, and relatedness

can greatly enhance a player's feeling of immersion, both across various game contents (Przybylski, Ryan, & Rigby, 2009) and game types (Ryan et al., 2006). According to self-determination theory, relatedness is one of the basic psychological needs that increases intrinsic motivation. When an individual is connected with others, he or she experiences relatedness (La Guardia, Ryan, Couchman, & Deci, 2000). Players are more embedded in the physical, emotional, and narrative aspects of the game environment if their needs are satisfied within the game (Przybylski et al., 2010). Thus, while cooperating with others in a game, individuals are more connected with others and they experience relatedness which is one of the basic psychological needs that increases the sense of immersion. Hence, we propose that:

H1: Cooperation increases immersion.

3.3.2. Cooperation and Enjoyment. Interpersonal relatedness is one of the basic psychological needs (Deci & Ryan, 1985; Ryan et al., 2006) and it has the capability to enhance an individual's intrinsic motivation (Ryan & Deci, 2000b). Motivation can be enhanced by relatedness (Ryan et al., 2006). Individuals experience relatedness when they perceive they are connected with others (La Guardia et al., 2000; Ryan & Deci, 2001). Hence, SDT suggests that if people work together in teams, their involvement and motivation are enhanced (Ryan et al., 2006).

In addition, transportation theory suggests that enjoyment increases by enabling individuals to connect with others (Green et al., 2004). Individuals who are transported feel as if they are familiar with the characters in media and may think about these characters as if they are real people (Green et al., 2004). Characters that are sympathetic may come to seem like friends (Green & Brock, 2000). As individuals become more

involved in a narrative environment, they may develop a strong sense of familiarity or connection with characters that they come across continually over time (Green et al., 2004). Enjoyment is strengthened by a basic desire of humans — in this case their relatedness need or a need for connectedness (Baumeister & Leary, 1995; Green et al., 2004).

In a cooperative gaming environment, players coordinate with others to achieve their goals and they experience relatedness during cooperative game play. Relatedness has emerged as an important factor in promoting satisfaction which in turn enhances game enjoyment (Ryan et al., 2006). Similarly, another study has demonstrated that individuals working together experienced greater enjoyment than individuals working alone (Walker, 2010). Hence, we propose that:

H2: Cooperation increases enjoyment.

3.3.3. Immersion and Enjoyment. Transportation theory suggests that immersion plays a crucial role in enjoyment and enjoyment can be created or destroyed by the characteristics of a game (Brown & Cairns, 2004).Transportation theory explains that enjoyment can be increased by the sense of immersive experiences in narrative environments (Green et al., 2004). Previous research demonstrated six notions of presence, and immersion is considered as presence where enjoyment is the consequence (Lombard & Ditton, 1997). Enjoyment and presence have been shown to be associated with each other (Weibel et al., 2008). Such immersion can enhance a sense of engagement in the gaming world that leads to enjoyment (Chen, Yen, Hung, & Huang, 2008; Nah et al., 2011) . Thus, we propose that:

H3: Immersion leads to enjoyment.

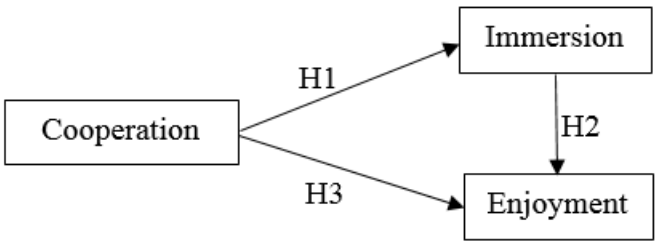

Figure 3.1 Research Model

4. RESEARCH METHODOLOGY

4.1. EXPERIMENTAL DESIGN

For this study, we used a within-subject experimental design. The independent variable, no cooperation vs. cooperation, is a within-subject factor. A within-subject factor is one where the same group of subjects experience all levels of that factor. Since one of the goals of this study is to assess the effect of individual versus cooperative game play, it is more appropriate to operationalize cooperation as a within-subject factor so subjects serve as their own control. However, we counterbalanced the order of these two game play among subjects. In line with the goal of random assignment, we assigned subjects to the individual or cooperation condition (i.e., with and without cooperation) as their first experimental condition by alternating between these two conditions for every subsequent subject in order to control for any potential ordering effects in the study.

After a comprehensive review and thorough search of first person shooter games, we identified Counter-Strike as an appropriate game that fits our research purpose. The reasons for choosing this game are: (1) it has the flexibility to enable us to manipulate individual and cooperative game play, (2) the gaming environment can be controlled, i.e., the researcher has the flexibility to limit the number of players in each team, (3) the ability to view the game as a spectator, and (4) the ability to select or specify the difficulty level.

4.2. RESEARCH PROCEDURES

This research study was conducted in a university computer lab. The research procedures are as follows: The subjects were asked to fill out a pre-study questionnaire to

capture their cooperation orientation scale (see Table 4.1). They were then provided with training on the game, Counter-strike. We provided a cheat sheet that showed the basic commands of the game to the subjects (Appendix A). The subjects were asked to read the instructions (Appendix B) and completed a 10-minute training session to practice playing Counter-strike with the specified console. Next, they read instructions about gaming session 1 (Appendix C), which is the first experimental condition they were assigned to. They then completed gaming session 1 which is followed by a questionnaire. The condition associated with gaming session 1 depends upon the order of participation of the subject. All odd-numbered subjects began with the no cooperation condition whereas all even-numbered subjects began with the cooperation condition. After the subjects completed gaming session 1 and the questionnaire following the session, they were then assigned to gaming session 2, which refers to a different condition from gaming session 1. Similarly, the subjects read instructions prior to gaming session 2 (Appendix D) and a questionnaire was administered after the subjects completed gaming session 2.

In short, some subjects were assigned to play the cooperation game condition followed by individual game condition, whereas other subjects were assigned to individual game condition followed by cooperation game condition. After playing each session, they filled out a questionnaire to assess their sense of immersion and enjoyment.

4.3. MEASUREMENT

We used the pre-study questionnaire to assess the subjects' cooperation orientation, and the post-study questionnaire to assess immersion, enjoyment, cooperation manipulation check, and background and demographic information of the subjects.

4.3.1. Cooperation Orientations Scale. The cooperation orientation scale was captured to understand the general tendency of the subjects to cooperate (see Table 4.1). The measurement scale for cooperation orientation scale was adopted from Chen, Xie, & Chang (2011) for measuring disposition differences among people. They included items such as "It is important to coordinate with others in this game." Subjects answered on a 7-point Likert scale (strongly disagree = 1 to strongly agree = 7).

Table 4.1. Measurement Scale for Cooperation Orientation

	Measurement Items
Cooperation	1. It is a pleasure for me to work with others. 2. Working with others helps me to improve performance. 3. It is essential for me to think from others' perspectives at work. 4. It is important to take both my and others' interest into consideration at work. 5. One must work with others to succeed.

4.3.2. Immersion. The measurement scale for immersion was adopted from (Agarwal & Karahanna, 2000) for measuring the subjective responses of players' experience of immersion (see Table 4.2). They included items such as "I was able to block out other distractions", "I was absorbed in what I was doing" and, "I was immersed in the task and activities I was performing." Subjects answered on a 7-point Likert scale (strongly disagree = 1 to strongly agree = 7).

Table 4.2. Measurement Items for Immersion

	Measurement Items
Immersion	1. While playing this game, I was able to block out other distractions. (IMM1) 2. While playing this game, I was absorbed in what I was doing. (IMM2) 3. While playing this game, I was immersed in the task and activities I was performing. (IMM3)

4.3.3. Enjoyment. The measurement scale for enjoyment was adopted from (Agarwal & Karahanna, 2000) for measuring the subjective responses of players' experience of enjoyment (see Table 4.3). They included items such as "I had fun playing this game", "Playing this game gave me enjoyment." and, "I enjoyed playing this game." Subjects answered on a 7-point Likert scale (strongly disagree = 1 to strongly agree = 7).

4.3.3.1 Cooperation manipulation check. The manipulation check questions for cooperation were developed by the researcher (see Table 4.4). The basic idea to include these questions is to assess whether the experimental manipulations were successful, i.e., effective. They included items such as "I tried to cooperate with someone during the game" and "When I played this game, I tried to outperform others." Subjects rated their responses on a 7-point Likert scale (strongly disagree = 1 to strongly agree = 7).

Table 4.3. Measurement Items for Enjoyment

	Measurement Items
Enjoyment	1. I had fun playing this game. (ENJ1) 2. Playing this game gave me enjoyment. (ENJ2) 3. I enjoyed playing this game. (ENJ3)

Table 4.4. Measurement Scale for Cooperation Manipulation Check

	Measurement Items
Cooperation	1. When I played this game, I was cooperating with someone. 2. When I played this game, someone cooperated with me. 3. I tried to cooperate with someone during the game. 4. When I played this game, I worked with someone to achieve the goal.

4.3.3.2 Subject background questionnaire. The background questionnaire included participant demographics (e.g., gender, age, education), and gaming habits (e.g., how often participants play games and the number of hours per week spent playing games).

4.4. PILOT TESTS

We conducted two pilot studies to test the instruments, the game software, and the experimental procedures. The first pilot study was used to fine-tune and assess the measurement items, where items that were not good were dropped from the study. The second pilot study was used to fine-tune the experimental setup, procedures and gaming software. Based on feedback from the pilot studies, we adjusted and made changes to the measurement items, experimental procedures and the gaming software. For example, we added instructions in Qualtrics for participants to switch to the respective gaming session after completing each set of questionnaire and reduced the time frame of each gaming session from 15 minutes to 10 minutes.

5. DATA ANALYSIS

The sample size for the study is 38. Subjects were both graduate and undergraduate students from Missouri University of Science & Technology and they were recruited based on their prior experience with games. Sample size is calculated using G*Power statistical power analysis (http://www.gpower.hhu.de/). Within the F tests family, we considered our statistical test as ANOVA: Repeated measures, within factors and the type of power analysis used is A priori: Compute required sample size – given alpha, power, and effect size. We considered effect size, f as 0.25, alpha error probability as 0.05, power (1-beta error probability) as 0.80, number of groups as 2, and number of measurements as 2. Thus, our total sample size is calculated as 34. We limited this study to only male subjects in order to control for gender. Participants were recruited through social networks, forums, and email contact.

All 38 participants were male. They averaged 9 hours of weekly game playing and were aged between 18 and 39. Factor analysis and validity checks on the measurement scales were conducted. We used SPSS 11.0 software to analyze the data collected.

5.1. MEASUREMENT VALIDATION

Statistical tests were carried out at a 0.05 significance level. Exploratory factor analysis (EFA) was conducted to evaluate convergent validity for the constructs of the survey instrument. EFA results with varimax rotation and principal component analysis are reported in table 5.1 for no cooperation condition and in table 5.2 for cooperation condition. As per our research model, we identified a two-factor structure with

eigenvalues greater than 1.0. All the measurement items loaded onto their target factors respectively and scored above 0.827 for no cooperation condition and above 0.73 for cooperation condition, which indicates good construct validity (Cook, Campbell, & Day, 1979).

Table 5.1. Results of Factor Analysis for No Cooperation

	Component	
	1	2
No Cooperation_ENJ1	**.975**	.143
No Cooperation_ENJ2	**.928**	.206
No Cooperation_ENJ3	**.937**	.223
No Cooperation_IMM1	.100	**.922**
No Cooperation_IMM2	.128	**.834**
No Cooperation_IMM3	.376	**.827**
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.		

Table 5.2. Results of Factor Analysis for Cooperation

	Component	
	1	2
Cooperation_ENJ1	**.889**	.202
Cooperation_ENJ2	**.927**	.221
Cooperation_ENJ3	**.932**	.194
Cooperation_IMM1	.070	**.895**
Cooperation_IMM2	.484	**.730**
Cooperation_IMM3	.218	**.839**
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.		

The Cronbach's alpha coefficient (Cronbach, 1951) was used to assess the reliability of the measurement. The Cronbach's alpha coefficients for immersion were 0.86 for the no cooperation condition and 0.83 for the cooperation condition. The Cronbach's alpha coefficients for enjoyment were 0.96 in the no cooperation condition and 0.94 for the cooperation condition. A value of at least 0.70 indicates adequate reliability (Nunnally, Bernstein, & Berge, 1967). The Cronbach's alpha coefficients for all constructs were well above 0.7, which indicate that all the measurement items achieved high reliability.

Table 5.3. Paired Samples Tests

	t	**df**	**Sig. (1-tailed)**
No Cooperation_Immersion – Cooperation_Immersion	-2.052	37	0.0235
No Cooperation_Enjoyment – Cooperation_Enjoyment	-1.701	37	0.0485

Table 5.4. Descriptive Statistics

		N	**Mean**	**Std. Deviation**	**Std. Error**
Immersion	No Cooperation	38	5.66	.997	.162
	Cooperation	38	5.82	.778	.126
Enjoyment	No Cooperation	38	5.63	1.292	.210
	Cooperation	38	5.92	1.116	.181

5.2. REPEATED MEASURES (PAIRED T-TEST) ANALYSIS

5.2.1. Immersion. We found a significant effect of cooperation on immersion, i.e., p = 0.0235 (<0.05) (see Table 5.3). Subjects in the cooperation condition (M = 5.82, SD = 0.778) were experiencing greater immersion in the game than subjects in the no cooperation or individual (M = 5.66, SD = 0.997) condition (see Table 5.4).

5.2.2. Enjoyment. We found a significant effect of cooperation on enjoyment of the game, i.e., p = 0.0485 (<0.05) (see Table 5.3). The subjects in the cooperation condition (M = 5.92, SD = 1.116) enjoyed the game more than the subjects in the no cooperation or individual (M = 5.63, SD = 1.292) condition (see Table 5.4).

5.2.3. Immersion on Enjoyment. We found a significant effect of individuals' immersion on enjoyment of the game, i.e., F (1, 36) = 10.505, p=0.005 (<0.05). We also found that dyads or subjects in the cooperation condition experienced greater enjoyment when they were immersed in the game, i.e., F (1, 36) = 11.502, p=0.001 (<0.05). Thus, the results suggest a positive relationship between immersion and enjoyment in both cooperation and no cooperation conditions. Overall, we can infer that irrespective of the context, i.e., in both no cooperation and cooperation contexts, immersion and enjoyment are positively related. Table 5.5 shows the ANOVA results for the relationship between immersion and enjoyment.

Table 5.6 shows the results of hypothesis testing. H1 (Cooperation → Immersion) and H3 (Cooperation → Enjoyment) are supported, suggesting that the cooperative game play leads to higher immersion and enjoyment than the individual game play. H2 (Immersion → Enjoyment) is supported, and suggests that immersion contributes to enjoyment.

Table 5.5. ANOVA Results

		Sum of Squares	df	Mean Square	F	Sig. (p-value, 1-tailed)
No Cooperation_Enjoyment → No Cooperation_Immersion	Regression	10.505	1	10.505	7.383	.005
	Residual	51.226	36	1.423		
	Total	61.731	37			
Cooperation_Enjoyment → Cooperation_Immersion	Regression	11.162	1	11.162	11.502	.001
	Residual	34.935	36	.970		
	Total	46.096	37			

Table 5.6 Results of Hypotheses Testing

Hypotheses	**Supported?**
H1: Cooperation increases immersion	Yes
H2: Immersion increases enjoyment	Yes
H3: Cooperation increases enjoyment	Yes

6. DISCUSSIONS

The findings from our study suggest that cooperative gameplay induces a greater sense of immersion and enjoyment than non-cooperative gameplay.

First, immersion is significantly increased by cooperation. Transportation theory states that transported individuals experience immersion, and self-determination theory explains that players are more embedded in the narrative environment if relatedness is fulfilled (Ryan & Deci, 2001). Thus, our findings in line with both transportation theory and self-determination theory, which posit that, cooperation leads to immersion.

Second, immersion in a game had a significant impact on enjoyment of a game. As per transportation theory, enjoyment experience is increased by immersion and also from its consequences of being immersed in the game (Green et al., 2004). Our finding is consistent with transportation theory, which posits that immersion leads to enjoyment.

Lastly, enjoyment is significantly increased by cooperation. As put forward by self-determination theory, relatedness can induce enjoyment (Przybylski et al., 2010). Our finding is consistent with self-determination theory, which posits that cooperation generates greater feelings of relatedness or connectedness that in turn is associated with enjoyment.

7. LIMITATIONS AND FUTURE RESEARCH

This study has some limitations, which can be resolved by future research. First, we limited this study to only male participants. Our reasoning for doing so was because we used Counter-Strike, which is a first person shooter game. Generally, first-person shooter games are played mostly by males. Hence, we did not risk having the results skewed by an audience group that is largely unfamiliar with the game, i.e., females. Future studies can overcome this limitation by choosing a game that is played by both female and males.

Second, we used a deception technique in order to maximize control of the experiment, i.e., we made participants believe that they were playing with other human players when they actually played with system bot. Future research can consider cooperation with a human versus the system to assess if the results are similar or different.

Third, although social interactions include both cooperation and competition, we limited our study to only comparing cooperation and no cooperation gameplay. Further studies can be extended to study the effect of solo, cooperation, competition and the combination of cooperation and competition on immersion and enjoyment.

8. CONCLUSIONS

In conclusion, this study investigates the role of cooperation on immersion and enjoyment in games. Based on transportation theory and self-determination theory, this study focuses on understanding immersion and enjoyment in the context of cooperation. The findings suggest that cooperation is an important factor that enhances immersion in games and enjoyment of games. In other words, both immersion and enjoyment are comparatively higher in cooperative than in non-cooperative gameplay. In sum, this study offers key insights on one of the social interactions, cooperation, and its effect on players' gaming experiences of immersion and enjoyment.

This research contributes to developing a greater understanding of users' immersion and enjoyment experiences in the cooperative context. The findings can benefit game developers by providing them with a better understanding of how the social context affects players' experience and performance. We also assessed the effects of players' immersion on enjoyment of games and hence, our research offers insights on the impact of the different game play conditions on players' enjoyment of games. This research may also offer insights on the design of successful games as well as game play strategies to increase players' interest toward specific games.

APPENDIX A.
COUNTER-STRIKE GAME COMMANDS

Command	Action
Z+1	Cover me
Z+2	You take the point
Z+3	Hold this Position
Z+4	Regroup Team
Z+5	Follow me
Z+6	Taking Fire, Need Assistance
0	Exit
X+1	Go
X+2	Fall Back
X+3	Stick Together Team
X+4	Get in Position
X+5	Strom the Front
X+6	Report-In
C+1	Affirmative/Roger
C+2	Enemy Spotted
C+3	Need Backup
C+4	Section Clear
C+5	I'm in Position
C+6	Reporting In
C+7	She's gonna Blow
C+8	Negative
C+9	Enemy Down
Basic Controls	Key
To move forward, left, backward, right	W,A,S,D
Defuse Bomb	Hold E
To buy Guns	B
To switch b/w primary and secondary weapons	Q

APPENDIX B.
PRACTICE INSTRUCTIONS

Welcome to this session where you will be playing a computer game, Counter Strike. We thank you and appreciate your participation and attendance. Our interest is to study game-playing behaviors to improve the design of computer games. Hence, you have been invited to play the game that includes two sessions that are preceded by a practice session described below.

The following information pertains to the practice session and instructions on how to play the game. Your performance and the training you receive in the practice session are critical for your successful participation in the experiment. Please read the instructions carefully and make sure you understand them before you start. If you have any questions, ***please raise your hand***.

- You are given 10 minutes to familiarize with the game.
- After 10 minutes, the system will end the practice session automatically.
- In the game, Counter Strike, you will be a member of Counter Terrorist forces. Your objective is to defuse the bomb planted by terrorists in one of the designated spots (A or B) before it explodes. When a bomb explodes, you will lose the game.
- Your goal in the game is to achieve the highest possible performance. The more terrorists you execute, the better your performance.
- Since you may play multiple games in a session, the overall performance will be recorded.

APPENDIX C.
GAMING SESSION 1 INSTRUCTIONS

Now, we will start the formal individual session. Please take this session seriously and follow the instructions carefully as they can have important consequences for our understanding of your game-playing behavior.

OBJECTIVE/GOAL: Your task during this session is to play the game by taking the role of a counter terrorist and achieve your highest possible score.

- As you play the game, you will get feedback on your performance through a scoreboard that displays your score via the surface pro 3 which is placed next to your computer screen.
- Your performance is based on the score you achieve in this session.
- During the entire session, you are not allowed to click on the tab button.

- After 15 minutes, your session will be automatically stopped by the system.
- Fill out the post-study questionnaire in the Qualtrics window based on your experience in this session.

APPENDIX D.
GAMING SESSION 2 INSTRUCTIONS

Now, we will start the formal cooperative session. Please take this session seriously and follow the instructions carefully as they can have important consequences for our understanding of your game-playing behavior.

OBJECTIVE/GOAL: Your task during this session is to play the game by cooperating with a partner we have assigned to you where both of you are taking the role of counter terrorists, and achieve your highest possible team score. The cooperation is between you and your partner (a counter terrorist team member).

- Your partner is another player who is sitting in the other room and playing the same game along with you. Because of privacy considerations, we will not be able to disclose his/her name.
- As you play the game, you will get feedback on your team's performance through a scoreboard that displays your team score via the surface pro 3 which is placed next to your computer screen.
- You must cooperate as much as you can with your team partner.
- Your performance is based on the overall team's performance in this game (i.e., it's a combined score of you and your partner).
- During the entire session, you are not allowed to click on the tab button.
- After 15 minutes, your session will be automatically stopped by the system.
- Fill out the post-study questionnaire in the Qualtrics window based on your experience in this session.

APPENDIX E.

SUMMARY OF LITERATURE REVIEW

Reference/ Authors	Antecedents	Online Experience	Consequences	Research Setting	Research Method
Agarwal and Karahanna (2000)	Temporal, Dissociation, Focused Immersion, Enjoyment, Control, Curiosity, Playfulness, Personal innovativeness	Cognitive Absorption	Behavioral Intention to Use, Perceived Ease of Use Perceived Usefulness	World Wide Web	Survey
Brown and Cairns (2004)	Engagement, Engrossment, Total Immersion	Immersion			Grounded Theory (Semi-Structured interviews)
Bushman and Anderson (2002)	Violent games		Aggressive responses, Aggressive thoughts and ideas, Aggressive behaviors	Violent video game or Nonviolent video game	
Green, Brock, and Kaufman (2004)	Gaining Benefits, Escaping the Self, Transformation, Connection with Characters, and Interactivity	Transportation	Enjoyment		Conceptual
Grüsser, Thalemann, and Griffiths (2007)	Excessive Gaming	Addiction	Aggression		Survey
Jennett, Cairns, Dhoparee, Epps, Tijs, and Walton (2008)	Game vs Control activity	Immersion	Level of immersion		Experiment
Lombard and Ditton (1997)	Media Form (Vividness or Sensory Richness), Media Content (e.g., Task or Activity), Media User Variables	Presence	Arousal, Enjoyment, Involvement, Task Performance, Skills Training, Desensitization, Persuasion, Memory, Social Judgment, Parasocial Interaction/ Relationships	Virtual Environment	Conceptual

Nah, Eschenbrenner, and DeWester (2011)	2D/3D Virtual World	Player Experience	Telepresence, Enjoyment, Behavioral Intention, Brand Equity	Second Life	Experiment
Peng and Hsieh (2012)	Goal structure (competition vs. collaboration), Goal commitment		Motivation, Relationship type		Experiment
Przybylski, Rigby and Ryan (2010)	Competence Need, Autonomy Need, Relatedness Need	Psychological Need Satisfaction in Video Gaming Contexts	Motivation	Video games	Conceptual
Przybylski, Ryan and Rigby (2009)	Competence, Autonomy	psychological need satisfaction	Enjoyment, Immersion and Motivation	Virtual Worlds	Survey and Experiment
Reinecke, Tamborini, Grizzard, Lewis, Eden, and, Bowman (2012)	Competence Need Satisfaction, Autonomy Need Satisfaction	Mood Management as Need Satisfaction	Affect Level of User Demand Selected, User Demand Experienced During Play, and Enjoyment	Lock-On: Modern Air Combat	Experiment
Ryan and Deci (2000)	Competence, Autonomy, and Relatedness	Intrinsic and Extrinsic Motivations	Self-determined Behavior		Conceptual
Ryan and Deci (2000)	Social conditions, Autonomy, Competence, and Relatedness	Intrinsic motivation	Internalization and Integration		Conceptual
Ryan, Rigby, and Przybylski, (2006)	Autonomy, Competence, and Relatedness	Psychological need satisfactions	Game enjoyment and preference for future play	Computer games	Survey and Experiment
Schmierbach, Xu, Oeldorf-Hirsch, & Dardis (2012)	Competition, and Cooperation		Enjoyment, Partner liking	Madden ’08	Experiment
Slater, Usoh, & Steed (1994)	Visual, Auditory, Kinesthetic, and Stacking depth	Presence	Level of presence	Navigated Virtual environment through Head Mounted Display	Experiment
Takatalo, Häkkinen, Lehtonen,	Gaming situation	Sense of presence,	Level of arousal and attention	FPS Halo	Experiment

Komulainen, Kaistinen, & Nyman (2008)		Involvement and flow			
Waddell, & Peng (2014)	Game goal structure (Competition or Cooperation), relationships between players		Aggression, cooperative behaviors	Gears of War 2	Experiment
Wang and Calder (2006)	Involvement	Transportation	Product attitude, Perceived intrusiveness	Ads	Experiment
Weibel and Wissmath (2011)	Immersive tendency, Motivation	Presence, Flow	Enjoyment, and Performance	Neverwinter Nights	Experiment
Weibel, Wissmath, Habegger, Steiner and Groner (2008)	Human-controlled opponent vs Computer-controlled opponent	Presence, Flow, and Enjoyment		Neverwinter Nights	Experiment
Witmer and Singer (1998)	Control Factors, Sensory Factors, Distraction Factors, and Realism Factors	Presence		Virtual Environment	Survey
Wood, Griffiths, Chappell, and Davies (2004)	Sound, Graphics, Background and setting, Duration of game, Rate of play, Advancement rate, Use of humor, Control options, Game dynamics, Winning and losing features, Character development, Brand assurance, and Multi-player features	Psychological and Social phenomenon		Video Games	Survey
Yee (2006a)	Achievement, Relationship, Immersion, Escapism, and Manipulation	User's motivations and derived experiences		Massively-Multiplayer Online Role-Playing Games (MMORPGs)	Survey
Yee (2006b)	Achievement, Social, and Immersion	Motivations of play		MMORPGs	Survey

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