



Who but not where: The effect of social play on immersion in digital games



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ABSTRACT

The majority of digital games available today offer a variety of multi-player settings including co-located and mediated play between opponents. Immersion, the sense of being “in the game,” is one of the key components of the gaming experience but existing literature suggests that social play provides more fun but less immersion. There is however little empirical support for this. This paper therefore addresses the question: how does playing digital games in a social situation alter the sense of immersion felt by the individuals playing? This paper presents three experiments that test the relationship between social setting and immersion. The three experiments aim to manipulate the social setting in which players play, be it against a computer, against a person online or against a co-located person. Overall the three experiments show that players are more immersed when playing against another person rather than playing against a computer but there is no significant difference in immersion whether the other person is online or in the same room. This refutes previous claims about social play reducing immersion and indeed that social play enhances the sense of being in the game where interaction is through the game.

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1. Social digital gaming

Digital gaming is becoming increasingly present in modern life. It is constantly evolving, with modern developers looking at ways to increase the audience of those playing their games. A relatively recent development has been the introduction of online games and online gaming communities which allow gamers to play against, or in collaboration with, other gamers over the Internet. The flagships of these online games are the Massively Multiplayer Online Role-Playing Games, such as *World of Warcraft*, which have proven to have quite complex social dynamics (Duchenaud et al., 2006; Chen and Duh, 2007). But these are by no means the exclusive, or even dominant, form of online games. Standard consoles such as Microsoft Xbox and Sony Playstation consoles are networked allowing multiplayer gaming. A good example of the success of such social games is a recent title in a successful series, *Call of Duty: Black Ops*. The game has passed the \$1 billion (£647 million) sales barrier (Whitworth, 2010). The single player part of the game is not particularly highly rated by reviewers (such as gamespot.com) but rather it is in the multiplayer mode that it excels. The game's online multiplayer version was played for more

than 600 million hours within the first 2 months after release (Whitworth, 2010).

Clearly, playing socially is a prevalent and important aspect of digital gaming. Gajadhar et al. (2008a) looked at how social presence, the awareness of being socially connected to others, related to the enjoyment of playing. It was found that high social presence led to a more enjoyable experience. Enjoyment or fun is the obvious experience that should come from playing games, that is, enjoyment is an experiential outcome. Additionally though, there is considerable research interest in the experience players have whilst playing as this can often include frustration and confusion (McGonigal, 2011) yet still lead to a good overall experience. One aspect of experience that is commonly referred to as significant when playing is that of immersion (Brown and Cairns, 2004). Immersion is the experience of being “in the game”, that is, being heavily emotionally and cognitively invested in the activity of playing. There have been several approaches to studying the immersive experience had by gamers (Brockmyer et al., 2009; Qin et al., 2009; Jennett et al., 2008; Ijsselsteijn et al., 2007). The social influence on these experiences has mostly been assigned a marginal role, for example in Ermi and Mäyrä (2005), and indeed has even been considered detrimental to the immersive experience (Sweetser and Wyeth, 2005) as discussed in deKort and Ijsselsteijn (2008).

The immediate argument for the tension between social playing and immersion is straightforward. If immersion is about being in the game, playing socially is a way of making you aware of those

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around you or, if online, those not intrinsically in and of the game. Thus, the presence of real others in a game can be seen as something of a distraction or interruption to an individual's immersive experience. This argument presupposes that any interaction with another person is extrinsic to the game. But it is simple to see, for instance, in a game of (real world) tennis, without the interaction of one player with another player, there would not be much gaming experience at all. Similarly, with digital games, when playing with or against other players, some interactions may be intrinsic to the game and therefore be crucial to the experience of the game. Of course, it may be that interactions increase enjoyment of the game but decrease immersion. Or it may also be that the other players in some sense become part of the game and interaction with them increases the immersion in the game.

This paper therefore addresses the question of how social play influences the immersive experience of playing digital games. We describe three studies to investigate the relationship between social play and immersion. The starting point is: does social play positively or negatively influence the immersive experience? The first study, building on a study in [Gajadhar et al. \(2008b\)](#), used a variant of the game *Pong* and looked at immersion across three conditions when people think they are playing against a computer opponent (but who was actually a person), against a human opponent online or against a human opponent in the same room. Contrary to the previously reported views in the literature, it seems immersion does increase when players play other people but, in this case, where players are located does not have any further effect on immersion. However, the game used in this study was a relatively old-fashioned game and moreover the participants were deceived about the nature of the online opponents. The second study therefore manipulated only the computer vs online human aspect of the game for a commercial game, *Midtown Madness 2* and maintained the social context of the players. Again it was found that playing against people is more immersive than playing computers.

It is somewhat surprising that despite the substantial change in social presence between the three conditions of the first experiment, there was only a slight change in immersion in the move from online to co-located play. The third experiment therefore examines this further with a larger sample and another modern game, *Wii MarioKart*. Again, it was found that there is no meaningful difference in immersion between online and co-located play. This is even the case when taking into account whether playing partners were friends or strangers.

Despite the different games with different types of social play, a consistent picture emerges with immersion increasing from individual play to playing against another person but no significant difference between whether the other person was online or co-located. This contradicts the argument made by others against social play reducing immersion ([Ermi and Mäyrä, 2005](#); [Sweetser and Wyeth, 2005](#)) and suggests that, in all social contexts, immersion is an important aspect of the gaming experience.

2. Immersion and presence in digital games

There are undoubtedly many aspects to the experience that players can have when playing digital games. Whilst the primary experience that is sought is clearly fun or enjoyment, there can be many other experiences had along the way including excitement, surprises, frustration, anticipation and winning. One experience though is consistently reported by gamers and reviewers of games, that of immersion ([Brown and Cairns, 2004](#)). This is the sense of being “in the game” by which is meant being wholly involved or absorbed in the activity of playing to the neglect of the real world around the player.

At first glance, immersion might easily be confused with the sense of presence ([Lombard and Ditton, 1997](#)). Presence is a complex term that is intended to address the feeling that people have when interacting with media, particularly virtual environments, that in some sense they are (present) in the medium. This is sometimes described as the illusion of non-mediation, that is, people are experiencing interactions mediated via a digital medium as if they were not mediated. However, there is substantial debate around this because it then begs the question of what it is like to experience things unmediated. [Floridi \(2005\)](#) suggests that it is better to think of presence not as a failure to perceive mediation but as the ability to have an observable effect on the mediated environment. This then makes it clear that there can be different types of presence depending on the effects that a person is able to have.

This was already noted by [Lombard and Ditton \(1997\)](#) who made a major division of the types of presence into spatial and social presence. Spatial presence ([Wirth et al., 2007](#)) is essentially the sense of being physically located within a virtual environment. Many games, such as first person shooters, allow players to feel physically located within the game world because the game gives them ability to navigate through the game world and for them to have an effect on the game world (or their tools, for example, guns) in the way that real objects would interact. Social presence, by contrast, is when there are actions that have social meaning such as being able to talk to other players or the game simulating social actors who can affect your mood and your actions as a response to the social situation. That is, social presence is the sense of being and interacting with others.

Though it may make sense to say of both types of presence that a player is “in the game”, this is not the sense intended for immersion. Immersion is a cognitive experience wherein the thoughts of the player are wholly absorbed in the action within the game. Thus, immersion is typically characterised as involving a loss of awareness of the player's surroundings, a loss of a sense of time, total involvement in the game and a strong sense of control and challenge within the game ([Jennett et al., 2008](#)). However, there are other aspects of immersion that may be included as important for immersion but there is less consensus about these. [Ermi and Mäyrä \(2005\)](#) break immersion down into three types, sensory, challenge and imaginative immersion (SCI). Sensory immersion has much in keeping with spatial presence whereas the other two correspond more to the cognitive and emotional sense of immersion. [Qin et al. \(2009\)](#) also add to immersion the importance of the narrative of a computer game for immersion. Whilst some games can be said to have strong story, for instance *Legend of Zelda: Spirit Tracks*, the relationship of the player to the narrative can be quite complex ([Ryan, 2001](#)) and it is arguable whether even games with a clear back story can be said to have a good narrative. [Qin et al. \(2009\)](#) further claim that any game can be said to have a narrative and it is this which causes immersion. However, this seems to be stretching the notion too far: what exactly is the narrative behind Tetris?

[Brockmyer et al. \(2009\)](#) looked specifically at players' engagement particularly with violent games. There, engagement was broken down into immersion, presence, absorption and flow but their interpretations of these terms differ from other literature in this area. Nonetheless, there is a substantial conceptual overlap with the other formulations of immersion.

Immersion has also been considered within the wider context of the general gaming experience. Most notably, the EU funded FUGA project developed the Game Experience Questionnaire (GEQ) which covered a range of elements of the gaming experience including: the three SCI aspects of immersion; tension; emotional outcome and competence whilst playing; and also the experiential outcomes of playing taking into account the effect of

social presence. Unfortunately, the GEQ and its validation has not been published in its entirety except for overview articles, e.g. IJsselsteijn et al. (2007), and an article describing the social presence module of the GEQ (deKort et al., 2007b).

It should also be noted that several approaches to studying the gaming experience consider flow to be an important part of the experience (Chen, 2007). Flow is considered to be an optimal psychological experience where a person is wholly absorbed in the activity that they are doing (Csikszentmihalyi, 1990). A typical example might be an athlete who is “in the zone.” However the use of flow in games seems to come from a rather superficial interpretation of flow swapping it for the “all or nothing,” exhilarating experience for something that can be partially experienced and placed on a Likert scale so that people can be “a bit in flow.” This makes little sense with the traditional understanding of flow: how would an athlete be considered to be “a bit in the zone”? In our understanding of immersion, flow corresponds to the extreme end of immersion where a person is so immersed in the game that they enter a flow state. This is supported by players’ reports of their experiences and it should be noted that players also reported that this total immersion was fleeting and definitely not the most consistent experience of playing (Brown and Cairns, 2004). It should also be noted that the concept of GameFlow appears to talk about flow experiences of gamers (Sweetser and Wyeth, 2005) but it is in fact a framework for analysing games and says nothing of the actual experiences had by gamers.

When it comes to studying the gaming experiences, it is possible to take a holistic view on the experience as it is with all experiences around technology (McCarthy and Wright, 2007). However, whilst this may address the individual experiences gamers have whilst playing, it makes it hard to compare experiences and make causal associations between elements of the game and the experiences had by players. The approaches to immersion therefore, on the whole, operationalise the analytical understanding of immersion in the form of questionnaires that can be administered after or during the gaming session under a study. Unfortunately, the SCI questionnaire (Ermi and Mäyrä, 2005) has never been published and the GEQ has not been fully published. In the studies reported here, we have therefore used the Immersive Experience Questionnaire (IEQ) of Jennett et al. (2008).

In brief, the IEQ consists of 31 questions score on a five point Likert scale. The immersion score is based on summing the answers to each item (having reverse-scored 6 of the items). Thus IEQ immersion scores range from 31 to 155 and can be understood as a unidimensional scale. The items range over a variety of aspects that could be said to constitute an immersive experience and so factor into five components: cognitive involvement (9 items) which is the experience of focusing on the game; emotional involvement (6 items) which is the strength of feelings experienced whilst playing; real world dissociation (7 items) which is the sense of losing awareness of the world around you and increased awareness of the game; challenge (4 items) which is the experience of being challenged by the game; control (5 items) which is the extent to which the player felt in control whilst playing. Though these can be considered separately, they do correlate and are better understood as a means to analyse which components of immersion are important in a particular experience. As well as being founded on qualitative studies of gaming experience (Brown and Cairns, 2004), the IEQ has subsequently had good empirical validation in studies relating immersion to attention (Jennett et al., 2009), addiction (Seah and Cairns, 2008), time perception (Sanders and Cairns, 2010) and eye-movements (Cox et al., 2006). The questionnaires of Qin et al. (2009) and Brockmyer et al. (2009), being relatively newer, have not had the time to build up this level of extensive use which would contribute to both the understanding of immersion but also to the validation of the questionnaires.

3. The role of social play in games

In stark contrast to early portrayals which often depicted gamers as socially isolated individuals with a lack of social skills (Bryce and Rutter, 2003), it is now argued that playing computer games is much more of a social activity than originally perceived (deKort et al., 2007b). It has been argued that gaming provides social opportunities similar to those offered by other leisure activities (Bryce and Rutter, 2003) and that co-located play is a pastime which promotes and provides the opportunity for social interaction between family and friends much like traditional board games (Durkin and Barber, 2002). Observations of gamers in their homes have shown that co-operative play and social interaction occur even in games which are designed only for single players. This illustrates that people not only enjoy playing games with others but also enjoy the conversational aspect and the presence of a crowd (deKort and IJsselsteijn, 2008).

In addition to the home environment, early research showed that arcade gaming was an important pastime for young people and a place where friendships formed and developed (Selnow, 1984). More recent research into the impact which gaming has on the social lives of children has shown that those who frequently play digital games have more social contact compared with non-gamers (Bonnafont, 1992) and socialise more with friends outside of school hours (Colwell et al., 1995).

The most conspicuous form of social gaming is the massively multiplayer online games (MMOGs) where social play is not merely an option but an essential component of the game. Bryce and Rutter (2003) argue that such mediated gaming has led to the development of new relationships between strangers and a new type of online friendship. Online gaming communities offered by MMOGs have promoted the development of such friendships. Indeed Griffiths et al. (2004) found that the most popular feature of MMOGs among adults and adolescents was the social aspect of play. And from the game designers’ perspective, the social aspect of the game leads to players feeling obliged from social pressure to play the game more often (Duchonaut et al., 2006).

Many other games also offer social play as an important selling point of the game for example the *Call of Duty* games, *Little Big Planet*, *Need for Speed* series and so on. de Kort et al. (2007a) argue that digital gaming provides a setting for interaction with others in both co-located and distant (online) settings and should therefore be regarded as a social presence technology. That is, digital gaming is a technology that allows people to feel as if they are in better social connection with each other. They believe that the experience of digital gaming is shaped just as much by the social setting in which it takes place as it is by the game itself, and that current models and theories should be adapted to ensure that the social aspects of gaming are accurately represented and recognised as having more than just a marginal role in shaping the gaming experience.

Building on this, the same team developed the Social Presence in Gaming Questionnaire (SPGQ) (deKort et al., 2007b). This can be considered as a module of the GEQ, fitting with the conception of social aspects as another constituent part of the gaming experience. However, it also functions as a stand-alone questionnaire by which to understand players’ social experiences. Social presence within the SPGQ consists of 17 items scored on a Likert scale from 0 to 4. The items are divided into three distinct but weakly correlated components: Psychological Involvement – Empathy (PI-E), 6 items, the sense of feeling to be in the same enjoyable situation as the other players; Psychological Involvement – Negative Feelings (PI-NF), 5 items, which is basically the extent to which players were competitive and aggressive to other players; and Behavioural Engagement (BE), 6 items, being the degree of feeling that the other players were influencing the game. Because

of the different numbers of items in the scale, the score on each scale is given as the mean score on the items of the scale so that each scale ranges from 0 to 4.

Gajadhar et al. (2008b) looked at the effect of social presence on aspects of the gaming experience. The game played was *WoodPong*, a more modern variant of the classic *Pong* tennis game. Players played against each other in pairs and the manipulation was whether players thought they were playing against an AI opponent, an online opponent or a co-located player. (In all three cases they were in fact playing the other person.) This had a clear effect on social presence as measured by the SPGQ and on the enjoyment components of the GEQ, namely Positive Attitude, Competence and Challenge. There was no effect of differences in social presence on Frustration. Other components of the GEQ related to immersion were not considered and so this leaves it open as to how social play might affect the immersive experience.

In a further study, Gajadhar et al. (2010) repeated the same experimental scenario with an older sample of players aged between 61 and 78. This time immersion and flow aspects of the GEQ were included. There was a small variation between the three conditions: immersion was higher in the co-located condition over the other two but flow was higher in the mediated condition. However, in both cases, the effect was small and it was also notable that the overall ratings of flow and immersion in the game were very low. Thus, it seems that the game was not offering a good immersive experience to the senior players and so it is hard to know how, in general, immersion is influenced by social play amongst a broader population and there is an opportunity for a good immersive experience.

In contrast to the two previous studies, Weibel et al. (2009) explicitly manipulated the opponent to be either a computer opponent or a real person to see the effect of spatial presence, flow and enjoyment whilst playing *Neverwinter Nights*, a fantasy role-playing game. It was found that playing against a person led to a greater sense of spatial presence, flow and enjoyment. Similarly, using physiological measures, Mandryk et al. (2006) found that playing a co-located friend was more fun than playing a computer. In both cases though, the increased enjoyment may have been due to the difference in gameplay between the person and computer opponent rather than due to the difference in social experience.

In all the work considered so far, the nature of the social connection between the players was not addressed. Ravaja et al. (2006) considered the difference in experiential outcomes due to playing against a computer, a friend or a stranger (human opponents were co-located). Spatial presence and engagement was in fact highest when playing against a friend but so too was challenge. Thus, it may be that the stronger social link with a friend improved the spatial presence and engagement experience or it may be that the game was taken more seriously when playing a friend and hence leading to the improved experiential outcomes.

Overall then, there is good indication that altering the social environment of playing digital games does substantially alter the gaming experience. However, when it comes specifically to the immersive experience of the game, there is only a slight indication from the study with senior players that increased social presence increased immersion. This is far from conclusive though because of the issues of representativeness of the sample and the generally low levels of immersion. In other situations, there is increased engagement when playing a computer rather than a person but this could be attributed to differences in the gameplay. Thus, the aim of this paper is to provide a clear indication of whether the social context of playing digital games works to influence immersion either positively or negatively. To do this, it is clearly important to consider both online and co-located conditions and possibly to address whether playing partners are friends or strangers.

4. Experiment 1: Social presence and immersion

Social play and immersion are both widely acknowledged by gamers as important for good gaming experiences. However because socially connecting with others means thinking about something other than the game, this has been posited to lead to a reduction in immersion as discussed earlier. The aim of this study is therefore to explicitly investigate the change in immersion experienced by players as a consequence of different social contexts of play. The experimental setup replicates that of Gajadhar et al. (2008b). That is, to see that the social contexts really are different, social presence was used to indicate the degree to which players felt their opponents were socially present to them. Also, social contexts were manipulated by players being alone and being told they are playing a computer or another person or by two players being co-located in the same room. Unlike Gajadhar et al. (2008b)'s study, the GEQ is not used to measure all aspects of the gaming experience but instead the IEQ (Jennett et al., 2008) is used to focus specifically on immersion. The hypotheses are as follows:

1. Social presence will be more when the player plays a person than when they play a computer and more still when they co-player is co-located in the same room.
2. Immersion will be affected by the level of social presence.

4.1. Participants

A total of twenty-four participants (12 pairs) 14 males and 10 females were recruited in an opportunity sample. All participants were post-graduate students at University College London aged between 21 and 32. Participants were recruited in friendship pairs (regardless of sex of the pairs) and were required to have played computer games against each other at least once in the past. During recruitment it was requested that participants within pairs should have a similar level of gaming expertise, this was an attempt to avoid the confounding variable of continual winning or losing and was judged by the participants themselves. All participants had experience with playing digital games, however the extent of participants gaming experience and expertise was not controlled.

4.2. Design

The study was a within participant design. The independent variable was the manipulation of social presence with three levels:

1. Computer: playing against the computer
2. Online: playing against a human mediated by the internet but not in the same room
3. Co-located: playing against a human in the same room

To control for the differences in playing abilities or styles when playing a computer as opposed to playing a human, in the first condition, players in fact played other people.

The primary dependent variable is immersion as measured by the IEQ. Social presence was also measured using the SPGQ to ensure that the experimental manipulation did in fact alter the social context as intended. This in turn is broken down into its three constituent factors: Psychological Involvement – Empathy (PI-E), Psychological Involvement – Negative Feelings (PI-NF), Behavioural Engagement (BE).

4.3. Materials

The game *WoodPong* was used as the digital game in this study¹ and was played on a standard 17" computer monitor with a standard QWERTY keyboard. *WoodPong* was released in 2005 and is an updated version of the game *Pong*. It is a simple game which simulates the sports game tennis. The aim, as in tennis, is for opposing players to return the ball and prevent it from bouncing out of play. The game was chosen in part as it was used in [Gajadhar et al. \(2008b\)](#). Also it was chosen because its simplicity would aid in focusing the outcome of the experiment on the social context of the gaming situation rather than on the graphics of the game, the individual preferences for the game or the controls of the game.

The IEQ and SPGQ were administered in paper form after completion of the game. All participants completed a post-study interview to record their demographic information and to collect information regarding their experience during the study. In addition, this interview allowed for the identification of individual differences between participants which may be relevant to the outcomes of the study.

4.4. Procedure

Pairs of participants were brought into the lab together and upon arrival were briefed on the procedure of the study but were informed that the study aimed to evaluate latency during periods of online gaming. It was decided that participants should be misled about the real aims of the experiment to avoid them responding to the demand characteristics of the experiment and producing what they anticipate is the correct answers to the questionnaires used in the study ([Field and Hole, 2003](#)).

In the online and computer conditions, the two participants were in separate laboratory cubicles and so unable to hear or communicate with each other. Obviously, in the co-located condition, both participants were in the same cubicle. The ordering of the conditions was randomised and counterbalanced across the participants. In the co-located condition, participants played against each other on the same computer using two separate keyboards.

Participants played the game *WoodPong* under their first allocated play condition until one participant in the pair won 3 sets, after this the game was ended automatically and a winner declared. After the first condition was completed the participants were asked individually to move to different computer cubicles to fill out the IEQ and the SPGQ and were told that during this time their experimental cubicles would be set up ready for the next play condition. There were no opportunities for the participants to interact in the break so that all of the social interaction could only take place while they were playing. Once the cubicles were adequately set up and participants had completed their questionnaires, they were collected and moved back into their respective experimental cubicles to complete the next play condition. This process was repeated until each pair had experienced all three conditions.

After the IEQ and SPGQ had been completed for the final play condition, a short interview was carried out with each of the pairs individually. Participants were then fully debriefed about the true aims of the experiment.

4.5. Results

To confirm that the experimental manipulation had the desired effect, the three SPGQ components were compared. Under the three conditions, the means (and sd) are reported in [Table 1](#).

Table 1

Means and (sd) for the three measures of social presence in the SPGQ which range from 0 to 4.

SPGQ	Computer	Online	Co-located
Psych. Involvement – Empathy	0.57 (0.35)	1.90 (0.66)	2.96 (0.52)
Psych. Involvement – Negative Feelings	0.72 (0.42)	1.73 (0.79)	2.47 (0.68)
Behavioural Engagement	1.60 (1.03)	2.45 (0.79)	3.00 (0.48)

As can be seen, the trend is as expected with measures of social presence increasing from computer to online to co-located. These changes are all significant: Psychological Involvement – Empathy (PI-E), $F(2, 46) = 194.5$, $p < 0.001$; Psychological Involvement – Negative Feelings (PI-NF), $F(2, 46) = 54.0$, $p < 0.001$; Behavioural Engagement (BE), $F(2, 46) = 31.7$, $p < 0.001$. Pair-wise t -tests were conducted on each scale separately to look at the differences between the computer and online conditions and the online and co-located conditions. They were all significant even after a Bonferroni correction for the 6 tests that were done: PI-E, computer vs online, $t(23) = -11.0$, $p < 0.001$, online vs co-located, $t(23) = -7.62$, $p < 0.001$; PI-NF, computer vs online, $t(23) = -6.48$, $p < 0.001$, online vs co-located, $t(23) = -4.27$, $p < 0.001$; and BE, computer vs online, $t(23) = -4.10$, $p < 0.001$, online vs co-located, $t(23) = -3.86$, $p < 0.001$.

The overall IEQ scores between the three conditions had means (sd): computer 86.5 (10.88), online 108.8 (11.80), co-located 113.2 (6.52). These differences are significantly different, $F(2, 46) = 52.04$, $p < 0.001$. A paired samples t -test with Bonferroni correction showed that there was a statistically significant increase in IEQ score between the computer and the mediated human opponent conditions ($t(23) = -7.616$, $p < 0.001$, Cohen's $d = 1.55$), however no significant difference was found between the mediated human condition and the co-located human condition ($t(23) = -1.622$, $p > 0.1$, Cohen's $d = 0.28$). Effect sizes have also been included for these pairwise comparisons in order to facilitate interpretation of the results across the three experiments.

4.6. Discussion

The results obtained support the predicted hypothesis that playing socially results in higher levels of immersion. First, participants showed progressive increases in levels of social presence through the 3 systematic variations of co-player type and location. This shows that the experimental manipulations were adequate enough to produce different perceptions of the social context for each condition. It is also interesting to note that it was enough that people believed they were playing against a computer for it to reduce their sense of social presence. Clearly there is no actual difference between the computer and online conditions in this study in terms of gameplay. Thus, the sense of social presence is an expectation in the player and not perceived in some way through how the game is played.

Secondly, immersion differed between the computer and online conditions and though there is a small effect on immersion between online and co-located conditions, this was not significant. Thus, the sense of social play was important for increasing immersion but the increase in social presence due to where the other player was located did not translate into a discernible increase in immersion. Again, it supports the importance of the expectation of the player but this time for the immersive experience because there was no actual difference between the online and computer conditions but immersion was different between those conditions. This emphasises the importance of the belief that a player has of playing against a human rather than a computer, but is also suggestive that the location of the human

¹ games.brothersoft.com/woodpong.html.

opponent is not as important for facilitating immersion. This therefore begins to question the idea that face to face contact between players is as important as originally perceived (Jansz and Martens, 2005) and shows that, in some contexts at least, mediated play can in fact facilitate immersion through social contact to a similar extent as that of co-located play.

A major limitation of this study was the choice of game which, though updated for a modern PC, was still very much an old-fashioned game with very simple gameplay. This was picked up by the participants where 10 of the 24 commented in the post-test interview that 'the graphics are terrible' 'this is not the sort of game I enjoy playing.' However, comments such as 'it was fun for what it was' and 'I enjoyed the competitive aspect' also came from participants who reported having not enjoyed playing the game. Despite the experimental advantages of using WoodPong, it is reasonable to say that it is no longer an accurate representation of the type of realism offered by the graphics of modern day PC or console games.

To ensure that the experimental manipulation was valid, during the post-test interviews carried out with all participants, the question was posed: Did you believe you were playing against the computer during one of the conditions you experienced? Most participants responded as anticipated and did not realise that during the computer opponent condition they were, in fact, playing against their partner. However two out of the twenty four participants said they had suspected that they were playing against their partner and not the computer. The results of these participants were not excluded from the analysis as when viewed individually there was no indication that their scores were outlying in any way on either the social presence (SPGQ) or immersion scales (IEQ). This, although useful for the overall aims of the experiment, raises the issue of demand characteristics as a confounding variable in this study whereby participants may have figured out the aims of the experiment and acted in a way which they deemed to be favoured by the experimenter (Field and Hole, 2003).

5. Experiment 2: human and computer opponents

The previous study gave a clear result that who (or what) people think they are playing against was very important for the sense of immersion. However, as this may have been due to the demand characteristics of the experiment where people give socially desirable responses having worked out the purpose of the experiment, the second experiment is designed to contrast playing against people with playing against computers where it is clear what the set up is. Thus, players play both each other and computer opponents and in the same physical set up. To reduce the social interaction outside of the game though, players are sat far apart. Thus what is being manipulated is simply who (or what) the opponent is. Social presence was not considered as it is clear that the only manipulation of the social context is through the game and so any change in manipulation can be directly attributed to that.

In addition, the experiment also looks to use a more modern game. WoodPong, whilst providing a simple game to learn, may not offer a strongly immersive experience so that any attempt to improve the game, such as having a human opponent, may increase the opportunity for immersion. However, the risk is that more modern games require substantially more knowledge to be able to control the game properly. We have therefore opted to use a driving game which has a strong element of competition but relatively simple controls: turn, speed up and slow down. This is compared with, say, a first person shooter where typically there are avatar directional controls, camera directional controls and controls for selecting and firing weapons.

The experimental hypothesis is as follows:

- Players will be more immersed when playing against humans than against the computer

Personality was also measured to see if it was relevant to the immersive experience in social gameplay but the results are not reported here.

5.1. Participants

Twelve participants took part in this study. They were all male undergraduates in the Department of Computer Science at the University of York. The participants were divided into four groups of three participants. They were also paid £5 for taking part in the experiment.

5.2. Design

The study was a within participants design where each group played online and against the computer with the ordering counter-balanced. In the online condition, players raced against each other on a particular track selected from the standard MM2 tracks. In the computer condition, players played against the AI of MM2 though concurrently with each other. Players were located in the corners of a teaching laboratory and also faced the same direction. Thus, whilst able to see each other, they were not able to easily directly talk or communicate to each other otherwise. This manipulation means that all differences in social context of playing are mediated by the game.

Immersion was measured using the IEQ. Personality was also measured using the Eysenck personality questionnaire revised (EPQ-R) but its analysis is not reported here.

5.3. Materials

The game used was Microsoft Midtown Madness 2 (MM2), an arcade-style car racing game. Whilst this is an old game, released in 2000 (Wikipedia, accessed July 2012), it is still popular, as people are still playing this online (www.voobly.com). It features both offline modes against artificial intelligence (AI) opponents, and similar racing modes but against real opponents. Players were told to race on one of the two pre-selected circuits.

The experiment took place in a large teaching laboratory where all screens face one direction. The three members of each group were seated in the corners of the lab. Three identical laboratory computers were used for this experiment. The specifications are Intel Core 2 Duo E6600 @ 2.4 GHz, 4gb RAM (3.5gb available due to 32-bit OS), Intel G965 integrated graphics, 160gb Seagate Barracuda 7200 rpm SATA hdd, Microsoft Windows XP Professional.

5.4. Procedure

Participants took part in groups of three. On arrival, they were directed to the three corners of the teaching laboratory where the game was set up. They were briefly introduced to purposes of the game and asked to sign the informed consent form. They were then introduced to the controls of the game and asked to play in either the online against each other or the computer. After 6 min, they were stopped even if they were in the middle of playing and asked to complete the IEQ. There was no opportunity for the participants to interact between the two conditions. After the questionnaires were completed, the participants were then set to playing again in the other condition and the process repeated. Finally the participants were debriefed about the aims of the experiment.

5.5. Results

The means (sd) of the immersion scores from the IEQ in the two conditions are computer 99.8 (15.7) and online 115.4 (15.6). Thus there is a clear difference in the level of immersion experienced by the players. A paired samples *t*-test confirms this with $t(11) = 2.44$, $p = 0.023$, Cohen's $d = 1.41$.

5.6. Discussion

The results confirm the findings of the previous experiment and that the effect size is similar in both studies. Moreover, it is clear that what is being manipulated is not the physical social situation which was identical in both conditions. Instead, it is who is being played that is important. When players are playing each other, the sense of immersion increases. The choice of game also showed that, as hoped, this game was more immersive as the IEQ scores were higher in both conditions compared to the equivalent conditions in the previous game. This was what was intended for this game but also in contrast to [Gajadhar et al. \(2010\)](#), there was a sufficient level of immersion generally for it to be clear how the change in social situation might influence it. This helps to make it clear that it is playing against people that is increasing the sense of immersion not just limitations in the richness of the gameplay.

6. Experiment 3: online and co-located playing

The first two experiments make it clear that a change in the social context affects the level of immersion experienced by players. However, it is therefore surprising that in the first experiment, there was a clear difference in the social context between online and co-located players but that this had a small non-significant effect on the level of immersion experienced. This third experiment aims to investigate more closely the relationship between immersion in online and co-located play. It improves upon experiment 1 in three ways. Firstly, as in Experiment 2, a more modern game was used, in this case *Wii MarioKart*. Secondly, Experiment 1 showed a small change in immersion in the direction expected so this experiment uses a larger sample of participants in the hope to perhaps better resolve any differences in immersion between these two conditions. Finally, because co-location involves putting players in reasonably close proximity, it is possible that whether players are friends or strangers may influence the playing experience ([Ravaja et al., 2006](#)). Whilst this was quite difficult to control due to constraints in the setting up of the experiment, we have nonetheless at least identified this as a possible variable when analysing the results.

The hypotheses are therefore:

- Players are more immersed when playing co-located than when simply playing online.
- Friends are more immersed than strangers when playing co-located.

6.1. Participants

Overall, 39 participants used for this study and they took part in the experiment in groups of two (one participant played twice because of the failure of a participant to turn up, but only the data for this participant's first play was used). The participants were 32 men and 7 women whose age range was 18–25, of which the mean (sd) was 20.4 (1.56). All participants were an opportunity sample of students at the University of York.

The demographics of the participants showed that all participants had played digital games before, with 35 participants having already played on the Wii before. 12 of the participants used or own a Wii and 36 participants had played the game we used for the experiment before.

While the gathering of participants was going on, those who offered to take part were asked if they had a friend they wished to bring to play with. This enabled us to test 30 participants as friends and 9 as strangers.

The participants were given a £10 Amazon voucher for taking part in the experiment.

6.2. Design

The experiment was a within participant design with the independent variable of this experiment being the settings of the participants. The two conditions were online and co-located as in the first experiment. It was also ensured that the participants could not see each other's screen whilst co-located so as not to give an added advantage in the game over the online condition.

The dependent variable was immersion as measured by the IEQ. Whether participant pairs were friends or strangers was noted as a pseudo-independent variable.

6.3. Materials

MarioKart Wii was used as the game in this study being a very popular game (over 31 million copies have been sold [Nintendo, 2012](#)). Two identical Wii consoles were used and networked through the built-in online racing function of the game. The controller was the Wii controller with the nunchuk joystick for steering. Each participant was given a sheet of paper which had a list of the controls for the game. The IEQ was administered on paper along with a demographic questionnaire looking at previous digital gaming experience.

6.4. Procedure

Before the experiment the participants were briefed on what the experiment entailed. In their pairs, the participants were given instructions of the controls of the game and the demographics questionnaire to complete. At this point any questions the participants had were answered.

They were then asked to race each other three times on three different tracks in one condition and then repeat the three races in the other condition. The ordering of online vs co-located setting was counterbalanced across the pairs. The participants were also given a 10 min break between each setting, which was also required to rearrange the experimental apparatus (move the Wii's to separate rooms or into the same room). During this time, players were kept apart so that their social interaction outside of the game would not influence the second condition. It was ensured that once play had commenced the participants were not disturbed until the game had completed.

After playing in each condition setting was immediately followed by the completion of the IEQ. Once both settings had been completed, the participants were debriefed.

6.5. Results

The scores from the IEQ also broken down by friends and strangers are summarised in [Table 2](#).

There is no significant difference in the overall immersion between the two conditions ($t(38) = -0.50$, $p = 0.62$, Cohen's $d = 0.08$). Even when taking into account the differences between friends and strangers, a mixed measures ANOVA gives neither

Table 2

The means (sd) of the IEQ scores (range 31–155) for each condition and also broken down by friends and strangers.

Condition	Friends ($n = 30$)	Strangers ($n = 9$)	Overall ($n = 39$)
Online	110.7 (15.5)	115.3 (16.6)	111.8 (15.7)
Co-located	113.6 (14.2)	111.3 (10.9)	113.1 (13.4)

main effect for online or co-located conditions ($F(1, 37) = 0.25$, $p = 0.62$) nor for whether players were friends or strangers ($F(1, 37) = 0.065$, $p = 0.80$) nor was there an interaction effect ($F(1, 37) = 1.24$, $p = 0.27$).

6.6. Discussion

Despite the larger sample size, the use of a modern game and the consideration of differences between playing against friends or strangers, there was no significant difference in immersion whether people played online or co-located. Indeed there was only a very small effect of the social manipulation on immersion. This supports the findings of Experiment 1 where there was also no significant difference in immersion between the online and co-located conditions.

The immersion scores were generally high and comparable to the immersion scores of the online condition of the previous experiment. This suggests that *Wii Mario Kart* was offering the opportunity for good immersive experiences like *Midtown Madness*.

It is of course clear that the proportion of friends is higher than the proportion of strangers and so that aspect of the analysis is not well represented in this study. Nonetheless, it does strongly support experiment 1's findings that, when players are friends, co-location does not necessarily improve the immersiveness of playing. Furthermore, contrary to the literature, it does not necessarily impair immersion either. It would be informative to make a larger sample of players who are strangers to each other to see if the small reduction in immersion when playing co-located is anything more than the chance variation it seems to be.

Overall then, these results offer a clear picture that there is no strong effect on immersion of whether players are merely online or are co-located when they play together.

7. Discussion and further work

These studies set out to examine whether playing socially affects the immersive experience had by players of digital games. Previous work had suggested that the presence of others, even mediated via online play, would require players to think about the other players and so draw their attention away from the thinking about the game. This would therefore reduce the level of immersion. The studies here suggest that this is not the case at all.

From both experiments 1 and 2, it is clear that people are more immersed when they are playing against another person than when (they think) they are playing against a computer. It is tempting to attribute the difference in immersion due to increased social presence. Experiment 1 confirms the intuition that there is an increase in social presence from playing alone to playing online and from playing online to playing co-located in the same room. However, there is no corresponding increase in immersion moving from online to co-located play in either experiment 1 or experiment 3. Thus, social presence alone cannot account for the pattern of differences in immersion seen across the conditions.

Given the argument that the presence of others would reduce immersion, it could have been the case that immersion would in fact reduce from the online to co-located conditions. In some

sense, an online player is simply an aspect of the game but a player in the same room is another person. These studies failed to produce such a reduction. From experiments 1 and 3, whether co-players were co-located or online had at best a small effect on immersion and not one that was significant either in terms of increased or reduced immersion. This suggests that whatever interaction was taking place between players was taking place through the game. Thus, where the other player is physically located is not a major influence on immersion. What is important is that the other player was part of the game world to become immersed in. There is perhaps an interesting future approach to take in which players are asked whether they think the other player is immersed or even present in the game.

From these studies, immersion in digital games does seem to be able to move beyond the individual and become a shared experience with other players. However, these studies have looked at only a limited set of games, namely arcade style and racing games, which were all competitive. In some sense, an opponent is an opponent only by virtue of being in the game and that the opponent is a person adds to the value of the outcome of the game (Juul, 2005): playing is nice but knowing that you are playing against another person and moreover that they know that too is nicer. So in competitive games, it is not too surprising that immersion increases with other human players.

These results though are currently far from being able to inform game design. Any particular feature of a game could lead to a greater emphasis on the game and hence work to reduce social presence but simultaneously promote immersion or may encourage social interactions unrelated to the gameplay itself and so reduce immersion in the game. These experiments are but a first step towards providing a sound empirical basis for one particular aspect of gaming experience, immersion, and how it relates to the richer, wider ecology of gaming playing activities.

To see this, consider the range of social interactions already seen in many games, for example, large teams working to a joint end in certain parts or styles of MMORPG games like *World of Warcraft* or team vs team games in first person shooters like the *Call of Duty* series. Moreover, these same games can be played as individuals without any previous social connection, in a social group online and in a co-located social group in LAN parties. Though it is supposed that the experience of immersion is the same in all of these games and contexts, how the immersion arises may be strongly influenced by the social context of the game and the activities within the game which players have to engage in. The team vs team play presents particular challenges: players are socially present with other members of their team and also members of the opposing team but surely in quite different ways and with conflicting social goals. This may move players out from the game world to explicit management of the social situation. An important avenue for research is therefore to consider immersion in games where players enter into complex, heterogeneous and contrasting social relationships. This matches the perception of game designers that players are a formal element in the game with complex relationships within and to the game (Fullerton, 2008) but it is not made clear in such formalisations how players' intrinsic role in the game interacts with other players in forming specific experiences. For some games, the social aspect may be far more important than in the games we have looked at and it is in these contexts that immersion could be reduced in the game as discussed in the previous literature. This effect, though, may be ameliorated by the players choosing to engage with each other in a game consistent way, for example, in a role-playing game only using language appropriate to the characters they are playing.

Playing games, and playing games socially, is an important part of the human experience. It seems though that when we play digital games socially we are not only able to immerse ourselves in the world but we are also able to do so in the company of others.

References

- Bonnafont, E., 1992. Video games and the child. in: Seminar on Myths and Realities of Play. London, England.
- Brockmyer, J.H., Fox, C.M., Curtiss, K.A., McBroom, E., Burkhart, K.M., Pidruzny, J.N., 2009. The development of the game engagement questionnaire: a measure of engagement in video game-playing. *Journal of Experimental Social Psychology* 45 (4), 624–634.
- Brown, E., Cairns, P., 2004. A grounded investigation of immersion in games. in: ACM CHI 2004, pp. 1297–1300.
- Bryce, J., Rutter, J., 2003. The gendering of computer gaming: experience and space. In: Fleming, S., Jones, I. (Eds.), *Leisure Cultures: Investigations in Sport, Media and Technology*. Leisure Studies Association, pp. 3–22.
- Chen, J., 2007. Flow in games (and everything else). *Communications of the ACM* 50 (April), 31–34.
- Chen, V.H.-H., Duh, H.B.-L., 2007. Understanding social interaction in world of warcraft. in: ACE 2007. ACM Press, New York, pp. 21–24.
- Colwell, J., Grady, C., Rhaiti, S., 1995. Computer games, self esteem and gratification of needs in adolescents. *Journal of Community and Applied Social Psychology* 5, 195–206.
- Cox, A., Cairns, P., Berthouze, N., Jennett, C., 2006. The use of eyetracking for measuring immersion. in: *What Have Eye Movements Told us So Far? Cognitive Science 2006*. Vancouver.
- Csikszentmihalyi, M., 1990. *Flow: The Psychology of Optimal Experience*. Harper and Row, New York.
- de Kort, Y., IJsselstein, W., Gajadhar, B., 2007. People, places and play: A research framework for digital game experience in a socio-spatial context. in: *DiGRA 2007*, Tokyo, Japan, pp. 24–28.
- deKort, Y.A.W., IJsselstein, W., Poels, K., 2007. Digital games as social presence technology: Development of the social presence in gaming questionnaire (SPGQ). in: *Presence 2007*, Barcelona, Spain, pp. 25–27.
- deKort, Y.A.W., IJsselstein, W.A., 2008. People, places and play: player experience in a socio-spatial context. *ACM Computers in Entertainment* 6 (2) 18:1–18:11.
- Ducheneaut, N., Yee, N., Nickell, E., Moore, R.J., 2006. “alone together?”: exploring the social dynamics of massively multiplayer online games. in: *ACM CHI 2006*. ACM Press, New York, pp. 407–416.
- Durkin, K., Barber, B., 2002. Not so doomed: computer game play and positive adolescent development. *Journal of Applied Developmental Psychology* 23 (4), 373–392.
- Ermi, L., Mäyrä, F., 2005. Fundamental components of the gameplay experience. In: Castell, J., Jenson, J. (Eds.), *Changing Views: Worlds in Play*. Vancouver, Canada, pp. 15–27.
- Field, A., Hole, G., 2003. *How to Design and Report Experiments*. Sage Publications, London.
- Floridi, L., 2005. The philosophy of presence: from epistemic failure to successful observability. *Presence: Teleoperators and Virtual Environments* 14 (6), 656–667.
- Fullerton, T., 2008. *Game Design Workshop*. CRC Press, Boca Raton, FL.
- Gajadhar, B., de Kort, Y., IJsselstein, W., 2008. Influence of social setting on player experience of digital games. in: *CHI '08 Extended Abstracts on Human Factors in Computing Systems (CHI EA '08)*. ACM Press, New York, pp. 3099–3104.
- Gajadhar, B., de Kort, Y., IJsselstein, W., 2008b. Shared fun is doubled fun: player enjoyment as a function of social setting. In: Markopoulos, P., IJsselstein, W., Rowland, D. (Eds.), *Fun and Games, 2008*. LNCS, vol. 5294. Springer-Verlag, pp. 106–117.
- Gajadhar, B., Nap, H., de Kort, Y., IJsselstein, W., 2010. Out of sight, out of mind: co-player effects on seniors' player experience. in: *Fun and Games 2010*. ACM, New York, pp. 74–83.
- Griffiths, M., Davies, M., Chappell, M., 2004. Online computer gaming: a comparison of adolescent and adult gamers. *Journal of Adolescence* 27, 87–96.
- IJsselstein, W., de Kort, Y., Poels, K., Jurgelionis, A., Bellotti, F., 2007. Characterising and measuring user experiences in digital games. in: *Advances in Computer Entertainment Technology, ACE 2007. Workshop 'Methods for evaluating games'*.
- Jansz, J., Martens, L., 2005. Gaming at a LAN event: the social context of playing video games. *New Media & Society* 7 (3), 333–355.
- Jennett, C., Cox, A., Cairns, P., 2009. Investigating computer game immersion and the component real world dissociation. in: *ACM CHI 2009*. ACM Press, New York, pp. 3407–3412.
- Jennett, C., Cox, A., Cairns, P., Dhoparee, S., Epps, A., Tijs, T., 2008. Measuring and defining the experience of immersion in games. *International Journal of Human-Computer Studies* 66 (9), 641–666.
- Juul, J., 2005. *Half-Real*. MIT Press, Cambridge, MA.
- Lombard, M., Ditton, T., 1997. At the heart of it all: the concept of presence. *Journal of Computer-Mediated Communication* 3, <http://dx.doi.org/10.1111/j.1083-6101.1997.tb00072.x>.
- Mandryk, R.L., Inkpen, K.M., Calvert, T.W., 2006. Using psychophysiological techniques to measure user experience with entertainment technologies. *Behaviour and Information Technology* 25 (2), 141–158.
- McCarthy, J., Wright, P., 2007. *Technology as Experience*. MIT Press, Boston, MA.
- McGonigal, J., 2011. *Technology is Broken*. The Penguin Press, New York.
- Nintendo, 2012. *Financial Results Briefing for Nine-Month Period Ended December 2011*. Technical Report, Nintendo Co. Ltd., Available at (www.nintendo.co.jp/ir/pdf/2012/120127e.pdf).
- Qin, H., Rau, P.-L.P., Salvendy, G., 2009. Measuring player immersion in the computer game narrative. *International Journal of Human-Computer Interaction* 25 (2), 107–133.
- Ravaja, N., Saari, T., Turpeinen, M., Laarni, J., Salminen, M., Kivikangas, M., 2006. Spatial presence and emotions during video game playing: does it matter with whom you play? *Presence* 15 (4), 381–392.
- Ryan, M.-L., 2001. *Narrative as Virtual Reality*. The John Hopkins University Press, Baltimore, MD.
- Sanders, T., Cairns, P., 2010. Time perception, music and immersion in games. in: *BCS HCI 2010*. BCS, London, pp. 160–167.
- Seah, M.-L., Cairns, P., 2008. From immersion to addiction in videogames. in: *Proceedings of BCS HCI 2008*, pp. 55–63.
- Selnow, G., 1984. Playing video games: the electronic friend. *Journal of Communication Research* 17 (1), 103–107.
- Sweetser, P., Wyeth, P., 2005. Gameflow: a model for evaluating player enjoyment in games. *ACM Computers in Entertainment* 3 (3).
- Weibel, D., Wissmath, B., Habegger, S., Steiner, Y., Groner, R., 2009. Playing online games against computer- vs. human-controlled opponents: effects on presence, flow, and enjoyment. *Computers in Human Behavior* 24 (5), 2274–2291.
- Whitworth, D., 2010. Call of duty: Black ops reaches \$1 billion sales mark. *BBC News*, URL: (<http://www.bbc.co.uk/newsbeat/12059244>) (accessed February 2011).
- Wirth, W., Hartmann, T., Böcking, S., Vorderer, P., Klimmt, C., Schramm, H., Saari, T., Laarni, J., Ravaja, N., Gouveia, F.R., Biocca, F., Sacau, A., Jäncke, L., Baumgartner, T., Jäncke, P., 2007. A process model of the formation of spatial presence experiences. *Media Psychology* 9, 493–525.