The Relationship between Player Involvement and Immersion: an Experimental Investigation

Laura Herrewijn
University of Antwerp
Sint Jacobstraat 2
2000 Antwerp, Belgium
+323 265 56 74
laura.herrewijn@ua.ac.be

Karolien Poels
University of Antwerp
Sint Jacobstraat 2
2000 Antwerp, Belgium
+323 265 55 87
karolien.poels@ua.ac.be

Gordon Calleja
University of Malta
Msida MSD 2080
Malta
+356 2340 2418
gordon.calleja@um.edu.mt

ABSTRACT

This paper investigates the player experience of immersion and its relationship with player involvement in an experimental setting. The paper follows Calleja's [3] premise that *immersion*, defined as "the player's sensation of inhabiting the virtual environment represented onscreen", is not a stand-alone experience but the result from a blending of a variety of experiential phenomena afforded by involving gameplay. These experiential phenomena are described in Calleja's [3] *player involvement model*, developed through qualitative research and identifying six dimensions of involvement in digital games. The aim of our study was to test this player involvement model and its possible conclusion in immersion in a quantitative context. The paper describes the execution of an experimental study in which we manipulated one dimension of player involvement (i.e. narrative involvement), and analyzed how this affects the other dimensions of player involvement on the one hand, and immersion on the other. Our results provide initial support for Calleja's [3] model, showing that the dimensions of player involvement are interrelated, and have a significant and positive effect on a player's sense of immersion.

Categories and Subject Descriptors

J.4 [**SOCIAL AND BEHAVIORAL SCIENCES**]

General Terms

Design, Experimentation, Human Factors, Theory

Keywords

Player Involvement, Immersion, Experimental Research

1. INTRODUCTION

Playing digital games has the potential to evoke a wide variety of engaging experiences, ranging from the exploration of wondrous new game areas to the participation in an intriguing narrative and the making of collaborative battle strategies when playing together with friends. One of the experiences that is responsible for this uniquely involving character of digital games is "the player's sensation of inhabiting the virtual environment represented onscreen", a phenomenon that is most-commonly known as *immersion* in popular and academic discussions of game involvement [3].

This experience of immersion is also one of the main motivations for people to play games altogether: people enjoy "escaping reality" by being immersed into an epic tale, exploring a virtual world and role-playing their alter-egos in a fantasy environment [13; 15].

Although the importance of immersion to the player experience is without discussion, the definitions of this phenomenon are often complicated by terminological confusion and vagueness [3]. In his recent book "In-Game: From Immersion to Incorporation", Calleja [3] identifies four major conceptual challenges that lie at the heart of the difficulties these definitions face, while offering a new, more precise conceptualization of immersion.

First of all, Calleja [3] states that there is a lack of consensus in current game research on the use of immersion to refer to either absorption (i.e. one's general involvement in the game) [6; 9] or transportation (i.e. the sense of being transported to another reality) [4; 11]. It gets even more problematic when game researchers do not clarify which one of these definitions they are using or when they use the term immersion to interchangeably mean absorption and transportation [1; 2]. The second problem concerns the specifics of the medium in which immersion is experienced. Media such as literature and film evoke experiences that are qualitatively very different from those evoked by games, and Calleja [3] argues that the qualities and affordances of each specific medium need to be taken into consideration when thinking about immersion. A third difficulty related to the conceptualization of immersion is concerned with the fact that, while the specifics of the medium are indeed important, immersion is not determined solely by the qualities of the technology (e.g. a bigger screen, better sound) [3]. Finally, Calleja [3] suggests that, instead of one single experience that can be measured, immersion is a multidimensional concept, and that the different experiential phenomena that make up immersion need to be considered as located on a continuum of attentional intensity.

As an answer to these challenges, Calleja [3] proposes a new conceptualization of immersion in digital games. He defines immersion as "the sensation of being in the game" (i.e. transportation) and states that it is a result of a blending of a variety of experiential phenomena afforded by involving gameplay (i.e. absorption). He posits that involvement is a prerequisite to the experience of higher-order cognitive processes such as immersion in much the same way that attention is a prerequisite of involvement [3].

Subsequently, Calleja [3] introduces his *player involvement model*, developed through qualitative research. This player involvement model identifies six dimensions of involvement in digital games, each considered relative to two temporal phases: the macro-involvement phase and the micro-involvement phase. The macro phase of involvement concerns the off-line, long-term involvement of the player with the game, while the micro phase describes the moment-to-moment (and thus immediate) engagement of players' gameplay [3]. These six dimensions concern involvement related to: (1) control and movement in the game environment (*kinesthetic involvement*); (2) the exploration, navigation and learning of the game's spatial domain (*spatial involvement*); (3) players' awareness of and interaction with other agents or players in the game environment (*shared involvement*); (4) story elements that have been written into a game or that emerge from the player's interaction with the game (*narrative involvement*); (5) the emotions generated during gameplay (*affective involvement*); and (6) the pursuit of goals and the making of choices in a game (*ludic involvement*).

According to Calleja [3], these dimensions of player involvement, in their more intensified and internalized blends have the potential to culminate in a person's sense of "being in the game", or *immersion.* As such, Calleja's model of player involvement and its extension to the concept of immersion address all of the conceptual challenges formulated above. The model makes a distinction between the sense of immersion as absorption versus transportation; the conceptualization is specific to digital game environments; it avoids technological determinism; and it addresses the multidimensional nature of the experience.

Building on this theoretical framework, a necessary subsequent step that we aim to tackle is to test the player involvement model and concept of immersion in an *experimental context*, in order to validate, disprove or complement the model in a quantitative setup. This will provide a comprehensive new foundation for future research studying the sensation of inhabiting a digital game environment to be built upon. Therefore, the aim of our current research was to test the micro phase of Calleja's [3] player involvement model and its relationship with immersion in several experimental studies, with each experiment manipulating one specific dimension of player involvement.

So far, we have conducted one study, focusing on *narrative involvement*. Our goal was to study how the manipulation of this one dimension affects the other dimensions of player involvement on the one hand, and immersion on the other. According to Calleja [3], the different dimensions of involvement do not operate in a vacuum; they are all interrelated. A captivating game story, for example, will not only influence a person's sense of narrative involvement, it will also affect him emotionally (i.e. affective involvement), it will have an impact on the quests and goals the game presents to the player (i.e. ludic involvement), etcetera. Moreover, Calleja [3] sees player involvement as a prerequisite of immersion, with higher levels of player involvement resulting in a greater sense of "being there".

2. METHOD

2.1 Experimental design

The goal of our first experimental study was to look at the impact of one specific dimension of player involvement, namely *narrative involvement*. Narrative involvement refers to engagement with story elements that have been written into a game, and those that emerge from players' interaction with the game [3]. An interesting narrative can attract players to a game and keep them coming back. If the narrative of the game is able to captivate players, they will tend to care enough about the game world and its characters to want to return to it in order to find out more about them [3]. The story of a game is therefore an essential part of the player's game experience. Prior research studying narrative involvement in an experimental gaming context showed that the exposure to a pre-game story positively and significantly influenced players' feelings of immersion and their evaluation of the game [12].

Therefore, our goal was to manipulate narrative involvement in our experiment by varying the story of the game between two experimental conditions: one group played a game level that had an elaborate, structured narrative, while the other group played a level that had a minimal story and in which the player only had to perform a simple, mechanical task. Apart from this manipulation of the narrative aspect of the game, the two experimental game levels looked identical and were played in the same way: there were no changes in the modes of control and movement that were possible in the game, the spatial lay-out of the game environment, and the nature and difficulty of the encountered enemies.

2.2 Participants

62 people (57 male, 5 female), 18 to 37 years of age (M = 22.3, SD = 3.2) and of Belgian nationality participated in the experiment. Respondents were required to play games on a regular basis, and be familiar with (the basic controls of) shooter and role-playing games in order to be able to participate.

2.3 Materials and Procedure

We made use of the PC version of the game *Fallout: New Vegas* [7]. Fallout: New Vegas [7] is a single-player action role-playing game that is set in post-apocalyptic Las Vegas, following a nuclear war that caused immense damage and destruction. Using the official game editor of the game, we created one tutorial level and two experimental game levels (one game level for each condition) for use in the experiment. As already mentioned, the two experimental game levels looked exactly the same, except for the manipulation of the game story.

During the experiment, participants first read the story and objectives of the game. In the "elaborate story condition", participants read a 1000 word story explaining the situation and context of the player character, and which mission he or she had in great detail. In the "minimal story condition", participants just read five sentences, describing the player character's objective. They then played a tutorial level that explained the basics of the game (i.e. controls, interface) to them. When participants thought that they were familiar enough with the game, they could start the actual experimental level. This level took approximately fifteen minutes to complete.

2.4 Measures

After playing the experimental level, participants were asked to fill out a questionnaire asking them how immersed and involved they felt during game play. These experiences were measured by combining several validated scales such as Witmer and Singer's [14] Presence Questionnaire, Jennett et al.'s [9] Immersion Scale,

de Graaf et al.'s [5] Narrative Engagement Scale, Lang's [10] Self-Assessment Manikin, and IJsselsteijn, de Kort and Poels' [8] Game Experience Questionnaire. We also formulated new items to measure players' involvement, based on the definitions of the concepts given by Calleja [3]. Shared involvement was not measured because participants played the game in a single player setting. Consequently, there were no social factors that could influence players' levels of involvement.

The questionnaire eventually consisted of a list of statements concerning player involvement and immersion to which agreement was measured on a five-point intensity scale ranging from "not at all" (0) to "extremely" (4). The narrative involvement scale, for instance, included statements such as "I was interested in the game's story" and "My attention was fully captured by the story" (Cronbach's α = .849). Most scales proved to be reliable (Cronbach's α = .65 to .87). Only the scale used to measure spatial involvement was not reliable enough (Cronbach's α = .31), so we were not able to take along this dimension in our analyses.

Finally, participants were asked about their socio-demographic (e.g. gender, age) and gaming characteristics (e.g. game expertise and frequency).

3. RESULTS

The results of our study show that manipulating the narrative of the game led to significant variations between conditions concerning narrative involvement: one-way ANOVAs demonstrate that players' interest in and attention paid to the story is significantly higher in the condition with the elaborate and structured narrative (M = 2.120, SD = .974) compared to the condition that featured only a minimal story (M = 1.628, SD = .707) ($F(1, 60)$ = 5.125, p = .027). However, against expectations, this manipulation did not lead to significant differences between conditions in the other dimensions of player involvement (*kinesthetic involvement* ($F(1, 60)$ = .1.796, *NS*), *ludic involvement* ($F(1, 60)$ = .144, *NS*), *affective involvement* (*competence* ($F(1, 60)$ = .117, *NS*), *negative affect* ($F(1, 60)$ = .007, *NS*), *positive affect* ($F(1, 60)$ = 2.095, *NS*), *challenge* ($F(1, 60)$ = .043, *NS*), *tension* ($F(1, 60)$ = .142, *NS*), *pleasure* ($F(1, 60)$ = 2.588, *NS*), *arousal* ($F(1, 60)$ = .023, *NS*), *dominance* ($F(1, 60)$ = .120, *NS*)) or *immersion* ($F(1, 60)$ = .458, *NS*).

In our next step, we therefore conducted correlation analyses to look at the strength and direction of the relationships between the dimensions of player involvement and immersion *across conditions*. The results of these correlation analyses demonstrate that the measured dimensions of player involvement are indeed significantly and positively interrelated and thus do not operate independently from each other. Narrative involvement, for instance, has a weak to strong[1] positive relationship with kinesthetic involvement (Pearson's r = .465, p < .001), ludic involvement (Pearson's r = .618, p < .001) and most of the emotional experiences making up affective involvement (e.g. positive affect or enjoyment (Pearson's r = .452, p < .001),

---

[1] *Strength and significance of correlations:*
Very weak to negligible correlation: Pearson's r = .0 to .2
Weak correlation: Pearson's r = .2 to .4
Moderate correlation: Pearson's r = .4 to .7
Strong correlation: Pearson's r = .7 to .9
Very strong correlation: Pearson's r = .9 to 1.0

challenge (Pearson's r = .469, p < .001), arousal (Pearson's r = .306, p = .016)).

Furthermore, the analyses show that immersion has a moderate to strong positive relationship with the measured dimensions of player involvement (e.g. correlation of immersion with narrative involvement: Pearson's r = .623, p < .001).

To further examine this relationship between player involvement and immersion, we performed a multiple regression analysis of the relevant dimensions of player involvement on immersion. Results show that: 1) taken together, the dimensions of player involvement explained a significant proportion of variance in immersion scores (R^2 = .689, $F(7, 54)$ = 12.771, p < .001), and 2) there are no signs of multicollinearity between the dimensions player involvement (the tolerance values of the player involvement dimensions varied from .34 to .73 (> .1) and the variance inflation factor values varied from 1.36 to 2.92 (< 10)).

However, not all of the dimensions proved to be significant predictors of immersion (see *Table 1*). When looking at all dimensions simultaneously, only narrative involvement and affective involvement were able to significantly predict immersion.

Table 1. Multiple regression analysis of player involvement on immersion

	B	*SE*	*Beta*	*t*
Narrative Inv.	.239	.102	.260	2.351*
Kinesthetic Inv.	.143	.141	.107	1.015
Ludic Inv.	-.195	.123	-.172	-1.589
Affective Inv.: *Competence*	.265	.113	.279	2.345*
Affective Inv.: *Positive Affect*	.164	.156	.139	1.052
Affective Inv.: *Negative Affect*	-.087	.138	-.059	-.633
Affective Inv.: *Challenge*	.378	.124	.301	3.039**
Affective Inv.: *Pleasure*	.016	.071	.024	.227
Affective Inv.: *Arousal*	.087	.036	.219	2.425*

*Note. * p < .05, ** p < .01, *** p < .001*

4. DISCUSSION

When people play digital games, they are often immersed into the virtual environment represented on their screens, giving the game their full attention while being dissociated from their physical surroundings [3; 11]. This experience of immersion is essential in a digital game experience and motivations context, but the concept is still surrounded by terminological difficulties and vagueness. The goal of our paper was to test Calleja's [3] premise that immersion, defined as "being in the game", is a result of the blending of several dimensions of player involvement.

In order to be able to study this hypothesized relationship between immersion and player involvement, we carried out an experimental study. This experiment aimed to manipulate one specific dimension of player involvement (i.e. narrative involvement) and look at how this manipulation affects the other dimensions of player involvement on the one hand, and immersion on the other. Specifically, we manipulated narrative

involvement by varying the narrative of a game level set in the digital game *Fallout: New Vegas* [7] between two conditions.

Our results show that the manipulation of game story led to the intended significant variations between conditions concerning narrative involvement. The manipulation, however, did not lead to significant differences between conditions in the other dimensions of player involvement or immersion. This may have been due to the relatively short play time of the game in the experiment and the fact that the involvement that one feels towards a certain story is a very subjective matter: the most captivating and gripping story for one person can leave another person flat, and vice versa. An alternative explanation might be that our manipulation of game narrative was simply not fundamental enough to lead to significant changes in player involvement.

Subsequently, we conducted correlation and regression analyses to be able to look at the strength and direction of the relationships between the dimensions of player involvement and immersion across experimental conditions. The results of these correlation analyses demonstrate that the dimensions of player involvement are indeed significantly and positively interrelated and thus do not operate independently from each other. These findings favor Calleja's [3] statement that the dimensions of player involvement do not operate in a vacuum: changes in one dimension will inevitably reflect on the other dimensions as well. Furthermore, the results show that player involvement has a significant and positive relationship with a person's sense of immersion. The findings of the multiple regression analyses, however, are more complicated. Results show that, when all relevant dimensions of player involvement are put in the equation, they explain a significant 69 percent of the variance in immersion. However, only narrative involvement and affective involvement prove to be significant predictors in the current study.

Based on these findings, we can therefore provide initial support for Calleja's [3] model that states that immersion or the player's sensation of inhabiting the virtual environment represented onscreen, is a result of a blending of a variety of experiential phenomena afforded by involving gameplay. As such, our study has taken the necessary first step to test Calleja's [3] player involvement model and its culmination in immersion in an experimental setting. Nevertheless, further research is essential in order to come to a better understanding of the sense of "being in the game" that is crucial for both the motivational and experiential aspect of digital games. Our study has examined gamers' involvement and immersion in the game *Fallout: New Vegas*, a single player action role-playing game. However, it is of great importance to study these experiences in other game genres, game settings and with other audiences (e.g. non-gamers) as well. A person's game experience is a very subjective matter and different types of games might emphasize different aspects of a person's gameplay, potentially resulting in other dimensions of player involvement being put in the forefront.

Finally, players' levels of involvement and immersion were measured retrospectively and subjectively by using self-report questionnaires. This way we were not able to objectively assess the players' involvement and immersion while they were actually playing the game. These limitations need to be tackled in future research (e.g. by combining self-report measures with psychophysiological and attentional measures) in order to get a more detailed picture of higher-order cognitive processes such as immersion and the experiences that underlie them.

5. REFERENCES

[1] Brown, E., and Cairns, P. 2004. A Grounded Investigation of Game Immersion. *ACM CHI 2004*. ACM Press, 1297-1300.

[2] Cairns, P., Cox, A., Berthouze, N., Dhoparee, S., and Jennett, C. 2006. Quantifying the experience of immersion in games. *Cognitive Science of Games and Gameplay workshop at Cognitive Science 2006* (Vancouver, Canada, July 26-29).

[3] Calleja, G. 2011. *In-Game: From Immersion to Incorporation*. Cambridge, MA; London: MIT Press.

[4] Carr, D. 2006. Play and Pleasure. In D. Carr, D. Buckingham, A. Burn, and G. Schott (Eds.) *Computer Games: Text, Narrative and Play* (pp. 45-58). Cambridge: Polity.

[5] De Graaf, A., Hoeken, H., Sanders, J., and Beentjes, H. 2009. The role of dimensions of narrative engagement in narrative persuasion. *Communications,* 34(2009), 385-405.

[6] Ermi, L., and Mäyrä, F. 2005. Fundamental components of the gameplay experience: Analysing immersion. In S. de Castell, and J. Jenson (Eds.) *Changing Views: Worlds in Play* (pp. 15-27). Selected papers of the 2005 Digital Games Research Association's Second International Conference.

[7] Fallout: New Vegas. 2010. Bethesda Softworks.

[8] IJsselsteijn, W.A., de Kort, Y.A.W., and Poels, K. 2008. *The Game Experience Questionnaire: development of a self-report measure to assess player experiences of digital games.* FUGA Deliverable D3.3. Eindhoven University of Technology.

[9] Jennett, C., Cox, A. L., Cairns, P., Dhoparee, S., Epps, A., Tijs, T., and Walton, A. 2008. Measuring and defining the experience of immersion in games. *International Journal of Human Computer Studies*, 66 (9), 641-661.

[10] Lang, P. J. 1980. Behavioral Treatment and Bio-Behavioral Assessment: Computer Applications. In J. Sidowski, J. Johnson, and T. Williams (Eds.), *Technology in mental health care delivery systems* (pp. 119-137). New Jersey: Ablex Publishing.

[11] Murray, H. J. 1998. Immersion. In H. J. Murray (Ed.) *Hamlet on the Holodeck* (pp. 97-125). Cambridge, Mass: MIT Press.

[12] Park, N., Lee, K. M., Jin, S. A., and Kang, S. 2010. Effects of pre-game stories on feelings of presence and evaluation of computer games. *Human-Computer Studies*, 68(2010), 822-833.

[13] Williams, D., Yee, N., and Caplan, S. E. 2008. Who plays, how much, and why? Debunking the stereotypical gamer profile. *Journal of Computer-Mediated Communication*, 13(2008), 993-1018.

[14] Witmer, B. G., and Singer, M. J. 1998. Measuring Presence in Virtual Environments: A Presence Questionnaire. *Presence,* 7(3), 225-240.

[15] Yee, N. 2006. Motivation for Play in Online Games. *CyberPsychology & Behavior*, 9(6), 772-775.