Understanding player experience in social digital games : the role of social presence

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PROEFSCHRIFT

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"Happiness is never better exhibited than by young animals, such as puppies, kittens, lambs, etc., when playing together, like our own children"

- Charles Darwin, 1871/1936 -

Preface

Since the arrival of the first game consoles, I am hooked to the phenomenon of digital gaming. My parents bought the Nintendo game console so I and my sister could play *Super Mario Bros* together after school until they would come home from work. Suddenly I became a member of a special group at school that owned the Nintendo. On the schoolyard we talked with each other about games and informed each other about tips and tricks, which often led to a game session at our or a friend's house after school. Years later I discovered that these patterns in my childhood were also present in my college years. When I left my parents' home to the city of Eindhoven, I bought the PlayStation so I could entertain myself when I was alone; at least that was what I thought. I played the game FIFA1999 to conquer the Champions League with my favourite soccer team Vitesse, which in real life would be unthinkable. Interestingly, I noticed that others in my class at school and futsal team were employing similar activities. In breaks, before and after school, or when we gathered to play a futsal match we occasionally discussed the game and eventually made arrangements to play against each other. With one of my best friends it even became a ritual to *play FIFA* before watching a soccer game on the television or before a night out. The fun we experienced together often resulted in being late for our appointments or sometimes missing the start of the soccer match.

When the PlayStation 2 was released, I did the same thing I did before: I immediately bought the console and the new version of FIFA. The biggest difference here was that I could play online against others, which to me meant three things. (1) I could play against strangers who even did not speak my language and who were located in a different time zone. (2) I could select my co-players, matching their skill level with mine. To train myself, I always picked a competitor who was slightly better than I was. This way I would be ready to show off my skills to my friends when we would come together. (3) I could play against friends without the necessity to be together physically; we could even play against each other right before going to bed. Perhaps against expectations, the latter did not mean that our face to face meetings became less frequent. On the contrary, our contact moments increased offline and online. In fact, my nephews – who played the game as well – would often ask me via MSN to come online and play a game. Headsets were bought so we could talk to each other while playing, and the times that we would come online were becoming fixed moments in the week. In May 2011, the PlayStation Network was attacked and therefore became inaccessible. Therefore, we could not play online against each other for a whole month. To my surprise the game was not that attractive to play anymore; playing against the computer seemed *fake*. Fortunately, we still could play at each other's houses, which was always the best option

in the first place. Especially at family occasions, arrangements about who will bring the console, game and controllers were carefully made so we can play against each other. Nothing is better than being together and then play against each other with everyone in the same room; these moments are hilarious and often result in many hours of game play and sore fingers.

Considering my passion for digital gaming and my drive for research, it made complete sense to everyone that I applied for the vacancy as a PhD candidate studying the role of social context in gaming. I was fortunate to have a reference point for my research, as I am a gamer myself. At the start of my PhD I therefore have questioned why the patterns described above occurred in my personal life, why playing against the computer seemed *fake* to us, and why we always have more fun when we are in the same room. With my Human Technology Interaction (HTI) background and the expertise of both my supervisors, I immediately started to approach these questions from a social psychology point of view. We discovered that these questions could actually not be answered by the available theoretical models/frameworks in current game literature; for us this was an ideal starting point. In this thesis I will try to reveal the answers on my initial questions supported by qualitative and quantitative studies based on a framework we introduced ourselves.

This thesis could not have been completed without the kind help of many. First of all, I am grateful to Cees Midden, Yvonne de Kort and Wijnand IJsselsteijn to provide me valuable input and critical remarks during the years as my supervisors. Furthermore, I would like to thank all my colleagues at the Human Technology Interaction department for creating a relaxed and ideal working environment. I am indebted to Martin Boschman who I always gave a headache when I wanted to run an experiment. Nevertheless, he always managed to fulfil my wishes despite the almost impossible experimental set ups. I also want to thank Karolien Poels and Daniel Lakens who both have been of great help during some difficult periods that every PhD candidate seems to encounter. I especially like to mention Henk Herman Nap and Daan van Bel, who both have been very important on an academic but also on a social level; you guys were the best roommate and neighbour I could have. Of course, I would thank my family and friends for their endless faith and support. And finally, Clasine, I would like to thank you for the many moments I was grumpy, the moments when stress levels raise to the max, and when I had an idea and you were around to share this with (any moment of the day!!!).

Thanks everyone, it was hard work but still fun to do because of you!

Brian Gajadhar
Tilburg, December 2011

Contents

Chapter 1
General Introduction

1.1 Social play

Decades ago, Huizinga (1938) defined human play as an intrinsically motivated activity that occurs in an environment far from reality; an activity with its own rules and which' outcomes may have no real-life consequences. Play differs from a game in that a game is a special type of play; a game is a system in which players engage in an artificial conflict, defined by rules, which results in a quantifiable outcome (Salen & Zimmerman, 2003; pp.96). Games are engaged in voluntarily and usually for the purpose of entertainment and relaxation. Play often involves the use of certain artefacts that are part of a game, e.g. dice or marbles. It is fascinating how the diversity and complexity of artefacts in play and games have changed over time from the 5000 years old game of *Backgammon* played by Sasanian Persians (former Iranians) to the digital games we currently play. The amount of money spent on research and development of game artefacts these days indicates how much people value play (Tan & Jansz, 2008). And people have good reasons for this, since play is essential to human development. For instance, play enhances brain connections to develop, and play is an important mechanism in behavioural learning and cognitive development (Brown & Vaughan, 2009).

Much of play research has focused on the importance of social elements in human play behaviour. Games have great potential for bringing people together, and therefore are a powerful means for establishing and maintaining friendships (Goldstein, 2007; de Kort & IJsselsteijn, 2008). Including others in a playful activity fundamentally changes the concept of play into social play, i.e. play which involves interaction between two or more individuals (Allen & Bekoff, 1994). Those who play along are called co-players. Indeed, many non-digital games are intrinsically social – e.g., card games, board games, traditional children's games (e.g., hide-and-seek). For a long time the image of digital games as portrayed in popular media (and scientific literature) was quite different. The digital age suddenly allowed for forms of play that were virtual, disembodied, and disconnected from other social actors. Following the first release of digital games, news media were critical of computer games as being damaging for children and diminishing their social interaction (Orleans & Laney, 2000). Many digital games were designed for solo play, making their potential for engendering social isolation a relevant topic of study. Nowadays, digital gaming is increasingly approached as a social activity that can be performed with friends, relatives or even strangers (Nielsen, 2005), and in which the role of social interaction is central to the player's experience of the game (de Kort & IJsselsteijn, 2008).

In this thesis, we attempt to understand the critical determinants of social play[1] in digital game settings. The aim is to focus on the key determinants in the process of playing digital games that may be of influence on how play is experienced. Especially the importance of social interactions in play settings and its influence on player experience will be investigated.

1 In this thesis we mainly focus on interactions between two players.

1.1.1 Animal & human play

In play literature, psychologists have often drawn parallels between animal and human behaviour in play. In animal behaviour research, play is described as a means for animals to improve motor skills and to practice social abilities (van Lawick-Goodall, 1968). Playing with others gives the animal the opportunity to develop complex and varied social interaction patterns for engaging in social exchanges (Baldwin & Baldwin, 1973). In human behaviour research similar conclusions have been drawn, especially in remedial teaching literature, as play starts and develops in early childhood (Vygotsky, 1977, 1978). By interacting with others in play settings, children at an early age learn social rules such as reciprocity, cooperation and sharing that can be used for proper social interaction with others (Cohen, 2006; Bekoff, 2001). An example of such behaviour is typical role-play of young children, such as drinking empty cups of tea. Interestingly, their next step is sharing this experience with others by offering them an empty cup as well, and expecting that the other will play along (Bergen, 1988). The desire to share activities seems to come naturally, as humans have a strong drive to form and maintain positive relationships with others (Baumeister & Leary, 1995). Face to face interactions have a central role in these interpersonal relationships. Since social interaction is a key factor in social play, play may function as a means to form and maintain relational bonds. Interestingly, this opportunity appears to be noticed and practiced even before we can walk on our own two feet.

In his *Theory of Play and Fantasy* (1983) Gregory Bateson draws another parallel between animal and human play. He observed animals playing with each other in a zoo, pretending that they were fighting and playfully biting one another. He was surprised by the apparent mutual understanding that the activity both animals were performing was play, although it seemed as if they were in combat. He concluded that the playful bite – referred to as "nip" – is distinguished from a genuine bite by the animal as a result of meta-communication that creates the mutual understanding that the activity is "just play". These signals have to be repeated during play to remind the other player of the status of the activity. Meta-communication is a form of communication about communication, e.g. "this is a joke". This means that before, during, and even after play the animals repeatedly communicate social cues to each other with messages which reveal that the activity they are about to do, are doing, or did, was just make believe, i.e. play. Bateson argued that these same processes are present in human play as well.

Besides emphasizing the importance of social interaction in play, the examples mentioned above also illustrate that social play is ubiquitous; whether we are at home with our children or in a zoo observing animals. It has been embedded in our daily lives and we enjoy every second of it. Humans seem to be intrinsically motivated to play together with others (Brown & Vaughan, 2009).

1.1.2 Intrinsic motivations for social play

People take pleasure in many forms of social play. It seems as if we have an innate motivation to engage in these types of activities, comparable with the intrinsic drive underlying play and sports (Frederick & Ryan, 1993, 1995). In literature, intrinsic motivation is defined as the tendency to seek out novelty and challenges, to extend and exercise capacities of ourselves, to explore, and to learn (Ryan & Deci, 2000, 2001). Ryan and Deci have introduced Self-Determination Theory (SDT) to study the natural process of self-motivation in social settings. The theory links basic human needs to intrinsically motivating activities. Since play is defined as an intrinsically motivated activity (Huizinga, 1938) SDT provides a basic psychological framework to study the motivations to engage in playing games, especially since it has successfully been applied to domains as varied as school, work, and sports (Ryan & Brown, 2005). The theory proposes that people's actions are driven by three core needs – autonomy, competence, and relatedness.

The first drive is the need for *autonomy*: when humans are autonomously motivated they feel free to follow their inner interests and will naturally and spontaneously engage in self-chosen activities. As play is an activity that emerges out of free will (Huizinga, 1938), playing games fulfils this need, whether it is performed alone or in the company of others. The second drive is the need for *competence*, which means exercising one's abilities or improving them. As stated before, play is described as a means to improve skills (van Lawick-Goodall, 1968), in single as well as in multi play. The third drive is the need to connect with others or feeling socially valued; i.e., the need for *relatedness*. In line with this view, Baumeister and Leary (1995) have revealed a broad assortment of evidence that the desire for interpersonal attachments – *the need to belong* – is a fundamental human motivation. Since the motivation to play with others is associated with relatedness (Ryan, Rigby & Przybylski, 2006), the Belongingness Theory may provide an ideal point of departure for understanding the motivation for to play games with others.

1.1.3 Social interactions in play

In many social games, people are fully aware of the physical presence of others who play along or watch from the sidelines. When humans are in the physical presence of others, they may feel differently and make different decisions than if alone (Asch, 1955; Mullen, 1983). Due to the numerous possibilities for interactions in social play, people will influence each other's feelings and thoughts. Our emotions – e.g., compassion, joy, embarrassment – are affected by what others do, say and feel (e.g., Hatfield, Cacioppo & Rapson, 1992). For instance, during an exciting game of chess, players may react on masterful or bird-brained moves by their co-player. Emotions resulting from such in-game moments easily can be conveyed and perceived through many cues; players may

start to talk to others, or occasionally smile and make eye contact. In general, humans communicate with each other by using a mix of verbal (i.e. talking), para-verbal (e.g., laughing) and non-verbal cues (e.g., smiling, eye-contact). During communications they make representations of what others may feel and think by the expressions others give (Goffman, 1959). Exchanging these cues causes spontaneous and natural tuning into the other person's thoughts and feelings, which creates a shared understanding between people (Baron-Cohen, 2003). Through the knowledge and experience of the other a bond is formed, which results in feelings of being in close personal association and feelings of belonging together. This strong feeling of being with another individual directly contributes to positive emotions, as a consequence of human motivation for social interaction, affiliation and belongingness (Ryan & Deci, 2001; Baumeister & Leary, 1995).

By engaging in social interactions feelings of intimacy, closeness, reduced uncertainty and mutual understanding between individuals may develop that will positively enhance the social experience of play. The interpersonal contact, by itself, fulfils people's fundamental needs for belongingness and may induce positive feelings. During play, these feelings can even be enhanced by the many mechanisms that emerge from the way humans interact with others. Play activities are filled with moments where people can influence each other's emotions by subtle - or not so subtle - signals. Several studies have focused on these processes that are present in the social activities people engage in. For instance, people have the tendency to mimic and synchronize their behaviours with those of others. One of the useful theoretical frameworks to understand this phenomenon is the contagion theory (Le Bon, 1903). Le Bon reveals that emotions and overt behaviours of a person have effects on others, which lead to accepting this person and reacting towards him/her. Based on this framework, the term *emotional contagion* was introduced, which is defined as the tendency to automatically mimic and synchronize facial expressions, vocalizations, postures, and movements with those of others and, consequently, to converge emotionally (Hatfield, Cacioppo, & Rapson, 1993). For instance, Coyne (1976) revealed that people who had talked on the telephone to a depressed patient were more depressed after the telephone conversation than were those who spoke with patients who were not depressed, independent of the content of the conversation. Chartrand and Bargh (1999) demonstrated that individuals who had the opportunity to monitor others performing tasks adapted their own behaviour and mimicked the behaviour of the people they observed. Mimicry and the subsequent convergence of emotions may lead to more enjoyment: Raghunatan and Corfman (2006) revealed that watching a funny advertisement is more enjoyable when others share the same opinion about the footage, but is less enjoyable when the same advertisement is experienced differently by others. Even at cinemas people mimic and synchronize the behaviours of others present (McDonald & Fredin, 2001).

People have the tendency to interpret conformity as a signal of psychological closeness and nonconformity as indicative of interpersonal differences (Raghunatan & Corfman, 2006). Since verbal and non-verbal interactions are often part of games, this process will most likely also occur in social play. In addition, a smile or wink from a co-player may – besides the convergence of emotions – also function as a reward. Social incentives – encouragements by others, cheering, or even a thumbs up – motivate people and let them feel good about themselves. The strengthening of a response with a social reward is called *social reinforcement*; eye contact, facial expressions, physical contact and vocalizations are examples of powerful reinforcers. For instance, the subtle eye contact with a collaborator after successfully defeating others is an abbreviated reach to touch, or approach. Game and sport activities are filled with such moments.

Visibility of one's performance

Besides talking, laughing and/or smiling, a player's in-game performance (e.g., score) can also be seen as a (indirect) social cue for others to interpret. Games have a strong evaluation potential because co-players can easily monitor a player's performance. The presence of others during an activity may affect our performance and feeling of competence. For instance, a person performing a task in front of an audience experiences more arousal than a person performing the same task without audience (Baumeister, 1984). *Social facilitation* is the process where the presence of others increases the likelihood of dominant responses, leading to better performance on easy tasks but worse performance on difficult tasks. Zajonc (1968) stated that the mere presence of others influences our experiences, even when there is no direct contact, and regardless of the other's age, gender, role or relationship. Cottrel (1972) introduced the *evaluation apprehension theory* according to which the presence of others increases arousal because of the anticipation of negative evaluations. His theory shows similarities with the work of Goffman (1959), who argues that we try to manage the impressions others form of us by (non)-verbal behaviour. In addition, Baron (1986) introduced the *information processing theory of distraction* to explain social facilitation. He argued that others can be seen as a source of distraction and consequently may interfere with information processing which ultimately will influence our performance and experience. In social play settings, facilitation effects are bound to occur. Empirical support for this was revealed by Kimble and Rezabek (1992), who found that the presence of others indeed hindered performance for individuals who played a difficult game.

The previously mentioned study revealed that individuals' awareness of their performance being observed is an important factor in game play. In general, humans have the drive to relate and compare their abilities and opinions with equal others

(Festinger, 1954). By doing so, knowledge of the self emerges (Mead, 1934) as people try to establish similarity, to differentiate the self from others, assess the self by comparison with peers, and to compete with others or express emotional uncertainty (Mosatche & Bragonier, 1981). People are motivated by a competitive orientation to increase their own performance or to achieve a status slightly better than that of others; this social process introduced by Festinger (1954) is called *social comparison*. Many studies on social comparison have focused on social play settings, since they offer people clear opportunities for interpersonal communication and to engage in social competition (Chafel, 1987). This is especially the case in studies on childhood, since social comparison is considered fundamental for teaching children to behave in socially accepted ways when interacting with others (Combs & Slaby, 1977).

What all of the above mentioned processes have in common – besides that they are likely to occur in social play –, is that they are present because people have an intrinsic need to belong (Baumeister & Leary, 1995). Whether individuals want to reach this by giving others the impression that they are competent, similar, or likable, the reason for these processes to emerge is that people have the desire to relate with others. By having social interactions, these processes are initiated and can install feelings of belongingness. As a result this will have its influence on people's experience in play, which again emphasizes that social play is fundamentally different from individual play.

Other play settings

The human need to belong seems to be the core motivation for engaging in play with others, whether this need is fulfilled by the intrinsic reward of having interpersonal relations, or by the many social processes initiated in social settings. Crucial for developing feelings of relatedness is the play setting's affordance to have social interactions. Although possibilities for communication appear to be commonly present in many settings, an exception has to be made for – what currently is a very popular form of human play – digital play, especially when a game is played over the Internet. In online co-play, not all forms of social interactions offered in traditional co-play are afforded. As a result, playing digital games may induce weaker feelings of belongingness in online co-play than would be the case in traditional co-play. To give more insight in these expectations, digital play will firstly be discussed in the next section.

1.2 Digital play

Over the past 30 years, digital gaming has become a very popular activity in homes across the world. When this form of play was introduced, many approached it as one of the products of technology that decreases the social interaction in our lives. Critics

blamed the isolating effects of such technology to be the cause of the disruption in our society's social structure. This process of individualization by technology for instance was discussed by Robert Putnam (Putnam, 2000). He argues that new media are shifting lively gathering spaces away from society and are causing a degradation of time spent on meaningful social activities. In his view the availability of technology causes social disengagement, as machines are replacing real people. For instance, current media keep children inside in their own rooms instead of playing outside with others, which obstructs the valuable interaction between friends or family members in their leisure time (Orleans & Laney, 2000). However, after exploring recent studies concerning the social impact of popular technology, this view seems incorrect. Within the usage of new media, trends are developing which confirm the exact opposite of Putnam's portrayal. One of the first signs would be the notion that Internet use is dominated by communication between people for a majority of its users (Axelsson & Regan, 2006). After all, the Internet evolved out of an effort to connect computers and information and therefore people. Research has shown that the use of new media enables users to interact with others even more than they did before (Tyler, 2002). Second, in spite of their use of new media people still seem to have the instinctive need to be together with others - a need to belong (Baumeister Leary, 1995). When using technology they often use additional communication devices to allow for personal contact with others, e.g. multi-tasking by using instant messaging programs while surfing on the Internet, or switching on the webcam while watching a favourite program on television together with online friends.

As mentioned above, an example of new media are the digital games that have conquered their place in our society. Social isolation used to be a relevant topic, as digital games were designed for solo play. From the first release of games, computer games were criticized as being damaging for children and diminishing their social interactions (Orleans & Laney, 2000). Selnow (1984) concluded that computer games players perceive the game as a surrogate companion, an electronic friend. However, parallel to the rise of digital games, research grew about this topic, and showed that there hardly seemed to be a relation between computer games and social isolation (Lin & Lepper, 1987). In contrast, Mitchell observed that after the acquisition of a digital game, social interactions increased within families. The shift from solo-play to multi-player games[2] introduced the component of playing together in digital games - either in competition or in collaboration. Just like in traditional board games, opportunities for social interactions are also present in multiplayer games (Durkin & Aisbett, 1999; Tychsen, Smith, Hitchens, & Tosca, 2006). According to gamers, socializing is the number one

2 Multiplayer games are digital games which can be played by more than one person at a time.

motivation for playing these games (Nielsen, 2005; Lazzaro, 2004). Gamers who come together are primarily motivated by social interaction in terms of fun with friends, camaraderie, chatting, teasing, taunting, and joking (Clarke & Duimering, 2006; Jansz & Martens, 2005). People even choose to play games they don't like so they can spend time with their friends; and research indicates that gaming is a good excuse to invite friends over (Lazzaro, 2004). These findings illustrate that – similar to traditional games – social interactions have a central role in playing digital games.

However, digital games provide an arena for human play in which computers (and the Internet) are used as a medium via which to play. Traditional games configurations only allow play configurations with all players co-located in the same physical space at the same time, for instance around a table. Social interactions in these settings may take place via various forms; e.g., through talking, laughing, making gestures, touching. Digital games however also offer the opportunity to play with others who are located elsewhere and are only "tele-present" over the Internet; this situation makes face-to-face communication impossible. Social interaction then only takes place through a medium, e.g. by using webcams, microphones or text messages. The difference between non-mediated and mediated social interaction has been extensively studied in literature, especially in the area of Computer Mediated Communication (CMC) research. In digital gaming however, this difference has not been given broad attention. In this section we will argue why the difference between non-mediated and mediated social interaction may be of importance to understand how people experience playing digital games in different types of co-play setting.

1.2.1 Mediated social interactions

Games can be played with two to four, or even to up to eight people simultaneously on commercially available consoles; they can be played online with one, two, or up to thousands of other people. The role these others play during a video game can be supportive, collaborative, competitive, or evaluative; they can play along sequentially or in parallel. Perhaps the most important factor for social interaction in digital play is the way in which co-players are present. In digital gaming a co-player can be artificial, mediated or co-located. An artificial co-player is a non-human opponent/collaborator – an agent, often with a visual representation in the game world controlled by the computer working on fixed algorithms. A mediated co-player is a human playing via the Internet. The difference with the artificial co-player of course is the fact that the other player is a real person, not an agent controlled by the computer. Although they may not interact with this person directly, he/she typically has an avatar in the virtual world; a perceptible representation whose behaviors reflect those executed, in real time, by a

specific and real human being (Bailenson & Blascovich, 2004). A co-located co-player is a human opponent/collaborator who is located in the same physical environment. Similar to mediated co-play, the behaviour of avatars is controlled by real persons instead of predefined fixed algorithms. In contrast to mediated co-play, co-players are represented both in the virtual world and in the real world. The latter gives players the opportunity to engage in more types of social interaction than in the other settings (de Kort & IJsselsteijn, 2008). In sum, digital play environments can be distinguished from each other by the way a setting affords social interaction; in CMC research this is referred to as the degree of *social richness* a medium or setting may offer.

The social richness of a medium

In CMC studies it has been argued that media – e.g., email, telephone, videoconference systems – differ in their capacity to carry data that is rich in functional and social information (Daft & Lengel, 1986; Short et al., 1976; Rice, 1993). For instance, even communication through videoconferencing tools feels unnatural compared to face-to-face meetings due to the lack of social cues. Signals such as eye contact, gaze (Grayson & Monk, 2003), body gestures and spatial hearing (Hauber et al., 2005) are essential for effective interpersonal communication. Compared to non-mediated encounters, mediated interactions are considered to cause psychological distance that reduces sociability, because the used medium may not provide the social cues that can be exchanged in face-to-face meetings. The higher the social richness of the medium – i.e. the number and type of social cues that can be exchanged – the more it is perceived to be sociable, warm, sensitive, personal or intimate when it is used to interact with others (Short et al., 1976).

In online multiplayer games features are also implemented to interact with others before, during, or after the game. For instance, games offer the possibility to use headphones, which enable players to interact through speech (e.g. *Fifa09, CounterStrike, Unreal Tournament*). Some platforms also offer the use of webcams through which players and co-players can interact visually, with or without sound (e.g. *Xbox360 Live Vision Camera, PlayStation 3 Eye*). Furthermore, by using text messages in games or with the use of an instant text-messaging program outside the game, players can inform, tease, or just chat with each other (Mckenna & Lee, 1995). These features enable players to give each other directions in a game, to easily locate each other's avatars in the game, or just share fun or interesting in-game or out-game moments (Clarke & Duimering, 2006; Jansz & Martens, 2005; Steinkuehler & Williams, 2006). Mediated communication has the potential to bring play to another level, enhancing the experience for both players by making the psychological distance between players

disappear. In other words, it almost makes us believe that they are together. In literature this feeling of being with another individual is described as *social presence*.

1.2.2 Social presence

Social presence is the sense of being together with another person (Biocca, Harms & Burgoon, 2001), and indicates the cosy and intimate feelings elicited by interactions in mediated and non-mediated environments. Since the introduction of communication media (e.g., telephone, the Internet), interactions between people have changed. To understand social behaviour in (mediated) environments, Biocca and colleagues argued that a robust and detailed theory and measure of social presence were needed. They identified social presence as a multidimensional construct that includes three key dimensions. The first dimension explains that an individual has to be aware of the other, and the other has to be aware of the individual. This *awareness* reflects the individual's feelings of being together, and signifies some degree of social presence. The second dimension argues that social presence is definable by the sense that an individual has an emotional connection with the other. This *psychological involvement* indicates the salience of the interpersonal relationship, the intimacy and mutual understanding between people. The third dimension regards the behavioural interaction and synchronization during an encounter, which is called *behavioural engagement*. Subsequently, Harms and Biocca (2004) constructed the Networked Minds Social Presence (NMSP) measure to empirically distinguish levels of social presence between media based on the social presence theory.

Relatively little attention has been given to social presence in digital gaming research, yet it has been extensively studied in computer mediated communication research (Short et al., 1976). In mediated settings – e.g. videoconferences – communication between people is filtered by media technology; the degree of experienced social presence between people strongly depends on the richness of the medium to allow for (non)-verbal communication. Short and colleagues revealed that different media exhibited different levels of social presence; the closer mediated communication approaches face-to-face communication, the stronger the experience of social presence. Their findings are empirically supported by other CMC studies that revealed similar results (e.g., Champness, 1972; Keil & Johnson, 2002; Bente, Rüggeberg & Krämer, 2005; Hauber et al., 2005). Since interactions are established in various ways in (online) multiplayer games, social presence theory may be used to understand the feelings of players in digital gaming as well.

Social presence in digital gaming

Co-play settings can be characterized by the way they offer different types of social interaction to take place and create a sense of being with another. In artificial co-play, social interactions are simply with a non-human representation, which is expected to provide players a low sense of being with another. In mediated co-play though, in-game decisions and actions are made by a human co-player and not a computer agent, which should increase feelings of social presence. Nevertheless, in both these settings there is less room for social interaction than there is in face-to-face communication. In contrast, in a co-located co-play setting it is easy to make gestures, joke around, tell anecdotes and laugh at others as a reaction on in-game moments. In this type of digital play setting many forms of social interaction are present, which probably give players a strong sense of being with another. At first sight, face-to-face communication has a resemblance to playing in a co-located setting; both users are physically present in the same physical environment. There is also a resemblance between playing digital games with mediated co-players and videoconferencing. In both settings others can be digitally represented, and interaction between users takes place via a medium. Considering these similarities, we should be able to apply conclusions drawn in CMC research to digital gaming.

However, although digital games are a social medium (de Kort & IJsselsteijn, 2008), they are not primarily designed for communication in contrast to technologies such as telephones or videoconference sets. First of all, the primary function of the activity is to play games; having communication by means of voice or text chat is a welcome side effect. Second, compared to applications such as videoconferencing, with digital games visual attention is not directed towards the other person but is needed for focusing on the game; even webcams are often ignored while playing online games (Gajadhar, de Kort, & IJsselsteijn, 2009b). Third, most digital game technologies were originally intended to be used individually; opportunities for playing with others were added later in the process. Fourth, while most communication media are based on verbal or text communication, most games can easily be played without these forms of interaction. Fifth, the medium at the same time is the object of interest providing content for interactions, which may be collaborative, but competitive as well. Due to these differences, the structure of conditions conducive to social presence in digital gaming differs from the structure of conditions in other types of computer-mediated communication, as suggested by de Kort, IJsselsteijn and Poels (2007). Based on the NMSP (Harms & Biocca, 2004), they developed the Social Presence in Gaming Questionnaire (SPGQ), which specifically aims to measure the feeling of being together in digital play. Survey data revealed that social presence in gaming consists of three components especially for digital play: *psychological involvement - empathy, psychological involvement - negative feelings,* and *behavioural engagement* (de Kort et al). Psychological involvement pertains to the

experience of positive feelings (e.g., empathy) and negative feelings (e.g., jealousy) towards a co-player. Behavioural engagement refers to the feeling that a player's action depends on their co-player's action in the game, and vice versa. Since it is expected – based on findings in CMC research – that online and co-located settings will exhibit different levels of social presence, social presence theory is essential in this thesis.

Effects of social presence in digital gaming

As we have explained earlier, an increase in social presence may have two main consequences. First, the strong feeling of being with another individual itself may contribute to positive emotions, as a general consequence of the human motivation for social interaction, affiliation and our need to belong. Second, a heightened sense of social presence may also strengthen social processes induced by interactions during the game. In co-located co-play though, the awareness of others and their expressions of emotions and approvals is stronger than when playing in a mediated setting with distant co-players. Hence, the opportunity for cues to be exchanged – e.g., nonverbal immediacy, verbal communication, reciprocation of behaviours, mimicry, and monitoring of the other – depend on the social affordances a play setting offers (de Kort & IJsselsteijn, 2008). Findings in CMC research suggest that the degree of social presence in co-located play will be higher than in mediated co-play. This would imply that due to this difference, the experience in mediated co-play is fundamentally different from the experience in co-located co-play. This argument seems to be supported by recent fieldwork, which has shown that the physical presence of co-players positively enhances players' experience compared to a mediated setting (Clarke & Duimering, 2006). Clark and Duimering's behavioural study suggests an important role for social interaction on players' experiences in digital multiplayer games. Their findings demand an empirical focus on how social interaction takes place in play settings, and how communication between players influences their experience. Unfortunately, as we will see in the following section, in literature most theoretical models of player experience do not include social interaction to explain effects on players' in-game experiences.

1.3 Player experience in social context

In the understanding of how social context affects player experience, it is necessary to get a clear picture on what is meant by the term *player experience.* First of all, let's be clear on why it is preferred to persistently use the term player experience instead of game experience. Playing digital games can induce many different feelings. We may feel challenged by the difficulty of the fast-paced game, immersed in the overwhelming virtual environment, excited by reaching the next level, or perhaps a mix of all these

feelings at the same time. Player experience reflects the wealth of player emotions and feelings while playing games (Poels, et al., 2007). Similar to watching television (Rubin, 1983), digital gaming is a leisure activity, primarily performed to have a good time in terms of fun, relaxation, and social interaction (Nielsen 2008). In watching television, McDonald and Fredin (2001) revealed that emotional states of viewers are influenced by two sources: the media content and the affective expressions of other viewers. This finding also holds for playing digital games. After all, we may experience more frustration when co-players are teasing, more enjoyment when they are joking around, or experience more challenge when they make provoking remarks. According to this view, player experience indicates the experience not only as a result of playing the game (i.e. game experience), but also as a result of playing with others in a particular context.

1.3.1 A multi-dimensional construct

Some models that have been developed to explain feelings in digital play refer to player experience as the involvement in (Calleja, 2007) or the enjoyment of (Sweetser & Wyeth, 2005) digital games. In a handbook on media processes and effects (Nabi & Oliver, 2009; pp.165-167), Oliver explains that pleasure in media indeed results from enjoyment – the positive affective experiences – as well as from involvement – the engrossment, focus and absorption – in a particular medium. This was also indicated by Csikszentmihalyi and Csikszentmihalyi (1988), who argued that one could not enjoy an activity without a minimal level of focus. Considering these studies, player experience seems a broad concept that can roughly be subdivided into enjoyment and involvement related feelings. Therefore, in the current thesis *player enjoyment* is approached as a generic term that indicates the positive valence of the experience; the term *player involvement* is used to describe a player's focus and interest during digital play. Researchers have suggested that enjoyment (e.g., Vorderer, Klimmt & Ritterfeld, 2004) and involvement (e.g., Calleja, 2007) have multiple dimensions and determinants. In line with this view, Poels, de Kort and IJsselsteijn (2007) approached player experience as a complex mixture of multiple experiences related to enjoyment and involvement. The player experience construct was empirically validated by IJsselsteijn, de Kort and Poels (2008) as composed of seven components of player experience: fun, challenge, competence, frustration, engagement, flow, and immersion.

Following the conceptualization introduced by IJsselsteijn and colleagues, in this thesis player experience is also regarded as a multi-dimensional construct. However, today the field still has not established consensus on definitions of these and related terms. Researchers use different names for overlapping experiences, and identical names for clearly different phenomena. To avoid any misinterpretations, the components that construct player experience will be briefly explained by the most relevant literature below.

Player enjoyment

Enjoyment is considered the experience of entertainment that reflects the sum of positive reactions toward activities (Vorderer et al., 2004). Besides enjoyment, some researchers have called this *pleasure or even delight* (e.g., Bosshart & Macconi, 1998; Zillmann & Bryant, 1994). Csikszentmihalyi (1990) argues that for experiencing enjoyment, one has to invest effort and attention; in contrast, pleasure does not require any effort. To avoid misinterpretations throughout the thesis, we describe enjoyment here as the positive valence of an experience in play that is constructed by feelings of fun, challenge, competence and (inversely) frustration.

Both terms *positive affect* and *fun* are in literature interchangeably used to denote the feeling of being happy. In an empirical study on sports games, Wankel and Sefton (1989) revealed that the experience of fun had strong correlations with positive emotional states. In general, the experience of fun is a significant cue for indicating whether people enjoyed a game. In this thesis, positive affect is defined as the positive emotional state of being happy. Wankel and Sefton (1989) also revealed that in sports games – besides positive affect – *challenge* is the best concept for predicting enjoyment in games. Csikszentmihalyi (1990) argued similarly in explaining the enjoyment in activities; he stated that there can be no enjoyment without challenge. Furthermore, challenge often emerged as a strong motivation to engage in digital games in many focus group studies (e.g., Poels et al., 2007; Olson, 2010). In this thesis, challenge is a component of enjoyment defined as the feeling of being stimulated.

Closely related to challenge is the term *competence,* which refers to feelings of pride, confidence and accomplishment in a game. According to Deci and Ryan (2002) attaining competence at an activity is an important psychological determinant of enjoyment. Wankel and Sefton (1989) argued that perceptions of personal achievements are also strong determinants for enjoyment in (sports) games. Similar findings were discussed by Ryan and colleagues (2006), who studied the motivations to play online games. Subjective competence therefore is defined as the extent to which players feel strong and skillful in playing a game.

A dissatisfactory outcome in play will likely elicit the adverse emotion of *frustration*. Frustration is related to feelings such as anger and disappointment. It is an essential emotion for game designers to elicit, because when people get frustrated they are motivated to engage in the game to overcome the difficulties and reach their goals (Gilleade & Dix, 2004). However, strong feelings of frustration may result in ending a game. In this thesis, frustration is defined as a negatively valenced experience, and also is regarded as a component that (counter-) indicates enjoyment.

These four concepts – derived from the work of IJsselsteijn and colleagues (2008) – are strongly connected and are all regarded as enjoyment related concepts. Due to their

clear differences, in literature they are rarely confused with each other. Unfortunately, this is often the case for the – more abstract – concepts that describe player involvement, which will be discussed next.

Player involvement

In this thesis player involvement is used to denote a player's focus and interest during play. We describe player involvement by using the concepts immersion, engagement and flow. *Immersion* is a metaphorical term originating from the experience of being submerged in water. In digital gaming it connotes the feeling of being surrounded by another reality, the reality of the game itself. Ermi and Mäyrä (2005) proposed a model for immersion in games including three components: sensory immersion - based on the audiovisual qualities of games imaginative immersion - based on the fantasy of the game and identification with the game character, and challenge-based immersion - based on skills addressed in the game. In this thesis, immersion is defined as the experience of being surrounded by the game as a result from the absorbing power of the game's audio, video, and narrative. In this sense the third component of Ermi and Mäyrä's model, challenge-based immersion, appears to fit better under the second component of game involvement: engagement.

Engagement is defined as the state of focus in a game, where players appear cut off from the real world, forget everything around them and are deeply involved in the medium, mainly through the cognitive challenges posed to them. Brown and Cairns (2004) defined a model of game involvement containing three levels: engagement, engrossment, and total immersion. They propose that the level of engagement players experience during the game very much depends on the effort they put into the game, or are willing to put into it.

Flow is also prominent in discussions of game play and game experience. The definition was adopted from Csikszentmihalyi (1975) who studied the enjoyment derived from various sports and leisure activities. He stated that flow is the optimal experience where one is performing at best, is alert, is in effortless control and where one's sense of time is altered and sense of self is lost. There are no tangible rewards one gets from flow; however it is such a pleasant experience that people are willing to reach and maintain the state for its own sake (Csikszentmihalyi & Csikszentmihalyi, 1988). Although flow theory was not developed as an explanation of media enjoyment, the association between flow and digital games has been made frequently in the past decade (e.g. McKenna & Lee, 1995; Sweetser & Wyeth, 2005). The flow experience differs from engagement in the sense that flow is considered only to emerge when the players' skills and the games' challenges are optimally balanced.

The three concepts described above – immersion, engagement, and flow – are obviously related and show some overlap in terms of their phenomenology. Empirical findings confirm the multidimensionality of player involvement similar as for enjoyment (see also next section). Yet the question of how these constructs relate to the social context of gaming has not been addressed before.

1.3.2 Player experience models

To date, several models have been proposed to explain player experience in digital gaming. Although in general these models describe the effects of interacting with games well, many of them have not sufficiently included the role of social context. Sweetser and Wyeth (2005) discuss a model to explain player experience that contains elements of Csikszentmihalyi's flow (Csikszentmihalyi, 1975). Their model consists of seven core elements that were derived from existing literature on enjoyment in games. The eighth element that was found in literature – social interaction – was not included in Sweetser and Wyeth's model as an element that explains the experience of players. According to them, social interaction is not a property of the game, but the game is a means to allow for communication. In contrast, one could argue that multi-play is in itself a form of social interaction. Second, in many games communication is integrated. For instance, in some online shooter games team members are constantly in contact with each other through team-speak as they form strategies to beat their opponents. In addition, the Sweetser and Wyeth model was validated for two games by thirty-two professional reviews, but not tested with data from actual gamers. We therefore consider this model unsuitable for explaining player experience in individual vs. social play settings. Brown and Cairns (2004) introduced a model that is based on interviews by real life users, i.e., empirically grounded. Their approach focuses on the game experience of gamers and the effort they are willing to put into a game. They laid the groundwork for other scholars in search for a model that may explain the experience in digital gaming, such as for Ermi and Mäyrä (2005). They introduced a model which presents game play as interaction between a game and a player, derived from observations among game-playing children and their non-playing parents. Although the components were derived from results in a social play setting, the role of social context in their model and study seems unclear (see Figure 1.1). In their conclusions, Ermi and Mäyrä (2005) acknowledge that more research is necessary for explaining the role of social interaction in digital gaming.

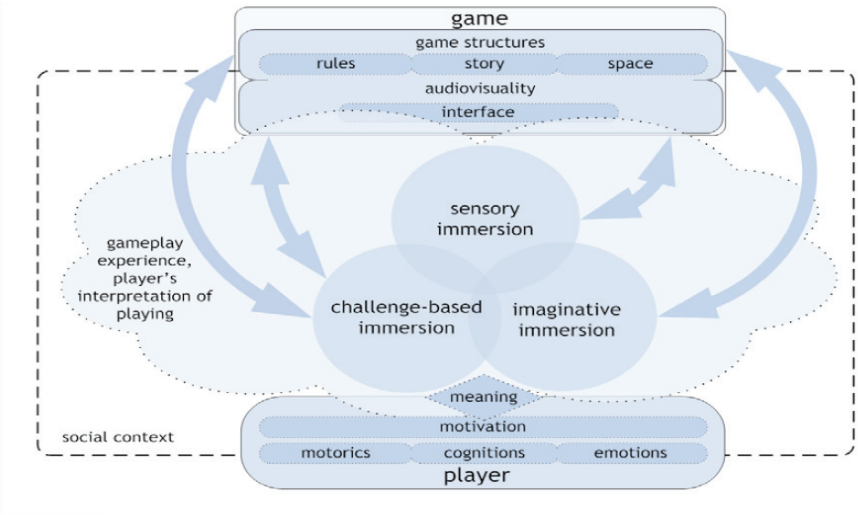

Figure 1.1: A schematic illustration of the SCI-Model (Ermi & Mäyrä, 2005).

The aforementioned models present some means to describe the effects of interacting with games. However, they can solely be used to interpret the experience in solo-play games. To be used for multiplayer games, models would also have to account for social elements in play settings and identify their role in defining the total player experience. Nevertheless, a trend is visible of authors increasingly recognizing the need to account for social interaction on players' experience in multiplayer games. This trend is even more perceptible in the latest models.

Extending player experience models

Incorporating social processes and the way they impact on experience in player experience models is no mean feat, yet this does not free us from the need to consider the importance of social context in digital play. This impact is likely to vary with varying play settings such as solo-play, online play and multi-play, with interpersonal familiarity, and with players' awareness of and potential to communicate with the other player(s). Initially, player experience models have focused primarily on the interaction between game elements and a single individual's experience. More recently, however, there is a growing awareness that the enjoyment digital games bring is to a large extent rooted in the social setting within which they are played. Reflecting the notion that a single player's experience may be interconnected with other players' experiences, Calleja (2007) introduced a conceptual model that incorporates shared involvement. He proposes an analytical model with a set of terms specific to the digital game experience. His model includes six frames of involvement, which were derived from qualitative research: (1)

Narrative involvement, (2) affective involvement, (3) ludic involvement, (4) kinaesthetic involvement, (5) spatial involvement, and (6) shared involvement. Calleja notices that shared involvement is the frame that makes digital games different from any other media, as users can interact with the virtual environment and with other users who are "in there" as well. The shared involvement frame covers all aspects of communication with and relation to others in the game world.

In addition to shared experiences within game worlds, De Kort and IJsselsteijn (2008) propose that player experience is also shaped by social interactions surrounding the game, through a variety of social psychological mechanisms. After all, in-game and out-of-game conversations are often present in co-play (Clarke & Duimering, 2006). Hence, they argue that a model should encompass the social characteristics that may shape the interpersonal dynamics and social mechanisms present. For artificial co-play settings, the AI characteristics in the game will shape the sense of social presence that will be experienced by players. However in mediated co-play, the media characteristics will create the feeling of being with another. In co-located co-play, the socio-spatial characteristics will affect the way players will experience social presence (see Figure 1.2). The framework introduced by de Kort and IJsselsteijn (2008) was based on a review of existing literature, mainly in social and environmental psychology and communication studies.

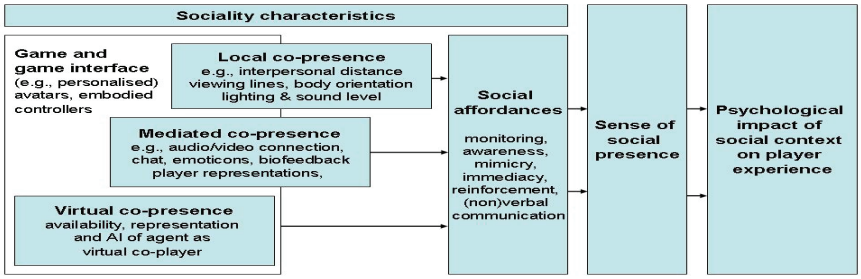

Figure 1.2: A schematic illustration of the effects of sociality characteristics on player experience in digital play settings (de Kort & IJsselsteijn, 2008).

Besides accounting for the social affordances, which influence the opportunities for social interaction, the framework suggests a direct relation between social presence and player experience. Fridlund, Kenworthy and Jaffey (1992) had also revealed that a significant relation is present between the social features of a setting and people's emotions. They conducted an experiment where participants had to imagine a happy moment when they were alone or when they were with others. The same questions were asked for moments of anger, sadness, and fear. Results on self-reports revealed that more happiness was experienced when participants imagined a joyful moment with others (e.g., going to a concert) in contrast to a moment when they were alone

(e.g., listening to a radio); the same effect was found on sadness. The opposite relation was found for fear; the more social the setting the less fear was experienced. Although some have criticized parts of their study (see e.g., Jakobs, Manstead & Fischer, 1996) their main findings suggest that emotions are significantly affected by the social context of an activity. Similar examples have been found for digital gaming as well; Ravaja (2009) and colleagues (2006), Mandryk and Inkpen (2004), and Weibel and colleagues (2008) revealed that play is experienced differently when the social context of the setting was changed (see also Chapter 3). Their findings suggest a direct relation of player experience with the different levels of social presence felt in their settings. Considering these studies, in this thesis it is expected that social presence indeed is a significant concept for understanding how experiences are shaped by different forms and degrees of afforded social interactions in play settings.

1.4 Hypotheses and overview of the thesis

We have argued that playing with others is fundamentally different than playing individually. Feelings of belongingness develop due to the awareness of others, their expressions of emotions, and approvals that are perceived and expressed via interpersonal dynamics. Similarly, when playing digital multiplayer games, emotional responses do not only originate from the game content, but from the influence of co-players as well. In contrast to other forms of play, in digital gaming the physical presence of one's co-player is not evident; they can also be present virtually (as an artificial agent or avatar in the game) or via a communication medium, such as an audio-link or a webcam. Since there are more opportunities to interact with others when players are seated side-by-side, different interpersonal dynamics are expected based on the dissimilarities in communication properties of the situations in mediated and artificial co-play.

As a result of more frequent and intimate interactions with others, we expect that playing with a co-located other will elicit stronger feelings of being together, i.e. social presence, than when playing with an artificial or mediated other. In general, the formation of social bonds and being with others is associated with positive emotions. This would imply that a high sense of social presence induced by social interaction in multi-play will elicit more positive player experiences; i.e., both players will be more involved in play and will experience more enjoyment. It is as yet uncertain which type of interactions may influence social presence the most. In most CMC studies, social presence appeared the highest when people could see and hear each other while communicating. However, in digital gaming players are primarily focused on the screen, which leaves auditory and in-game communication as the best and most likely options to interact with others. Communicating by voice may give players the opportunity to express and share emotions and in-game information. Subsequently, we question

whether the opportunity for gamers to express themselves, share emotions, and share in-game information is sufficient to explain why co-play would elicit more positive experiences than co-play settings where this is not possible. Having opportunities for social interaction may not necessarily mean that communication will occur more frequently or be more intimate.

In sum, this thesis will reveal that the experience in digital gaming depends on the social context in which it takes place. The insights will contribute not only to the relatively new field of digital gaming, but to the social presence literature in media psychology in general. Furthermore, these findings will be useful to game designers who aim to positively enhance players' experiences in digital play.

1.4.1 Overview of the thesis

This thesis is organized in six chapters. In the present chapter, the research question and hypotheses were discussed. We argued that social context is important in player experience as it relates to the basic needs for social contact and intimacy. Social play is different from playing alone since it involves co-players, who also have their influence on how people experience play. We have explained that digital play is different from other forms of play, because the physical presence of a co-player is not evident in all digital play settings. Social presence is suggested as the concept that can distinguish co-play settings on the basis of the affordances for social interaction a setting may offer. Furthermore, we have proposed that social presence during game play positively enhances player experiences due to more frequent and intimate interactions.

In *Chapter 2*, we first explore environments in which gamers meet to play digital games together. Based on focus groups and contextual inquiries, the appeal of playing together is studied and compared with existing literature. These findings also reveal the motivations to come together in physical settings to play games, instead of staying at home and connecting with others through the Internet. Furthermore, results will give more insight in the multiple forms of interactions in co-located and mediated co-play.

In *Chapter 3* an experiment is discussed in which the mediating role of social presence is explored in relation to player experience components. With the use of self-reports three types of co-play configurations are examined that differ from each other by the presence of a co-player: artificial co-play (i.e. solo play), mediated co-play (i.e. online co-play) and co-located co-play (see Figure 1.3a, 1.3b, and 1.3c). Results will give insight in whether social presence indeed distinguishes these co-play settings from each other, and whether different levels of social presence have different effects on players' experience. Furthermore, we will empirically demonstrate that player experience includes enjoyment and involvement related components, and that social presence has

an impact on both concepts. Mediation analyses are employed to establish the causal relations between social settings, social presence and player experience.

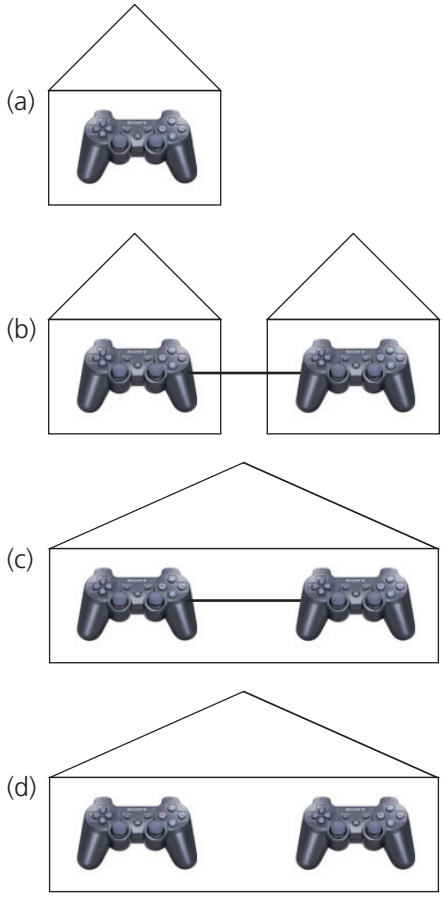

Figure 1.3: (a) solo play / artificial co-play, (b) mediated/online co-play, (c) co-located co-play (d) co-located solo play.

In *Chapter 4* an experiment is discussed in which the influence of audio and visual communication channels on social presence and player experience will be shown. From CMC literature it is expected that media richness will enhance social presence, which implies that this would result in enhancing a positive experience in play. However, in digital gaming the visual channel is already occupied in processing the real-time changes in the game (especially for action games). In contrast to CMC literature, we therefore predict the audio channel to be the most important, and that interaction by visual cues will hardly affect feelings of social presence and subsequent player experience. With the use of self-reports and observation data from a competitive first person shooter game we reveal which channel significantly increases a player's sense of social presence the most. Again, mediation analyses are employed to reveal the causal relation between

communication opportunities, social presence and player experience. In addition, observations are presented of the multiple cues that participants exchange and display. Results will give a view on which type of cues are most important for enhancing social presence in playing multi-player games.

Since we expect that the role of co-players will influence the quality and quantity of interactions, the previous experiment is replicated in *Chapter 5,* with the difference that co-players are collaborating rather than competing with the player. Results on social presence and player experience for players in collaboration will be compared to the results found for players in competition. In addition, we present a content analysis of the verbal communications between players in collaboration and in competition, to explain the (presence and absence of) differences found on self-reports and observations between playing against opponents or with team members.

In *Chapter 6* the last experiment is discussed that was conducted to investigate the importance of players being connected through the game for inducing feelings of social presence. Therefore, an experiment was designed in which individuals were co-located, but not always played together and/or were not always in competition (see Figure 1.3d). We expect that these factors will vary the strength of the social connection between players, which will affect their subjective shared experience.

Finally, *Chapter 7* presents the general discussion of the findings of the previous chapters. We will provide our view on why social presence is important in playing digital games with co-players. We will discuss the role of frequent and intimate interactions on feelings of social presence, and explain why this happens in digital play. Our results will be discussed in the light of implications for practice and future research.

Chapter 2
The Appeal of Playing Together[3]

3 This chapter is based on Gajadhar, de Kort, IJsselsteijn & Poels (2009c).

2.1 Introduction

Digital games bring many opportunities for frequent and meaningful social interactions between players and among spectators (de Kort & IJsselsteijn, 2008). Similar as in other social activities, connecting with others while playing seems intrinsically rewarding (see also Ryan et al., 2006). Moreover, one of the main motivations to play (online) games is the desire to form long-term meaningful relationships with others (Yee, 2007). In Chapter 1 it was argued that social interactions may have a significant effect on how play is experienced. To verify this, it firstly is necessary to explore and discuss how in general games are played together, how social interactions surround play, and how important it is to have personal interactions in play. Therefore, in this chapter the focus will be on those environments where gamers meet regularly and where interactions are most intensive and frequent. To explore the complexity and meaning of social interactions, it was decided to study them in their richest form, where communications between players have a recurring, persistent character. Such opportunities in online settings are mainly afforded by Massively Multiplayer Online Role Playing Games (MMORPGs). Recent studies (e.g., Steinkuehler & Williams, 2006) have already illustrated the lively social dynamics in mediated co-play settings. However, communications in co-located settings are expected to be even richer, and therefore perhaps more suited for the current study; examples of such places are Internet cafes and specifically game cafes. Although LAN events do afford intensive and face-to-face interactions between players similar to game cafes, they typically do not offer the recurring interactions needed to uphold long-term relationships. Unfortunately though, studies on places where gamers physically meet, such as game cafes, are scarce. The few that were published about social interactions were focused on Asian oriented game cafes. Regarding the many differences between Western and Eastern culture (e.g., Lindtner & Nardi, 2008), it is doubtful whether the reported findings also hold for Western gamers. To check whether conclusions drawn in these studies can be used in our research, it was decided to conduct a similar study at a typical Dutch game cafe. Studying communications between visitors of these gathering places combined with existing literature on online communities and Asian game cafes will function as a starting point for this thesis. It will give a deeper insight in the role of social interactions in people's experiences in play. Furthermore, the current field study will provide the opportunity to generally contrast behaviour and experiences in co-located co-play with those in mediated co-play. Moreover, by exploring such play settings, variables that can affect player experience may be noted. These variables then can be included in the experimental design of our planned experiments. Before presenting the study, in the following section, literature on motivations and interactions in social play environments will be discussed.

2.1.1 Meeting co-players

Many studies (Nielsen, 2005; Seay et al., 2004; Lazzaro, 2004; Chen & Duh, 2007) have shown that socializing is the number one motivation to play digital games. The participation of millions of people worldwide in online virtual game worlds illustrates the importance of gamers' needs to come together and interact on the Internet (Steinkuehler & Williams, 2006). Online virtual worlds are computer-simulated environments that can take the form of communities in which users can interact with each other (Bishop, 2009). These environments have become a natural place to meet with co-players, where communication is highly important (Wiklund, 2005). For instance, Hsu and Lu (2004) revealed that social interactions are important predictors of players' intention to play online games, while Chen and Lei (2006) demonstrated that gamers with a higher degree of interpersonal interactions play longer than those who communicate less with others. Off course, establishing contact with others is a must since grouping and sharing information is crucial for surviving in some games (Taylor, 2003). However, conversations may easily be about real-life issues as well. These studies illustrate the rich and diverse interactions that take place in these environments, which qualify online virtual worlds as excellent places to study the meaning and type of social interactions that emerge between (online) players.

However, it is expected that interactions are even richer and more frequently present in co-located settings; co-playing at home or at a friend's place is the most popular option for such a setting (Nielsen, 2005). The appeal of multi-play is also evident at Local Area Network (LAN) events. At these social events, gamers physically come together to meet peers and play their favourite games in competition or collaboration; compared to homes, at LAN events far more co-players can be present. Research revealed that LAN visitors are primarily motivated by social interaction in terms of fun with friends, camaraderie, chatting, teasing, taunting, and joking (Clarke & Duimering, 2006; Jansz & Martens, 2005). They themselves strongly support the assumption of gaming being a social activity, and consider digital gaming to be a shared experience with friends or strangers (Griffiths, Davies & Chappell, 2004). LAN events are excellent places to study interactions between gamers, however, the gathering of visitors cannot be compared to those in virtual worlds in terms of building a community. The events are only organized a few times per year alternately in different cities across the country. Therefore it is much harder for gamers to build or maintain friendships and feel themselves at home, since it is not a permanent social gathering space like a virtual world. A place that perhaps is more similar to online communities is the game café; in spite of the impressive penetration of computers and consoles in private homes, game cafes are appearing in many countries over the world. They are places where one can use a game computer

for a fee, and enjoy food and drinks like in a regular Internet cafe. Several studies argue that the appeal of these cafes is mainly determined by the presence of co-players and peers (Chee, 2005; Lee, 1999; Lin, 2005; Võ & Danico, 2003). By visitors the cafe is seen as a social place, where they can meet others and escape from daily worries. Moreover, the cafe may be the only public space for them to socialize and play games with their "real" and "virtual" friends at the same time, any day of the week (Powell, 2004). Considering these affordances, game cafes seem excellent places to study frequent and rich interactions between co-players before, during, and after game play.

Third Place

Although co-playing in mediated and co-located settings differ in terms of physical proximity, the above mentioned studies demonstrate that social interaction has an important role in virtual worlds and game cafes. This is also supported in literature where both environments are characterized as *third places* (Steinkuehler & Williams, 2006; Chee, 2005). According to Oldenburg (1989), third places are public places where people can gather and where social interaction is promoted. They are places of social equality where "everybody knows your name", which everyone can visit regularly, voluntarily, informally and almost at any time. The environment offers a home-like atmosphere and a sense of belonging for visitors, because people may come and go as they please, "nobody plays host" and one can find like-minded others there. As a result, these environments are perfect places to bond with friends and to build new friendships. Researchers in online multi-player games suggest that virtual worlds are structurally similar to third places as described by Oldenburg (e.g., McGuire, 2003; Steinkuehler & Williams, 2006; Ducheneaut, Moore & Nickel, 2007). Since all of Oldenburg's characteristics are present in online communities, they can be seen as places where people can maintain their social networks by meeting peers (Steinkuehler & Williams, 2006). Studies on game cafes reveal very similar phenomena as was shown by Chee (2005) and Liu (2009); game cafes are neutral ground, everybody is equal, they are easy to access, have a homely character, the mood of visitors is playful, and – above all – social interaction is the main activity (Oldenburg, 1989). Both places are denoted to have social functions that highly depend on the interpersonal interactions that may take place during visits. However, since the types of social interactions within mediated and co-located settings are expected to be divergent, it is therefore plausible to suggest that the quality and quantity of interpersonal interactions in virtual worlds and game cafes are different as well. Consequently, relationships between co-players in online games may be dissimilar to those built and maintained in physical co-play environments, which may in turn have an impact on how play is experienced.

Asia-based studies

It was noted that literature on game cafes is often specifically focused on Asian gamers, while research on interactions in virtual worlds are not primarily based on one specific ethnicity or culture. In Asian countries the tight living spaces and family dynamics have their impact on where people play games. Less privacy and parental disapproval to play games force young Asian adults – who often still live with their parents until they are married – to Internet cafés; entertaining friends therefore is rarely done in the home (Lindtner & Nardi, 2008). Furthermore, China has a one-child policy for controlling the Chinese population. This may result in less social interaction in the homes than families in other societies, and in less availability of co-players in the homes to play games with. As a result, in Asian countries gaming is mostly done in Internet cafés (Chee, 2005; Liu, 2009). In Western society however, it is more common to invite friends over to play. Since motivations to visit game cafes seem to vary between Asian and Western gamers, it therefore is uncertain whether findings on game cafes by Liu (2009) and Chee (2005) are universal and for instance hold for social interactions in game cafes in Western societies.

2.1.2 Aim of the study

To get more insight on how digital games are played together, how social interactions surrounds play, and how important it is to have personal interactions in play, it was decided to explore the communications between visitors of game cafes. Since social interactions are prominently present in these places, they form an ideal starting point to explore interpersonal communications in light of our research. Research has shown that game cafes are environments that can be theoretically understood as third places. However, in most studies the focus has specifically been around Asian gamers. It was therefore decided to study communications and behaviours of visitors in a typical Dutch game cafe and relate our findings to existing literature on social interactions in virtual worlds and Asian game cafes. Focus groups and contextual inquiries were employed to unravel the key factors that explain the appeal of meeting others in play settings. First, interviews were analyzed to understand the social function of co-located co-play by using game cafes as an example. Second, results are compared with similar studies to identify whether the included Dutch game cafes also can be regarded as a third place. If so, conclusions drawn in Asia-based studies – regarding the third place – may also be used in our research. Lastly, results on co-located settings are compared to findings from existing studies which focused on mediated co-play. This chapter will give more insight in the differences in social dynamics between play settings, and will function as a proper start-off point for this thesis to reach a better understanding of social interactions

and the influence on player experience in digital co-play. Moreover, by exploring social settings, variables that can affect player experience can surface. These variables then will be included in the experimental design of our planned experiments.

2.2 Method

2.2.1 Design and participants

Two qualitative techniques for gathering information were used. Both tools, *focus groups* and *contextual inquiries*, are common techniques for exploring how and why people behave in a certain way. A focus group is an exploratory form of qualitative research in which a group of participants is asked about their experiences or beliefs about a complex phenomenon (Lunt & Livingstone, 1996). Due to the open discussions, focus groups often reveal topics that might not be discovered through other means (Merton, 1987). A contextual inquiry is a process of engaging in conversation with users in the context of their task (Holtzblatt & Jones, 1993). This technique is grounded in observation of behaviour, and its value lies in the opportunity to reveal inconsistencies between what people say they do (e.g., in an interview or focus group) and their actual behaviour (Beabes & Flanders, 1995). Both techniques complement each other and together make a strong method to gain a much deeper insight in behaviours and their motivations (Dray, 2008).

Three focus groups were organized with Dutch gamers (all male) who frequented the *Starbuzzgames* game cafe in Amersfoort, the Netherlands. Interviews were performed in the game cafe, to prime participants in their role as gamers. Two focus groups (FG1 and FG2) were conducted during the afternoon, both with eight high school students as participants. The third focus group (FG3) consisted of six participants, high school students and working people, and was held in the evening. Ages of participants ranged from 14 to 20 ($M = 17.9; SD = 1.7$). Three contextual inquiries were organized with (Dutch) visitors of a gaming tournament at the *WZZRD* game cafe in Enschede, the Netherlands. The participants were all 17 years of age, male, and high school students. All participants mentioned that they visited the game cafe at least once a week, and played games approximately one hour per day. They indicated to play online games both at home (in a mediated co-play setting) and in game cafes (in a co-located co-play setting), providing them good insights in possible differences between the settings. Participants were recruited by the game cafe managers. They received consent forms for themselves or their parents to fill in for giving permission to use their data.

2.2.2 Procedures

Focus groups

The focus groups were structured in four parts:

Introductory round: First, after gathering around in a circle of chairs the moderator introduced himself and explained the purpose of the session to the participants. They were informed that the research was performed to explain non-gamers about the experiences of playing multiplayer games at home and in game cafes. Subsequently, they were given consent forms to fill in and were asked to introduce themselves.

Individual task: Second, each participant was asked to individually write down three advantages and three disadvantages of co-playing in a game cafe compared to co-playing a similar game at home. After three minutes, the moderator copied their answers to a whiteboard. The whiteboard would be visible throughout the whole session; additional (dis)-advantages that emerged during the interviews could be added if necessary. After constructing both lists, the group discussion was started.

Group discussion: The largest part of the session was the group discussion. It consisted of a discussion about all the responses to the individual task, and three core questions: (1) 'Can you describe why and how you decide to go to this game cafe?', (2) 'Which steps do you take chronologically after you enter the cafe?', and (3) 'Can you describe why and how you decide to leave?'. Participants could freely talk and discuss their opinions with each other. Besides the core questions, the moderator cold probe further to clarify remarks or views of the participants; sub questions were mainly focused on the contrast of playing online at home with playing in the game cafe. The group discussions lasted approximately forty-five minutes.

Ordering task: Lastly, after the main group discussion participants (in groups of 2 or 3) were asked to rank all advantages and disadvantages mentioned according to their relative importance. Discussion between the groups was not allowed.

After ordering the lists, participants received 12 Euros compensation for their participation, and were debriefed. The focus group interviews were taped with a voice recorder and video recorder, and later transcribed for analysis.

Contextual inquiries

A contextual inquiry was performed, in which the interviewer watched participants play games for forty-five minutes and recorded events that took place and any questions associated with the events; afterwards, the participant was interviewed on the basis of the recorded notes. After all, gaming is an activity that requires much attention

and therefore ideally should not be interrupted by the interviewer. The inquiries were structured in four subsequent parts, in which the introductory round, individual and ordering tasks[4] were identical to those in the focus groups; the group discussion however was substituted by the reflection task. During this task, information was gathered about what the participant said and did while starting, playing, and ending a game. The same core and sub questions as in the focus groups were asked. In addition, the interviewer could ask participants to demonstrate certain actions and clarify them (e.g., *"Can you demonstrate how you invite others to join the game?", "Is this done differently when you play at home?"*). After ordering the (dis-)advantages, participants received 10 Euros for their participation, and were debriefed. Contextual inquiries were only taped with a voice recorder, due to restrictions set by the game cafe owners.

2.3 Results

This results section is structured according to the three core questions and ordering tasks from each interview; results for the focus groups and contextual inquiries are merged in this section to avoid overlap. Results from the individual task are discussed throughout the text, and those of the ordering task are given in the last paragraph. According to the Grounded Theory approach (Glaser & Strauss, 1967), key points were extracted from the interviews and grouped into three concepts (the appeal of co-playing at game cafes, activities at game cafes, pros and cons of game cafes). Transcriptions of both methods were manually coded by the author; each remark or action was given meta-data (e.g., freedom of choice, escape from daily hassles, hardware/software, performance, social interactions, in-game tactics, co-play vs. solo, collaboration vs. competition, online vs. offline, extra benefits and costs). Subsequently, three experts formed categories by using the remarks with meta-data from which conclusions were drawn. This method was also used by Poels and colleagues (2007).

2.3.1 The appeal of co-playing at the game cafe

First of all, participants concluded that their decision to come together at the game cafe was always a result of having spare time (as a group). Their attendance was never planned long in advance, although they did indicate that at the end of the week they expected the others would be present.

...no, I just go when I feel like it...actually when I'm free. For example on Fridays, we come together here more often than on other days. You know, everything on the other days is planned... on Fridays though, we have more spare time. However, when

4 The ordering task for contextual inquiries was performed individually, whereas for focus groups it was performed collectively in groups of three participants.

something is rescheduled during the week, and we do have some time left, we also try to come here... (FG1, 16 years) [5]

Once the decision to visit the game cafe has been made, appointments are arranged via e-mail, chat or SMS. Participants indicated that they often travelled to the game cafe together by bus or bicycle and waited for each other at crossroads, and never liked to enter when only strangers were present, although the latter rarely happened. The motivations to decide to play at the game cafe were in general similar across all interviews. All participants indicated that they wanted to (physically) meet their friends and have fun with them. They saw the game cafe as a central point to meet each other, away from school, work and home. Next to discussing in-game moments, the opportunity to socialize about real-life topics was mentioned as a big advantage of playing at the game cafe instead of at home.

…it's just that, here we are pleasantly together with each other…. we can sit here as one group, talking to each other and gaming with each other…. that's the part I like best... (FG1, 16 years)

…look, at home I have an even better computer than we have at this game cafe, but still…. here it is more fun, because of the atmosphere…. to be together with your friends and others, it is so much fun to play with each other… you cannot find that at home…(FG3, 14 years)

Some participants referred to the game cafe as their second home, and considered the owners as confidants or even family. Being there made them feel carefree from problems at home and brought them the (physical and mental) rest they needed.

…of course, the owners... they always remember what they talked about with you, and the next time you come by, they will ask you how you are and ask about the thing you mentioned last time….they really show interest, as if they are some kind of second parents…(FG3, 18 years)

….well, when I step into this cafe I just enter another world, far away from my daily worries... (FG2, 19 years)

Furthermore, participants pointed out that in game cafes, people share the same interests, in contrast to their relatives at home who typically don't show much enthusiasm

5 All citations were translated from Dutch.

for digital games. This was a powerful motivator for them to visit these cafes. Related to this, they all confirmed the enjoyment they experienced while playing with each other, while other visitors watched and commented on in-game events.

…well, everybody understands each other, we all want the same and that is to have some fun together...you can also make inside jokes, which somebody outside will not understand... that makes it so special to be here... (CI2, 17 years)

Ohh, yeah…the reactions of the others….you know, what just happened earlier, the "ooohhwww" …we played a session of an online first person shooter (FPS). We started with eight persons, and one-by-one players were eliminated. However, when you're eliminated you still can watch the game. So, when there are still two or three players left… the others are still absorbed with the game as spectators, cheering and shouting after great moves…. That makes it even more fun… (FG1, 16 years)

The experience of being co-located together, sharing thoughts and emotions was explicitly reflected on the following quote:

...at home, you just talk into a microphone, and that's it... here, we actually talk to each other...directly...you can better feel the other's emotions.... (FG1, 16 years)

The physical presence of co-players also affords social control and conformity and compliance to shared social rules. Acts of cheating, aggression and/or annoyance, are easily sanctioned, as players would refuse to include the offender in a new round.

...you actually can't find cheaters here (in contrast to mediated co-play); because everybody here knows the rules and is furious when they are broken...we know that of each other...otherwise you wouldn't come here... (CI1, 17 years)

If someone is cheating, we just refuse to play against him and he will be excluded from co-playing. The same holds for people who use inappropriate words or have an aggressive attitude… (FG2, 18 years)

As expected, participants unanimously indicated that the superb quality of the available hardware in game cafes was also a reason to decide to play there. Next to the high speed Internet connection, powerful computers, large screens and game oriented adjustments for the mouse and keyboard, the number of available popular games to choose from is attractive for many gamers.

...here you have a lot of games to choose from, and it always works. You just sit down, choose the game you like, and play against anyone you like. At a LAN-event you have to install several things, and then people don't have the same game as you do..... here, you just sit down with your friends and play...instantly... (FG2, 17 years)

To elaborate further on hardware, participants reported team-play to be much easier and better due to the physical nearness of co-players. In contrast to when they play at home, here they refuse to use indirect communication via microphones and preferred direct communication for in-game tactics and reactions.

…furthermore, strategies are communicated faster than at home, where you are just sitting alone instead of in a group of fifteen players... (FG2, 17 years)

The importance of streamlined team play can be attributed to the importance of competition and performance for players in game cafes. The physical presence of co-players results in even more peer pressure than during mediated co-play. This reinforces player enjoyment as the performance is directly monitored by co-located co-players and spectators.

…here, the pressure is higher, because they sit next to you. At home, excuses for playing badly are easy to make, and you just can stop immediately. Here, if you quit the game due to bad performance you will lose status. You have to prove yourself, you have to perform… and if it's going badly, you have to cope with that… but this pressure at the same time is part of the enjoyment, without it…it wouldn't be that much fun to play here… (FG3, 17 years)

…if you shoot someone in a nice way, or you just walk behind a player while he has no clue that you're walking behind him….yeah that's fun, and you can show that here to others… (FG1, 16 years)

Although competition is of high importance, it is not the primary motive to visit game cafes. In contrast, when playing purely for competition, participants indicated to rather play "solitary" at home where game settings are personalized.

…if I really want to play competitive, I think I would play at home. There you have your own pc, mouse, and there is no distraction… (FG3, 17 years)

But most of all, the main reason to play online at home is the much larger pool of potential (online) team mates who are available. These co-players can be chosen based on their in-game expertise to guarantee a better (team) performance, than those present at the game cafe.

…at home you can choose your team mates on their in-game specializations... here you just choose team mates because they are your friends… (FG3, 18 years)

This eighteen years old participant furthermore explained that he often played at home with his (mediated) friend *Striker84* since their cooperation always went very smooth. However, he could not give his friend's real name or contact address for participation in this study, since he did not have this information.

2.3.2 Activities at the game cafe

When visitors entered the game cafe, they often behaved similarly. First of all, they entered the cafe in a way people would enter their own living room returning home from work or school (e.g., get something to eat, talk to friends about their day). Then they searched for an available place where they could sit as a group.

...I always say "hi" to the people who are present and then search for a place to sit down and game...I always get the feeling that I'm coming home when I enter the cafe... (FG3, 20 years)

Once they were logged on and their group-territory was marked out with coats and rucksacks, matches were arranged by walking around, looking for other groups to compete with. If their own group was too small, they would ask others for permission to join their game; making contact with other visitors was easy to accomplish. Participants stressed that they never experienced exclusion, since it was always more fun to play with a larger group and meet new people.

…firstly, you ask around who wants to join or whether you can join. We are very reasonable, nobody will be rejected because everybody is welcome… the more players the better… yes, meeting new people, isn't that what it's all about? (FG1, 19 and 17 years)

Game selection was often determined by what the other players already were playing. The highest preferred genre was the FPS, although it was observed that sports games were also frequently played.

…it depends on the mood you're in you know…sometimes you feel like playing a round of FIFA, and sometimes you feel like playing a shooter game… (CI1, 17 years)

…at home I also play strategy games, but not here, because they take too long. We always play shooters, because of the action and short rounds… (FG2, 18 years)

After the agreements, the players returned to their computers and started to customize settings, e.g. accuracy of mouse, volume of sound etcetera. While waiting for the game to load and for others to customize their settings, the waiting period was filled with joking around, challenging each other, or selecting radio channels together for background music.

…I always customize settings, because I'm used to a particular setting. It's very annoying to have a slightly too fast or slow mouse. Some of us also take their special game mouse with us to the cafe… (FG1, 16 years)

During the game, al lot of communication took place between both collaborative and competitive co-players. Communication between players in collaboration was mainly focused on in-game strategies, whereas communication between opponents was mainly focused on challenging, teasing, and joking. All participants indicated that communication with others while playing was far less at home. Breaks were an important part of the game cafe visit, and gave visitors the opportunity to chat with others and to watch others play. Participants indicated to take far more breaks at the game cafe than at home, and always to take breaks with others.

…well here it is more fun to have breaks and watch others play…at home you only can watch the ceiling or the walls, but here you can enjoy yourself by being a spectator… (CI3, 17 years)

…when you think that you have gamed enough, you can take a break, drink something, breathe some fresh air… there are always others who want to join you when you're going for a walk outside, they then also take a break, maybe for smoking a cigarette… and most of the time you talk about the games you played… (FG3, 16 years)

When a game ended, opponents shook hands and discussed the game. Discussions sometimes even took more time than playing together and often resulted in rematches. Occasionally, discussions attracted other visitors who then interfered, which eventually led to an even larger group that collectively started a new game.

Participants mentioned three main reasons for ending game sessions and leaving the game cafe. First of all, they explained that playing at the game cafe can become very expensive as one has to pay a gaming fee per hour, pay for drinks and pay for snacks. After all, most visitors were young adolescents who still went to school, received allowance from their parents, and perhaps had a job on the side. Second, the desire to play at the local game cafe often depended on the presence of friends or familiar others. Participants emphasized the importance of being surrounded by acquaintances and indicated that the sole presence of strangers was a reason to leave or not enter the game cafe.

… oh, when there are no people here who I recognize, then I just turn around and go home…it's not so much fun to play with strangers. It doesn't go that well… (FG2, 19 years)

The last reason for leaving was that other engagements were scheduled such as homework, appointments with friends, dinner or catching the train/bus. Notably, participants never mentioned leaving on account of boredom. Most of the time visitors left simultaneously so they could cycle home together, stop by the local snack corner for a sandwich, go to the gym, or go out for some drinks. Their conversations often started about the activities in the game cafe, but soon would switch to non-game related topics. Interestingly, participants mentioned never to play games at home shortly after they had visited the game cafe, even when they had not gamed a lot.

2.3.3 Pros and cons of game cafes

At the end of the interview, participants ordered a list of advantages and disadvantages of visiting a game cafe over playing at home in terms of their relative importance. The presence of co-players and spectators was the primary reason for preferring co-play in game cafes. It related to many perceived advantages such as an atmosphere of cosiness, conversations, shared interests, better team-play, visibility of game performance, and higher pressure to perform. A second cluster of important advantages involved the escape from the reality of home, having time for oneself, having some privacy (e.g. from family), no commitments, relaxation after school/work, and distraction from problems. The presence of high quality hardware and many popular games was revealed as the third category of important advantages that attracts gamers towards game cafes. All participants mentioned the amount of money they had to pay as a big disadvantage. Addiction was also mentioned, although none of the participants considered themselves as addicted. They indicated that mentioning addiction was largely inspired by the media and not by personal experiences. One participant confessed he used to have some problems with addiction and gaming. However, due to his visits and experiences in game cafes these problems disappeared.

...if I'm really honest, at home I gamed too much. However, when I was introduced here, I actually gamed less, most of the time I was just having a good time with others chatting or watching others play. If my friends were not here, I probably would be at home, playing alone... (FG2, 20 years)

In general, advantages were far more prominent than disadvantages; in most interviews the same examples were used by participants to explain the (dis)-advantages.

2.4 Discussion

In light of the research in the current thesis, a general understanding of the quantity and quality of social interactions that are afforded in play settings is needed. Therefore the current study employed qualitative research methods to explore the interpersonal interactions between gamers who frequently play multiplayer games in co-located settings. To understand how the social setting of game play may influence the relationship and interactions between co-players, co-play was studied among fervent gamers in their 'natural habitat'. It was chosen to study the behaviour of visitors at game cafes, in which interactions are intensive and frequently present. Game cafes are examples of places where gamers come together with the purpose to meet and play with others face-to-face, or rather, side-by-side; they can be theoretically understood as third places. Literature already reported of a number of studies on game play in such game cafes (e.g., Chee, 2005; Liu, 2009), but these were mostly located in Asia, where cultural differences may well exist. A second goal was to compare this phenomenon of intensive and recurring co-located co-play with its virtual counterpart: online multi-play. The gamers in the current study all embarked in online multi-play on a regular basis as well, so they could reflect on the differences from their own perspective. Moreover, literature reports of a number of (ethno-methodological) studies of online multi-play (e.g., Steinkuehler & Williams, 2006; Ducheneaut et al., 2007), against which these findings can be discussed. Results revealed that Dutch game café visitors' principal motivations for deciding to visit such places were the opportunities to maintain or build social contacts. In game cafes they may share their interests with their peers, which most often is not the case at home. According to players' personal reflections, competition was not their primary motivation to play in the game café; winning seemed more important to them when playing online at home.

2.4.1 Game cafes as third places

In general, the results from the interviews revealed three important classes of affordances offered by game cafes and throw light on the secret of their success. The first is the *opportunity for social interaction* with other visitors, especially with friends

and familiar others. As with Dutch LAN-events (Jansz & Martens, 2005), visitors indicated that playing, talking, and being surrounded by (familiar) co-players and spectators is the most important part of being at the game cafe. In line with arcade hall studies (Durkin & Aisbett, 1999; Williams, 2006) and other Internet cafe studies (Lee, 1999; Lin, 2005; Võ & Danico, 2003), visitors argued that the presence of others induced a higher peer pressure and therefore enhanced their player enjoyment. They collectively indicated that without the presence of (familiar) others they would not frequent a game cafe, since it is a place to socialize and where friendships are built and maintained. The second category of affordances is *escape from the hassles of home, school and/or work*. Visitors mentioned the carefree and cosy atmosphere, which offered them distraction from their daily worries. Both cafes included living-room furniture where visitors could chat, read, or just sit down to have some relaxed moments. In line with results of other teen centres (Witt & Caldwell, 2005), the cafe also functioned as a safe place where daily problems could be shared with peers, and especially with the owners who were often treated as confidants and by some even regarded as substitute parents. The last category of affordances is the use of *high quality hardware*, such as high speed Internet connection, powerful computers, large screens, game oriented adjustments for mouse and keyboard and a large offering of popular games. However, since most participants indicated that they had the same quality of hardware at their homes, this category does not answer the question why visitors chose to play at these cafes and not chose to play at home. Considering these results – especially the first two affordances –,the Dutch game cafes in this study are entitled to be seen as a *third place* (Oldenburg, 1989) just like their Asian counterparts. These findings clearly underline the fact that digital games need not be isolating, but can be enjoyed collectively – before, during, and after play – and work as a catalyst in creating and maintaining social ties[6].

2.4.2 Mediated vs. co-located co-play

Game cafes and virtual worlds (Steinkuehler & Williams, 2006; Ducheneaut et al., 2007) are put in the category of third places, and they both are environments that provide people the feeling of inclusiveness and belonging to a group. Despite these similarities, a clear distinction can be made between them in terms of the presence of co-players. In game cafes visitors are physically present, while in virtual worlds they can be physically located on another continent. Some researchers mentioned the issue

6 Interestingly, Oldenburg himself claimed that *"a room full of individuals intent upon videogames is not a third place"* (p. 31). Apparently he focused on playing digital games as a performance orientated form of activity without informal (out-of-game) interactions, and was not fully aware of the activities within Internet/game cafes.

of locality in computer mediated communication environments and acknowledge the difference in opportunities for social interactions between mediated and co-located settings (Doheny-Farina, 1996; Soukup, 2006). Since third places have social functions that heavily depend on social interactions (Oldenburg, 1989), the dissimilarity in afforded types of communication between mediated and co-located settings may point out that the social function of a third place may differ between play settings. This is partly shown by our results, where visitors mentioned that the opportunity to socialize about real-life topics was a big advantage of playing at the game cafe over online play at home. Furthermore, they mentioned the importance of being physically there as one group, as it gave them a sense of belongingness. They indicated that emotions of others are more easily perceived, which enhances their player experience. Their enjoyment is also positively affected by the absence of cheating as a result from social control and conformity, and compliance to shared social rules. The visibility of their in-game performance and presence of spectators gave game play a more social dimension, which is different from playing over the Internet at home; they are a source for discussions during and after the games, and often result in social gatherings and a rematch. An important remark was made concerning friends in both play environments. While visitors of game cafes were highly informed about the lives of their friends who joined them, friends in virtual worlds were only superficially known. Interpreting the advantages and disadvantages of the two co-play settings, differences mainly are concerned with the gamers' player experience and the strength of social ties with their co-players. In the next section, these findings are discussed in the light of the social consequences and meanings of interpersonal interactions.

2.4.3 The bonding & bridging function of co-play

In online games, players create or select an in-game avatar which they use to interact with other visitors in virtual worlds. They will give the avatar – an in-game representation of their selves – a screen name, often different from their real names. Since name, age, gender and race can be easily manipulated, personal information of one's co-player cannot be reliably deduced from created avatars (Lee & Hoadley, 2006). This anonymity provides a safe haven beyond the reach of one's real (offline) life and blurs social boundaries embedded in traditional games. In a way, most online friends are actually real life strangers, whose names, addresses, interests are not known. Although visitors do meet and interact with a lot of new people online, their relationships more often will remain superficial. As a result, numerous but weak social ties emerge between co-players in mediated settings (Steinkuehler & Williams, 2006; Kobayashi, 2010). However, when gamers physically meet each other, personal information about one's age, gender

and race are hard to conceal. Since results revealed that in co-located co-play more communication takes place, opportunities are available to learn even more about each other. After all, by spending a lot of time with each other outside game-periods, private conversations – e.g., about school, work, home, or other shared interests – are common; earlier findings have revealed that real-world communication can be supported by digital technology, and that conversations about the technology often gradually shift towards more general topics (Sueda, Ishii, Miyaki, & Rekimoto, 2009). In physical settings, (unfamiliar) co-players easily could become acquaintances or real life friends; if they already are companions, this setting is a convenient environment to maintain this friendship. Thus, although fewer co-players are encountered compared to online co-play, stronger social ties seem to be created and maintained within offline co-play.

The dissimilarity in strength of social ties (i.e., social connectedness) between both environments can be explained by two concepts introduced by Robert Putnam (2000). In his book *Bowling Alone*, Putnam discusses the social capital theory (Bourdieu, 1983) and argues that all social networks have value. He divides social networks in multiple dimensions, with the dimensions of *bridging* and *bonding* as the most important. Bridging refers to the connection when people reach out outside their own circle. It is associated with progress, economic growth; chances of success for a new job are much higher when employment agencies are consulted, instead of the small pool of familiars (co-workers, family members, and friends). Similarly, online gamers in virtual worlds search co-players over the Internet with an individual expertise that may heighten their chances of success in the game when they collaborate, or that matches their own expertise for an exciting competitive match. In line with Steinkuehler and Williams (2006), we argue that mediated co-play settings function as bridging mechanisms. On the contrary, bonding refers to maintaining strong social ties with people within one's own sociological niche. It is associated with "getting by" in life and represents the strong social relations humans need to survive; people have the intrinsic need to share personal information, experiences, and emotional feelings with others (Baumeister & Leary, 1995; Ryan & Deci, 2001). Considering the current study and that of others (e.g., Chee, 2005; Liu, 2009), we argue that environments in which gamers play side-by-side function as bonding mechanisms.

2.4.4 Additional findings

The study was also explored additional factors in social play settings that could or should be included in the design of future planned experiments. The first factor that emerged was players' and their co-players' performance in the game. Many conversations within or outside the game were related to achievements of individuals,

which seemed to influence the behaviour and experience of players. Another factor was the degree of familiarity between players; play was indicated as more fun and intense with familiar others than with strangers. A third factor that appeared relevant for the way players interacted was whether they were in collaboration or in competition. Since we expect that there is a possibility these factors may influence player experience, they will be included in our planned empirical studies.

2.4.5 Conclusion

Game cafes are one of the most intensive and richest settings to study interactions between digital gamers in co-located co-play. They can be seen as third places, environments that provide the feeling of inclusiveness and belonging to a group. Although virtual worlds and game cafes differ in the physical location of co-players, in academic literature virtual worlds also are considered to be third places. Both environments are examples of two types of social play settings; playing in virtual worlds is an example of a mediated co-play setting, and playing in game cafes an example of a co-located co-play setting. Using Putnam's dimensions, we argue that mediated co-play settings work as bridging mechanisms, a place where weak ties with others are established. Whereas co-located co-play settings work as bonding mechanisms, environments where strong social ties with others are built and maintained, and daily issues can be vented. These social functions are the main factors that illustrate the difference between mediated and co-located co-play due to the difference in physical proximity of the co-player. In the next chapters we will investigate in more controlled settings how these differences have an impact on players' experiences in playing multi-player games.

Chapter 3
Player Experience in Co-Play Settings [7]

7 This chapter is based on Gajadhar, de Kort & IJsselsteijn (2008b; 2009a; 2011).

3.1 Introduction

Interpersonal interactions in mediated co-play differ from those in co-located co-play settings. When players are in the same physical space, interactions are more intimate and occur more frequently. As a result, it is expected that playing with a nearby other will elicit stronger feelings of being together, i.e. social presence, than playing with an artificial or mediated other. In general, the formation of social bonds and being with others is associated with positive emotions. This implies that a strong sense of social presence induced by social interactions in multi-play may elicit a more positive player experience. A small number of earlier studies indeed reported differences in player experience between digital co-play settings (e.g., Ravaja et al., 2006; Weibel et al., 2008; Lim & Reeves, 2010). These studies revealed that players' in-game experience became more positive when more opportunities for social interaction are provided; findings hint toward a positive role of social interaction in player enjoyment. However, the general view in literature on player involvement is that social interactions may be of negative influence on players' focus on their game. Sweetser and Wyeth (2005) argued that other people[8] provide players a link to the real world, potentially interrupting flow or immersion and pulling attention away from the game. Their view is corroborated by the work of Baron (1986), who argues that others can be regarded as a source of distraction and consequently may interfere with information processing which ultimately will influence players' experiences. After all, immersion and flow in essence describe mental states in which all attention is directed at the game. From this perspective co-players can be considered a distraction. However, no empirical results were found in literature to support this theory. Moreover, the fact that a number of authors have reported that social interaction is the number one motivation for digital gaming (e.g. Nielsen, 2005; Jansz & Martens, 2005) appears to challenge this hypothesis of disruptive effects of the presence of others. Moreover, Copier (2007) argued that people who are engaged in play create a social play atmosphere themselves – referred to as *the magic circle* – which keeps them involved and motivated in the activity. Perhaps this apparent contrast explains why most scientists have been hesitant to adopt social components in their player experience models. Since writings have mostly been conceptual or theoretical, empirical investigation of the influence of co-player presence on player involvement may help shed light on this ambiguous matter. In this chapter we therefore will investigate how co-players affect people's experiences by their presence, relating to both enjoyment and involvement. Based on findings in previous work in gaming (e.g., Ravaja, 2009; Lim & Reeves, 2010), computer-mediated interaction (e.g., Short et al., 1976), and

8 Sweetser and Wyeth (2005) were not clear on whether they meant co-players (playing against or with each other), players (playing games independently from each other) or audience members (non-playing others).

theoretical considerations (de Kort & IJsselsteijn, 2008; Biocca et al., 2003), the role of social presence as mediator of social context effects will also be empirically examined. Furthermore, more insight will be provided in whether co-players break the focus in play as projected by Sweetser and Wyeth (2005). Yet before the experiment is presented, previous work on player experience and social presence will be discussed below.

3.1.1 Effects of co-player presence on player experience

Recently, effects of co-player presence on player's feelings were studied by Ravaja (2009) and colleagues (2006). Results from the study between playing against an artificial and a co-located co-player revealed that human co-play elicits higher anticipated threat, spatial presence, challenge and engagement than play against a computer controlled non-human agent (see Ravaja et al., 2006). Moreover, they reported higher positively valenced emotional responses in co-play with a co-located human opponent compared to play against a computer. Importantly, since engagement and arousal were both higher for human co-play, it was argued that attention in co-located co-play was higher. Although they could not test for this, Ravaja and colleagues conjectured that perhaps their findings could be attributed to the basic human motivation for belongingness. Mandryk and Inkpen (2006) revealed similar effects between co-located and artificial co-play settings. In addition, since in both studies the level of engagement was higher when the opponent was a co-located human instead of an artificial agent, these findings seem to contradict the assumption made by Sweetser and Wyeth (2005) that co-players reduce the focus on their games.

Ravaja (2009) repeated the experiment (Ravaja et al., 2006), this time studying the difference between playing with an artificial versus a mediated co-player; similar effects were found as for co-located versus artificial co-play. Differences between computer controlled and human controlled opponents were also studied by Lim and Reeves (2010) and Weibel and colleagues (2010). Their studies revealed similar results to that of Ravaja; play was experienced as more positive when playing against a "real human". Ravaja contrasted his latest (2009) results for a mediated human co-player with those of the co-located human opponent from the previous (2006) study. A comparison revealed no differences on self-reports between the mediated and co-located setting; facial EMG did show higher scores for co-located play. It was suggested that this muscle movement was only caused by voice communication between participants when playing side by side. This type of communication was not available in the other setting. An alternative explanation could be that the measures employed for self-report were not sensitive or accurate enough to pick up the differences between these two conditions across studies.

Social presence in game studies

The above-mentioned studies indicate that play becomes more engaging and fun as the sense of playing with a real human is more manifest. Online co-play with a human other was experienced more fun and engaging than (alleged) playing against the computer, even when in fact both play settings were identical (Weibel et al., 2008; Lim & Reeves, 2010). Perhaps this effect occurs because gaming with others – even without any vocal or visual cue of the other – is still felt as a form of social interaction. In artificial co-play, the perception of social interaction is minimal as the other co-player is a (non-social) computer. In mediated co-play, the same type of interaction is perceived as more social, simply because in-game behaviours are controlled by humans. In addition to this, co-located co-play naturally offers many communication possibilities such as talking, laughing, gesturing, and so on. Hence, gaming seems to become more social from artificial, to mediated, to co-located co-play. A concept that has been used in literature to distinguish media settings from each other on the basis of afforded social interaction is *social presence*. As mentioned in Chapter 1, Biocca and colleagues (2003) defined social presence[9] as the sense of being with another; it has been widely adopted in Computer Mediated Communication research (Short et al., 1976). In the field of digital gaming though, very few researchers have employed the concept. Xu and colleagues (2008) studied three different types of play settings for board games and argued that these settings could be classified by the interactions they afford. Results confirmed that more social presence in terms of social interaction, awareness of others, and awareness of being observed was present in the co-located settings that offered most opportunities for interpersonal interactions. In addition, findings showed that the same trend was present for the enjoyment of play, suggesting that social presence has a mediating effect. Although a mediation analysis was not employed to test this underlying mechanism, their findings suggest that social presence is a relevant concept for comparing play settings with each other that differ in type and amount of afforded interaction.

Player enjoyment vs. player involvement

The level of social presence affects players' experiences in digital gaming; in Chapter 1 we discussed that player experience is a broad construct that consists of enjoyment and involvement related feelings. Although highly related with each other, it cannot safely be assumed that social presence has the same influence on both concepts. First of all, some have theorized that the presence of human co-players brings more enjoyment

9 Social presence should not be interpreted as a dichotomy; i.e., the other is absent or present. The concept presents a continuum where the sense of the other can be very strong, very weak, or somewhere in between.

(de Kort & IJsselsteijn, 2008), while others suggest that they may also hinder the focus in play (Sweetser & Wyeth, 2005). Second, feelings of enjoyment may be transferred to the co-player differently than those of involvement. For instance, during informal observations in a pilot study (Gajadhar et al., 2009b), it was noted that enjoyment was often expressed by both verbal (e.g., laughing, talking) and nonverbal (e.g., smiling, hand gestures) cues, while involvement was only noticeable from nonverbal cues (e.g., leaning forward towards screen, eyes on screen). Moreover, in contrast to cues that express involvement, behaviours signalling enjoyment are more often directed towards a co-player. These considerations suggest that social context and social presence may differentially affect player enjoyment and player involvement.

3.1.2 Aim of the study

This thesis is geared towards gaining an understanding of the effects of social context on how play is experienced. Differences between social play settings can be explained by the type and degree of social interactions they afford. It was suggested that this can be studied by comparing the social richness of play settings with each other on the basis of their position on the social presence continuum. Considering related studies (e.g., Ravaja et al., 2006; Weibel et al., 2008), it is expected that the availability of social interactions in play settings has a positive effect on players' game experience, for player enjoyment and player involvement. Furthermore, we hypothesized that differences in player experience we expected to emerge between social play settings could be explained by the different levels of social presence between them. On the basis of these hypotheses a study is presented in which player experience is empirically investigated and in which the social context is systematically varied. By using settings that vary in the amount of social contact afforded, differences in opportunities for sharing (in-game) moments and emotions are created which will affect players' experienced social presence. Since social presence is expected to be a relevant construct and potential mediator of the influence of a social setting on player experience, we will test whether the relationship between objective co-player presence and player experience is mediated by social presence. In sum, explicitly treating player experience as a multi-dimensional construct, the current study aims to yield a deeper understanding of people's experience as a function of social setting when digital games are played.

3.2 Method

3.2.1 Experimental design and participants

For exploring differences in player experience between three common social play settings, a mixed-groups design was employed. Co-Player Presence was manipulated as a within-groups[10] factor (artificial co-play vs. mediated co-play vs. co-located co-play). Performance (winners vs. losers) was treated as a between groups factor; this factor was created post-hoc. Eighty-six Dutch undergraduate and postgraduate students (27 females), aged between 16 and 34 (M_{age} = 22.4, SD_{age} = 3.5), played in pairs against each other. Participants were randomly assigned to conditions, which were fully counterbalanced. Since participants played in dyads, and dyadic data are non-independent, only half of the data was actually used for the analyses (the data of all players '1'). The data from all players 2 will be used for future studies. Therefore the actual sample size was 42[11] participants (15 females). They were recruited from a participant database via email, or approached personally on the university campus. All participants had played digital games before; a substantial portion of them played digital games regularly.

3.2.2 Experimental procedure and manipulations

The experiment was conducted in a lab at the Eindhoven University of Technology, consisting of eight separate participant booths. Participants were led to believe that the purpose of the study concerned latency in online games, and were asked to fill in a consent form. During the experiment, they played the game *WoodPong* on a 17" monitor display as described in Gajadhar, de Kort, and IJsselsteijn (2008a). This arcade-like game is derived from tennis: the player has to return an approaching ball and hit it towards the other player by controlling a bat (see Figure A.3.1 in the Appendix). The game was chosen for its simple controls – i.e. short learning curve –, its non-violent character, and clear outcome of winner and loser.

Players wore headphones to hear the music and in-game sound effects. For each condition, participants were redirected to another booth: in the 'artificial' co-play configuration participants were told that they played against the computer (in separate rooms), although in fact they played online against their partner (see Figure 3.1a). In the 'mediated' setting they played against each other online (in separate booths) and

10 It was chosen to use Co-Player Presence as a within-groups factor to increase power and reduce error variance associated with individual differences.

11 One dyad was excluded from analysis since one player was not a native speaker.

were notified of this, and in the 'co-located' setting they played against each other in the same booth, on the same console (see Figure 3.1a/b). Due to the game sounds from the headphones and large distance between the closed booths, players were not able to hear each other in the artificial and mediated co-play settings.

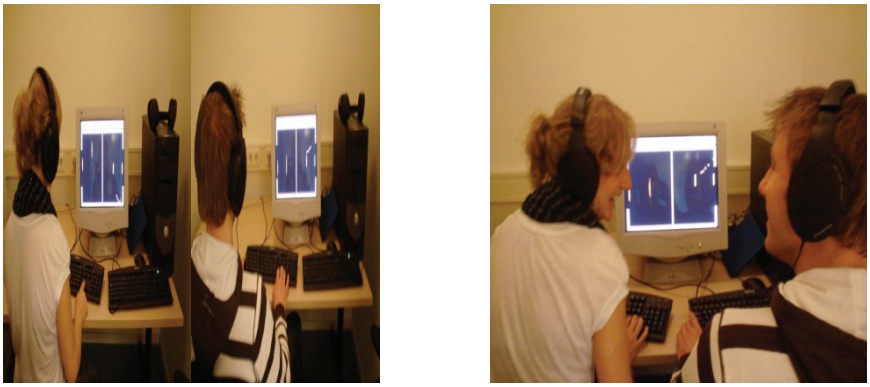

Figure 3.1: (a) The artificial and mediated co-play setting; (b)The co-located co-play setting.

Based on the results of a pilot study (Gajadhar et al., 2008a), the decision was made not to have participants play against the computer in the 'artificial' play configuration for two reasons. First, results showed that all players lost their game against the computer, which provided confounds in that study. Second, in case there would be an effect of co-player presence, it would be impossible to attribute this to either the social meanings and affordances of the setting, or – alternatively – to the fact that computers play differently than humans. The current set up basically implies that in this study the artificial and mediated co-presence conditions were identical [12], except for the fact that in the first condition players thought they were playing against the computer whereas in the mediated condition they knew that there was someone "at the other end" (see Figure 3.1a). To strengthen the impression, a clearly visible cable was connected between the two computers in the mediated setting. However in the artificial setting, cables which connected both computers were hidden. The third setting remained the same as in the pilot study, both players played on the same computer, side by side (see Figure 3.1b).

In each condition, three sets of *WoodPong* were played before filling in the questionnaire. The games were started by the experimenter via a wireless keyboard, and ended automatically after one of the participants had won six points. After three

12 None of the participants discovered the similarity between the virtual and mediated co-play settings. More strongly, the experimenter noted that players were more noisy – i.e., cheering, laughing – when playing in the online setting.

sets a winner was noted, and participants received an on-screen request to fill in their questionnaires individually, in separate rooms. The order of conditions was randomly assigned per couple. Lastly, participants were debriefed, paid and thanked for their participation. The experiment lasted 30 minutes; participants received a standard compensation of €5,-.

3.2.3 Measurements

After each condition participants completed a set of self-report measures in which they rated their experiences during the game. This combined questionnaire included 55 items and probed two categories of experiences: social presence and player experience. Social presence was measured with the use of the Social Presence in Gaming Questionnaire (SPGQ; de Kort et al., 2007) and player experience with the Game Experience Questionnaire (GEQ; IJsselsteijn et al., 2008). Reliabilities of all scales were satisfactory to excellent; see Table A.3.1 in the Appendix. Participants could respond on 5-point uni-polar scales, ranging from 1 (not at all) to 5 (extremely), to indicate the intensity of the described experience. For correlations between components, see Table A.3.2 in the Appendix. Intra-class correlations between data from players 1 and players 2 indeed revealed interdependency on social presence subscales (r_{emp}= .25, p_{emp}= .05; r_{beh}= .88, p_{beh}< .001) and Positive Affect (r= .21, p= .05); correlations were significant and the highest in co-located and not significant and lowest in artificial co-play (only for this test the data of player 2 was used in this study).

Social presence

Three subscales from the SPGQ were administered to verify the manipulation of social presence in the three play configurations under study (as was also established in Gajadhar et al. (2008a)). *Psychological Involvement Empathy* tries to measure the experience of positive feelings with questions such as "*I empathized with the other*". *Behavioural Engagement* approaches the feelings that players' actions depend on their co-players' actions in the game, and vice versa, with items such as "*what the other did affected what I did*". Because the authors felt that two items from the *Psychological Involvement Negative Feelings* did not solely measure negative feelings, only the item "*I felt jealousy towards the other*" was used to study the negative feelings. The other items ("*I was influenced by the other's moods*", and "*I influenced the mood of the other*") were therefore excluded from analysis, as they could also target positive feelings.

Player enjoyment

Player enjoyment was measured with four scales from the GEQ. (1) *Positive Affect* basically probes the fun and enjoyment of gaming, or how good players feel with items such as "*I felt happy*". (2) *Competence* is defined as the extent to which players feel strong and skilful in playing a game; it was measured with questions such as "*I felt successful*". (3) *Challenge* measures whether players feel stimulated and put a lot of effort into playing; it consists of items such as "*I had to put a lot of effort to it*". (4) *Frustration* is a negatively valenced experience, measuring the degree of feeling tense and irritable with items such as "*I felt annoyed*".

Player involvement

Player involvement was measured with three scales from the GEQ. *Immersion* was approached with items such as '*it was aesthetically pleasing*'. Engagement was probed with the *Boredom* and the *Flow* scales. Boredom measures negative affect, in particular related to feeling bored and distracted during the game. In other words it is a reversed engagement scale with questions such as "*I found it tiresome*". The Flow scale measures the degree of absorption and the experience of being cut off from the real world, with items such as "*I lost track of time*". Since it was felt that the Flow scale did not perfectly target the *optimal* experience as described by Csikszentmihalyi (1975; 1988), the *Revised-Flow* scale was constructed with 4 items such as "*for a moment it felt as if I succeeded in all my actions*", and "*sometimes it felt as if my fingers were pushing the buttons automatically*". As involvement potentially also relates to the willingness to learn and refine skills for a better performance, the *Performance Improvement Drive* scale was constructed, consisting of 3 items such as "*I wanted to become better in the game*", and "*I wanted to be a natural at playing the game*".

Player performance

As was also discussed in §1.1.3, social competition may have its effect on players' feelings during the game (Vorderer et al., 2003). Previous studies (e.g., Kimble & Rezabek, 1992; Mandryk & Inkpen, 2004) have shown that the presence of others differently affects players' feelings between successful and less successful players. It was therefore decided to include player performance in the analyses; all in-game scores were logged to determine whether players had won or lost the game (post-hoc constructed factor).

3.3 Results

Linear Mixed Model Analyses[13] (repeated measures) were performed on each component of the questionnaire with Co-Player Presence as a within groups factor, and Player Performance as a mixed groups factor; Participant was included as random factor. This chapter first reports the analyses of the fixed factors; it then provides the mediation analyses.

3.3.1 Co-Player Presence

Figure 3.2 presents the scores of the social presence indicators. As expected, artificial co-play was rated lowest, co-located co-play scored highest and mediated co-play scored in between for all social presence subscales.

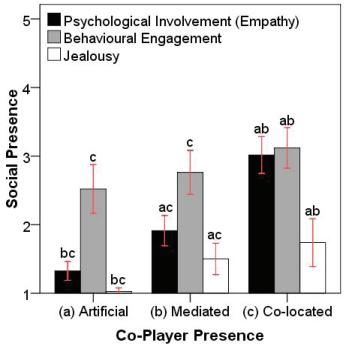

Figure 3.2: Social presence measured by self-report as a function of Co-Player Presence; (1 = not at all, 5 = extremely; SE indicated in graph; letters above SE-bar indicate significant difference with the condition that starts with this letter).

The analyses showed significant differences for Co-Player Presence on all social presence scales (see Table 3.4). Outcomes indicate that the manipulations in the study were successful. Contrast analyses showed that scores increased significantly with each subsequent category for all scales (p=.03); except for Behavioural Engagement between artificial and mediated co-play, the difference here only approached significance (p=.08).

13 It was chosen to analyse the data in the current thesis with the use of Linear Mixed Model Analyses due to the planned mediation analyses. These were performed by including covariates which differ between conditions; a common Repeated Measures ANOVA only provides the option to include covariates that are constant over the conditions (such as age, gender, etc.). By not using common ANOVA or MANOVA measures, multivariate testing was not possible.

Table 3.4: Results on the social presence scales for Co-Player Presence [14] [15].

Co-Player Presence			
	P.I. Empathy	Behavioural Engagement	Jealousy
F	74.55	10.42	10.67
p	**.001**	**.001**	**.001**
R^2	.74	.32	.29
df	2, 82.5	2, 79.7	2, 77.2
$M_{Art}(se)$	1.3(0.1)	2.5(0.2)	1.0(0.1)
$M_{med}(se)$	1.9(0.1)	2.8(0.2)	1.5(0.1)
$M_{col}(se)$	3.0(0.1)	3.1(0.1)	1.7(0.2)

As is shown in Figure 3.3a and 3.3b, player enjoyment and player involvement subscales appear to increase from artificial to co-located co-play.

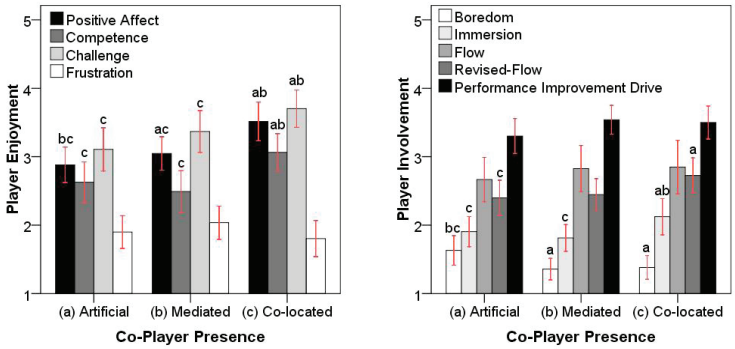

Figure 3.3: (a) Player enjoyment and (b) player involvement related scales measured by self-report as a function of Co-Player Presence (1 = not at all, 5 = extremely; SE indicated in graph; letters above SE-bar indicate significant difference with the condition that starts with this letter).

For player enjoyment related scales, analyses revealed significant main effects of Co-Player Presence on Positive Affect, Competence, and Challenge; see Table 3.5. Contrast analyses on player enjoyment related scales showed that positive affect was significantly

14 In this thesis Adjusted R-Squared are given since LMMA does not provide the R-Squared based on the Sum of Squares; note that the Adjusted R-Squared (based on variance of residuals) can have also negative values (see also: Kreft & de Leeuw, 1998; Singer, 1998).

15 Degrees of freedom are not integers, because the MIXED command in SPSS uses the Satterthwaite approximation when calculating df for these tests (see West, Welch & Galecki, 2007).

higher in co-located co-play than in mediated (p=.02) and artificial co-play (p<.001). The contrast between mediated and artificial co-play was significant as well (p=.02). Feelings of subjective competence were significantly higher in co-located than artificial co-play (p=.01) and mediated co-play (p=.03); no difference was found between mediated and artificial co-play. The same pattern emerged for challenge, where in co-located co-play the intensity was significantly higher than in mediated (p=.04) and artificial (p=.01) co-play. Feelings of frustration were not significantly different between the conditions.

For player involvement related scales, analyses revealed significant main effects of Co-Player Presence on Boredom, Immersion, and Revised-Flow (see Table 3.5). Contrast analyses showed that boredom was significantly higher in artificial co-play than in mediated (p=.04) and co-located (p=.02) co-play. Furthermore, immersion was significantly higher for co-located play than for mediated (p=.02) and artificial (p=.02) co-play. Similarly, contrast analyses showed that flow (revised) was significantly higher for co-located than for artificial co-play (p=.01); the contrast between mediated and co-located co-play approached significance (p=.08).

Table 3.5: Results on player enjoyment and involvement related scales for Co-Player Presence.

Co-Player Presence						
	Player Enjoyment			*Player Involvement*		
	Positive Affect	Competence	Challenge	Boredom	Immersion	Revised-Flow
F	12.00	5.22	6.73	3.46	3.33	3.86
p	**.001**	**.01**	**.01**	**.04**	**.04**	**.03**
R^2	.30	.15	.22	.10	.17	.12
df	2, 81.5	2, 82.0	2, 81.4	2, 80.5	2, 79.9	2, 80.6
$M_{Art}(se)$	2.9(0.1)	2.6(0.1)	3.1(0.2)	1.6(0.1)	1.9(0.1)	2.4(0.1)
$M_{med}(se)$	3.1(0.1)	2.5(0.1)	3.3(0.2)	1.4(0.1)	1.8(0.1)	2.5(0.1)
$M_{col}(se)$	3.5(0.1)	3.0(0.1)	3.6(0.2)	1.4(0.1)	2.1(0.1)	2.7(0.1)

Interaction effects

Analyses on self-reports revealed significant main effects of performance on social presence, player enjoyment and player involvement scales (see Table A.3.3 in the Appendix[16]). Furthermore, analyses revealed a significant interaction effect between Player Performance and Co-Player Presence on Jealousy (F(2,103.2) = 4.08; p=.02,

16 Performance was not the theoretically focus here; therefore main effects are reported in the appendix.

R^2=.16). According to this effect, the increase of feelings of jealousy for each subsequent category of Co-Player Presence was larger for losers than for winners (see Figure 3.4).

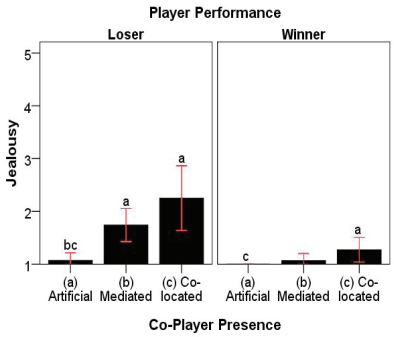

Figure 3.4: Jealousy as a function of Co-Player Presence and Player Performance (1 = not at all, 5 = extremely; SE indicated in graph).

3.3.2 Mediation analyses

Results on player experience indicated significant effects of Co-Player Presence on six player experience scales; the analyses on the social presence scales had already indicated that social presence increased from the artificial to the co-located setting. To test whether these effects of Co-Player Presence on player experience were mediated by the subjective sense of social presence of the co-player, the Linear Mixed Model Analyses on the player experience scales were repeated with Psychological Involvement (empathy), Behavioural Engagement and Jealousy (i.e. Social Presence) as covariates. In the case of mediation, the covariate(s) should become significant, and the effects of Co-Player Presence on player experience should disappear (Baron & Kenny, 1986). The analyses revealed that main effects of Co-Player Presence on the enjoyment related scales all disappeared due to the inclusion of the Empathy scale as a covariate (see Table 3.7a). Psychological Involvement (empathy) became highly significant in the mediation analyses with Positive Affect, Competence, and Challenge as dependent variables. In contrast, the main effects of Co-Player Presence on the involvement related scales disappeared due to the inclusion of the Jealousy scale as a covariate (see Table 3.7b). Jealousy became highly significant in the mediation analyses on Boredom, Immersion, and Revised-Flow.

Table 3.7: Results of mediation analyses with social presence on the (a) player enjoyment and (b) involvement related scales for Co-Player Presence.

Co-Player Presence			
	Player enjoyment		
	Positive Affect	Competence	Challenge
F	.12	.26	.05
P	.89	.77	.95
R^2	-.05	.04	-.03
df	2,86.8	2,91.0	2,86.2
P.I. Empathy	***p*<.001**	***p*=.03**	***p*=.02**
B. Engagement	*p*=.25	*p*=.46	*p*=.29
Jealousy	*p*=.72	*p*=.55	*p*=.12

Co-Player Presence			
	Player involvement		
	Boredom	Immersion	Revised-Flow
F	1.58	2.93	.30
P	.21	.06	.74
R^2	.03	.13	.00
df	89.7	78.5	83.8
P.I. Empathy	*p*=.31	*p*=.75	*p*=.94
B. Engagement	*p*=.15	*p*=.51	*p*=.07
Jealousy	***p*=.01**	***p*<.001**	***p*<.001**

These results confirm that social presence mediates the effects of Co-Player Presence on player experience. An additional Sobel test (1982; 1986) was performed to check for any Type 1 and Type 2 errors (Preacher & Hayes, 2004). Again these results confirmed mediation, as the Sobel test revealed that mediation by empathy was significant for Positive Affect (z = 3.61, p<.001), Competence (z = 2.17, p=.03), and Challenge (z = 3.68, p<.001). Similarly, findings also revealed that mediation by Jealousy was significant for Boredom (z = 2.14, p=.03), Immersion (z = 2.34, p=.02), and Revised-Flow (z = 2.01, p=.04). These findings indicate that indeed the differences between the three settings of Co-Player Presence are fully accounted for by the subjective sense

of social presence, in particular by psychological involvement (empathy) for enjoyment scales and by jealousy for involvement scales[17].

3.4 Discussion

Since previous studies on enjoyment (e.g., Ravaja et al., 2006; Weibel et al., 2008) provided indications of an important role for social characteristics in play settings, it was hypothesized that players' enjoyment is at least partly caused by the presence of social elements in play settings. Furthermore, in contrast to what some scholars have suggested in the literature (e.g., Sweetser & Wyeth, 2005) it was expected that the presence of co-players would not present a threat to game involvement. The current study therefore systematically varied co-player presence according to the three most common co-player settings (artificial, mediated, and co-located) and investigated effects on player experience. To check whether the manipulation of co-player presence was successful, social presence was measured with the SPGQ (de Kort et al., 2007). In addition, the influence of the factor of winning or losing a game was accounted for. Results revealed that the chosen play settings were indeed positioned differently on the social presence continuum. Co-located co-play was experienced as the most social setting to play in, and playing against the computer offered the least social play situation. These three settings also produced very different player experiences. Playing side-by-side significantly added to the enjoyment of and the focus in the game as compared to playing against a distant or artificial opponent. As hypothesized, these effects on player experience were mediated by the level of experienced social presence. In addition, the interdependency of feelings of social presence (empathy and behavioural engagement) was stronger in co-located play. Furthermore, intra-class correlations revealed that co-players within dyads experienced play more similar in terms of fun when they played in co-located settings. These results seem to support the findings that people have the tendency to interpret conformity – here: having fun together – as a signal of psychological closeness (see e.g., Raghunatan & Corfman, 2006).

Artificial vs. mediated vs. co-located co-play

Let us first consider the differences between artificial and mediated co-play. In terms of methodology and design, the artificial co-player setting was identical to the mediated setting in the current experiment – same game, same opponent – except for the players' conviction that they were competing with a non-human other in the

17 To test for causality, for all mediation analyses an extra analysis was added in which the mediator and dependent variable were switched. Because these analyses showed no significant mediation, we may speak of causality in our results (see Kenny, 2009).

artificial co-play setting. Still, self-reports showed that players reported higher levels of social presence in the mediated co-play setting; in parallel, analyses of player experience showed increased positive affect and a decrease in boredom. In line with findings by Lim and Reeves (2010), this suggests that the mere idea of playing against a mediated human co-player (i.e. an avatar) instead of a non-human co-player (i.e. a social agent) is enough to increase the enjoyment and involvement that players experience during a game. The result can only be attributed to the player's awareness of playing against a (non)-human. This awareness of their opponent being human induced a higher sense of psychological involvement, which subsequently impacted both engagement with and enjoyment of the game.

In the mediated and co-located co-play conditions respondents also played against the same person; the only difference here was their opportunity for richer social interaction during co-located play. Results revealed that more social presence was experienced in the co-located than in the artificial and mediated co-play settings. Players situated side-by-side were more aware of each other's behaviour, and experienced both more empathy and more jealousy towards each other. Furthermore, compared to playing against an artificial or mediated co-player, playing against a co-located other significantly added to the enjoyment and involvement in the game. More fun, perceived competence, challenge, immersion and flow were experienced when players were in the same room, than when they were apart. This result can only be ascribed to the continuous presence of social cues, since – again – no difference was present in strength of co-players between the conditions.

Mediation analyses revealed that the differences between settings on player experience components were caused by the differences in experienced social presence. These outcomes support the view that social presence provides a meaningful characterization of social play settings. Interestingly, results from the analyses on player enjoyment related scales revealed mediation via the feelings of empathy subscale of social presence. Players experienced more fun, competence and challenge as their feelings of empathy towards the other increased and they felt that they experienced more similar emotions. However, effects of social setting on player involvement related scales were mediated by the jealousy component of social presence. Players experienced more focus on the activity as the presence of their human opponent became more evident, experienced as feelings of jealousy. These empirical findings support the qualitative data in the previous chapter in that digital gaming with others is a mix of experiencing social fun and social competition.

Player performance

Considering the importance of social competition in playing computer games (Vorderer et al., 2003), player performance was included in the analyses as a post-hoc created factor to account for the effect of winning and losing on players' feelings. Results revealed a significant interaction between the play setting and the game outcome on jealousy; the increasing feeling of jealousy from artificial to mediated and co-located co-play was steeper for losers than for winners. In other words: differences in feelings of jealousy between winners and losers became more pronounced with the social richness of the setting. Remarkably, the enjoyment in play for both winners and losers was higher in co-located than in online co-play. This suggests that despite the reported feelings of jealousy, losing in front of others was experienced as more positive than losing from a distant co-player. This may partly be explained by an increase of mutual understanding (Bateson, 1983; see also Chapter 1), as opportunities for meta-communication that signalled "this competition is just for fun" were continuously enabled in the co-located play setting. As a result, losing did not "hurt" as much as in mediated co-play where players perhaps were more uncertain of the behaviours and emotions of others.

Comparisons with related studies

Opportunities for social interaction directly impact the positive experience in social play. Results on social presence are similar to those that have been reported in related computer mediated communication studies, which reveal that social presence is increased when the social richness of a medium is augmented (e.g., Champness, 1972; Keil & Johnson, 2002; Bente et al., 2005; Hauber et al., 2005). Outcomes on the player enjoyment components are also in line with recent findings supporting the notion that social interaction is key to a more positive player experience (e.g., Jansz & Martens, 2005; Clarke & Duimering, 2006). Empirical studies indeed showed playing side-by-side (Ravaja et al., 2006; Mandryk & Inkpen, 2006) and playing with a distant co-player (Ravaja, 2009) to be a more positive experience than playing alone. Besides findings confirm many similarities with related studies, two important contrasts have surfaced that may complement these related studies. First, Ravaja (2009) compared results of a mediated human co-player with those of a co-located human opponent. In contrast to our findings, he did not find any differences on self-reports between mediated (Ravaja, 2009) and co-located (Ravaja et al., 2006) co-play. Perhaps this non-appearance was caused by the questionnaire employed, which was not specifically geared towards people's experiences in digital gaming. After all, the expected differences between mediated and co-located co-play did emerge in physiological data. Second, in contrast to Sweetser and Wyeth's (2005) predictions, players' involvement in the game was not

reduced in the richer co-play settings. Findings showed that the level of involvement players experienced did not drop as hypothesized. If anything, gamers came closer to Csikszentmihalyi's (1975) optimal experience, in spite of their increased awareness of the other, residing in 'the real world'. In addition, although some studies have reported differences in social presence or player experience between social play settings, mediation analyses and Sobel tests were not performed in these studies. The current study therefore contributes to insights in the underlying psychological mechanisms in playing digital games with others.

3.4.1 Limitations of the study

Type of game

Although we have gained a deeper understanding of social context effects on players' experiences, some limitations of the current study have to be acknowledged. The results presented here are based on the experiences in one specific digital game. This particular game belongs to the class of classic arcade games, and is a very early example of games in the sports genre. Choosing a game from a different genre – such as First Person Shooter (FPS), adventure, role playing – may have influenced our results based on other features such as a higher level of violence, the ability to play with more than two co-players, or a more captivating and immersive narrative. Also, we have only considered playing modes where people are in competition against each other; experiences of social presence may well differ for collaborative playing modes and as a result influence player experience differently. However, results in the current empirical study are supported by earlier findings in a survey study, in which a range of game genres and playing modes were considered (IJsselsteijn et al., 2008). We therefore expect that our results may be influenced by differences in genres and roles of the co-player, but not in a way that will violate our main conclusions. Nevertheless, we will study the difference of a co-player being a competitor or a collaborator in the following two chapters. In addition, to be able to generalize our conclusions, we will use a different type of game than WoodPong.

Statistics

We have found that jealousy mediates feelings of involvement. In contrast to other components, jealousy consisted of a single item since other items – that were not exclusively targeting negative feelings – were excluded. We acknowledge the concern for discussing these results of jealousy and aim to include more items that measure jealousy (or better; that measure negative feelings towards others) in the following

chapters. Furthermore, we acknowledge that familiarity between dyads can cause differences in results. We therefore aim to include this factor in the analyses in our future studies.

Type of cues

We have concluded that social interactions induce social presence, and that this feeling of being with another positively affects players' game experiences. However, it is not clear which type of cues people use while playing games that may increase feelings of social presence. We speculate that this should be caused by verbal (e.g., laughing, talking) rather than nonverbal (e.g., smiling, hand gestures) cues, as nonverbal cues (e.g., leaning forward towards screen, eyes on screen) are harder to detect for co-players in digital gaming. After all, players mostly look towards the screen during games rather than at each other. However, the current study did not set out to distinguish between specific cues that are facilitating social presence. In a follow-up study we will look further into the individual influence per cue, and observe vocal and non-vocal cues in co-located co-play settings.

Anonymity

A final remark has to be made about the anonymity of playing in mediated settings. In real life settings, online players will not directly meet each other before or after the play session. However, in our experiment participants would always meet each other before and after the study. This could have increased the gap between artificial and mediated co-play, and perhaps decreased the gap between mediated and co-located co-play.

3.4.2 Conclusion

Essentially, this chapter provides evidence for the psychological impact of social context on player experience. It establishes that social affordances directly shape player experience in social play. Player enjoyment was enhanced when the sense of presence of a human co-player was stronger, and that a player's focus was not necessarily impaired by this presence. If anything, co-players contributed to the players' involvement in the game. Thus, enhancing the sense of being with another player has a positive effect on player experience. However, how this process evolves cannot be derived from the current results. To give more insight on which type of cues induce feelings of social presence, two important types of cues will be investigated in the next chapter. Furthermore, in the next chapters results form a different game than WoodPong will be discussed, and analyses will be provided for both competitive and collaborative play modes.

Chapter 4
Psychological Effects of Social Cues in Competitive Play

4.1 Introduction

We have demonstrated that the increase in players' enjoyment and focus in a game activity was directly caused by the enhanced sense of social presence in co-located play environments. Our empirical results support the arguments made in related studies (e.g., Jansz & Martens, 2005) that communication between players enhances a positive player experience. Communication has the potential to bring play to another level, enhancing the social presence for both players, not only during the game but before and after the game as well. This chapter sets out to investigate the effects of different communication channels on social presence and player experience. In terms of the social presence continuum it will consider settings that are closer together on this spectrum than were the settings in the experiment described in Chapter 3 – each of them belongs to the mediated category. We will focus on the visual and audio channels, and try to discover the effects of exchanged cues on social presence and in-game experience. Furthermore, we will contrast our results with existing social presence literature on computer mediated communication (CMC). To reach a more in-depth insight into the role of communication, we use behavioural observation in addition to the questionnaires used in the previous chapter. Before presenting the experiment, previous work on audio and visual channels will be discussed below.

4.1.1 Communication channels

In the General Introduction we have argued that player experience is (partly) shaped by players' awareness of their co-players, their involvement with them and the degree to which they are affected by others' experiences. This process becomes more palpable as players have more means to monitor and communicate with each other. Hence, utilising the social richness of a play setting – i.e., making use of the opportunities for exchanging social cues - is key in experiencing more fun and involvement. The influence of the social richness of media on interactions has been investigated extensively in Computer-Mediated Communication (CMC) literature. Face-to-face interaction is often assumed to be the richest form of interaction and even labelled 'the gold standard' in communication (e.g., Clark & Brennan, 1991; Short et al, 1976). Accordingly, communication media can be ordered in social richness according to how well they approximate the face-to-face setting. Short, Williams and Christy (1976) combined results from multiple CMC studies in which different communication channels were tested against each other. They argued that the continuous dimension of social presence is a good discriminator of communication media. Their analysis revealed a trend which showed an increase in social presence with an increasing number of communication channels; their findings have been repeatedly supported, also in more recent literature (e.g., Keil & Johnson, 2002; Bente at al., 2005; Hauber et al., 2005).

Communication media differ in their capacity to carry data that is rich in practical and social information (Daft & Lengel, 1986; Rice, 1993). Daft and Lengel (1986) introduced *Media Richness Theory*, which describes communication media by their ability to reproduce the information sent over them. In contrast to *Social Presence Theory*, they argue that the social richness of the communication medium has to be matched with the task in order for people to accomplish it satisfactorily. Media that are not well matched to task requirements will degrade communication performance. In this context, communication research shows that video conferencing is often preferred to audio-only conferencing as it approaches face-to-face communication the most (Short et al., 1976; Schliemann et al., 2002). The addition of video to sound significantly enhances the feeling of others being present and is experienced as more pleasant for interpersonal interaction. As communication frequently occurs in playing digital games, the same trend may be expected here. After all, digital games share features with other media that support social presence via voice or video generated representations of the communication partner (Schroeder, 2006). However, although digital games are a social medium, they are not primarily designed for communication in the way that telephones or teleconference sets are. First of all, the primary function of the activity is to play games. Following Daft and Lengel, it is unclear what level of communication between players would be optimal for this kind of task. Second, while most communication media are based on verbal communication, games can easily be played without any auditory cues from a co-player. For these reasons we cannot blindly generalize findings from communication studies to digital gaming.

Interactions in digital gaming

Thon (2006) and Manninen (2003) described multiplayer games as a form of computer mediated communication and examined communication processes in First Person Shooter (FPS) games. They observed that many FPS games offer players the opportunity for communication with spoken language via headsets. It is essential to note that in contrast to text chat, players in voice chat would continue fighting their opponents while talking (see also Gibbs, Hew & Wadley, 2004). Since it is hard to use hand signals or to focus on the physical behaviours of co-players, multiplayer FPS games may then possess lower levels of social presence than face-to-face situations. The lack of non-verbal signals was also noted by Chen and colleagues (2009), who showed that although players were facing each other in a table top multiplayer game, minimal eye-contact was observed during all sessions. Because people may not look at each other, valuable information typically conveyed through eye-contact and facial expressions will potentially be lost (McKenna & Bargh, 2000). Nonverbal cues may

support the verbal reports, but they may also hide or reveal other feelings. Such cues are known to enrich and disambiguate communication. After all, words may not carry all the emotional information that one wants to convey (Argyle et al., 1970; Krauss & Hadar, 2001). However, we cannot say that non-verbal interactions do not take place around digital games at all. For instance, Halloran and colleagues (2003) observed that players occasionally used non-verbal behaviours; such as simultaneous arm-raising and cheering after a win, or behaviours during reorganizations when new teams were formed. Interestingly, their observations only contained examples of non-verbal behaviours when the game was finished or had to start. In sum, these findings suggest that non-verbal behaviours towards other players are rarely expressed during games.

Utilising opportunities for social interaction

In Chapter 1 we have argued that when playing digital multiplayer games, emotional responses are not solely related to the game content, but are also related to the influence of co-players. In the current chapter we have discussed that information of co-players conveyed by visual cues may not be used as frequently as auditory cues during digital play; visual cues are expected to be used more frequently before and after a game session. This is in line with our qualitative findings, reported in Chapter 2, detailing that before a game was started, players were engaged in face-to-face interactions concerning the possible outcome of the game, and were provoking each other in a fun and positive way. Right after the game, immediately laughter would burst out combined with humoristic and playful remarks reflecting emotions such as Schadenfreude, revenge, and jealousy. The highly dynamic interactions during these specific moments rarely took place through headsets, but more often involved gesturing and making eye-contact over a distance (see also Manninen, 2003). Similar to observations made by Halloran and colleagues (2003), these illustrations suggest that visual information is used just before the start or just after the end of a game rather than during the game, and seems to have a function in co-located co-play. This would support the Media Richness Theory in that the gaming "task" doesn't lend itself well to visual communication between players. If this is correct, this would mean that the Social Presence Theory – i.e. adding more channels will increase social presence – will not hold for digital gaming.

4.1.2 Aim of the study

On the basis of aforementioned studies we suspect that in digital games the visual channel will be largely occupied by the game content. Therefore, for the purpose of communicating with other players, the audio channel is expected to yield more added value in terms of social presence than the video channel. As in the previous chapter,

we expect that an increase in social presence will directly cause stronger feelings of enjoyment and involvement. To test the role of auditory and visual communication in digital gaming, we present an empirical study in which social presence and player experience are investigated as a function of social cues while two co-players compete against each other in a first person shooter game. Employing observation and questionnaires, competitive play settings are studied in which the availability of auditory and visual cues of the other player is systematically varied. To check whether enabling the audio channel results in more vocal interactions (verbal or non-verbal), players' behaviours will be analyzed from recorded video data; the same holds for non-verbal interactions and the visual channel. In addition, by observing the behaviours of players during the game, more insight will be gained in the timing of cues. We expect that visual cues will be exchanged mainly before and after the game. In contrast, we expect that auditory communication will be present throughout the whole activity. In addition, to gain insight in what type of information is being conveyed, the content of conversation is coded and analyzed. Since related studies have shown that topics of conversations between players often concern the (possible) outcome of the game, we hypothesize that this will also be the case in the current study.

4.2 Method

4.2.1 Design and participants

To address the research question a 2x2x2 incomplete mixed groups design was employed, where the Audio Channel (open vs. closed; within groups[18]), Visual Channel (open vs. closed; within groups) and Team Performance (winner vs. loser; between groups) were used as fixed factors. It was decided to use an incomplete design which would prevent participants to guess the manipulations in the experiment. Furthermore, a pilot study revealed that the experiment with four game sessions would become a time consuming activity. It was therefore chosen to let participants play three out of four conditions; the conditions were randomly assigned and the order was counter balanced, see Table 4.1 for the number of participants per setting.

Table 4.1: Number of participants per setting.

Audio	No	No	Yes	Yes
Visual	No	Yes	No	Yes
N	27	28	29	26

18 It was chosen to use Audio and Visual Channel as within-groups factors to increase power and reduce error variance associated with individual differences.

Eighty Dutch graduate and postgraduate students (11 female), aged between 17 and 35 (M_{age} = 23.4; SD_{age} = 2.1), participated in the experiment. Since participants played in dyads, and dyadic data are non-independent (see Kenny et al., 2006), only half of the data was actually used for the current study; the data of all "players 1". The other half of the data will be used in a future study. Therefore the actual sample size was 41 participants (5 female). They were recruited via email by using an online participant database, or approached on the premises of the university. They all specified to have played computer games before.

4.2.2 Experimental manipulations

In all conditions in the experiment, both participants were seated next to each other – at approximately 50 cm distance – with a glass window between them (see Figure 4.1). They played in competition with a computer controlled team mate against the other participant and his/her computer controlled team mate. Conditions differed in the degree of possibilities for social interaction. To control the factor of vocal communication, each participant was placed in a separate room which shielded them from direct audio contact. Both participants were only able to communicate vocally when the connection between headsets was enabled (Audio Channel – open). The possibility to see each other was manipulated by a curtain which was either closed or opened (Visual Channel – Closed vs. Open). They sat on a chair behind their desks on a podium, which afforded them a direct view line of their co-players' upper body through the window.

Figure 4.1: The play setting in which opportunity for interaction via auditory cues is manipulated by headsets; possibility for interaction via visual cues is controlled by a curtain.

The game *Unreal Tournament* (Miday & Epic Games, 1999) was used, displayed on a 17" monitor display. This is a popular First Person Shooter (FPS) game among gamers and has also been used in previous research on digital games (e.g., Oxford, Ponzi & Geary, 2010; Thon, 2006; Merkx et al., 2007). An FPS game was chosen for the many interactions that can be expected around such type of game (see Jansz & Tanis, 2007). Three levels of the game were randomly chosen for each condition (fully counterbalanced). Participants used the keyboard and the mouse to control their avatar; instructions were printed on a sheet that lay on their desks. Cameras were used to record expressed behaviours by the participants. The music and in-game sound effects were played via speaker systems[19] and were identical for both players. The participants were escorted to another part of the room after playing the game, and filled out the questionnaires independently.

4.2.3 Procedures

The experiment was conducted in two separate rooms of the Auditory Lab at the Human Technology Interaction department (Eindhoven University of Technology). Participants were welcomed in pairs by the experimenters and entered the lab together. They were asked to fill in a consent form and a short questionnaire probing their age, gender, affinity with computer games and their relationship with the other participant (i.e., familiarity). Participants were led to believe that the purpose of the study concerned latency in online games. After a brief explanation they were separated and randomly directed to one of the two rooms to start playing the game against each other. The game was started and ended by the experimenter from a control room in another lab, from where both game screens and both participants could be monitored. Unreal Tournament is a highly competitive game in which teams who most frequently 'kill' their opponents – without being killed by them – will win the game. The option to hurt teammates in the game (i.e., friendly fire) was disabled. Each dyad played in three conditions in which audio channels were opened or closed and visual channels were opened and or closed. The game in each condition lasted ten minutes. After each game, participants filled out a questionnaire. Finally, they were debriefed, paid and thanked for participation. The experiment lasted 45 minutes; participants received a standard compensation of €10,- for their participation.

19 Also the vocal sounds by the co-player were played by these speakers, when audio communication was enabled. Players' headsets only included microphones, and not speakers.

4.2.4 Measurement instruments

Self-reports

After game play, participants completed a set of self-reports in which they rated their experiences during the game. The same questionnaires[20] were used as in Chapter 3 which probed social presence (*psychological involvement-empathy, behavioural engagement, jealousy*) and player experience (*positive affect, competence, challenge, frustration, boredom, immersion, flow, revised-flow, performance improvement drive*); reliabilities of the scales were satisfactory to excellent (see Table A.4.1 in the Appendix). The combined questionnaire included 56 items. Participants could respond on 5-point uni-polar scales, ranging from 1 (not at all) to 5 (extremely), to indicate the intensity of the described experience. For a more detailed explanation of the components and their items, see the Methods section in Chapter 3.

All "players 2" received the same questionnaire, however they had to answer from their co-player's perspective (i.e., [*Name co-player*] *empathized with me*", [*Name co-player*] *felt happy*, etc). Intra-class correlations between data from "players 1" and "players 2" for audio-channel open conditions (r_{emp}= .57, p_{emp}< .001; r_{jea}= .30, p_{jea}= .03; r_{beh}= .37, p_{beh}= .01), Positive Affect (r= .70, p< .001), Competence (r= .79, p< .001), Challenge (r= .45, p< .001), Frustration (r= .68, p< .001), Boredom (r= .64, p< .001), Flow (r= .59, p< .001) and Revised Flow (r= .46, p<.001); correlations were significant and highest in conditions with the possibility for verbal communication and not significant and lowest in conditions were this was not possible (only for this test the data of "player 2" was used in this study).

In addition, as previous studies were inconclusive as to whether their findings were affected by players' familiarity within dyads (see Halloran et al., 2003) we chose to control for the degree of acquaintance between participants. Familiarity was measured before starting with the experiment by four items[21] from the Social Connectedness Questionnaire at the Individual level (SCQ-I; Van Bel, Smolders, IJsselsteijn & de Kort, 2009); its Cronbach's Alpha was .93. Moreover, because most FPS games provide rank and score feedback, similar as in the previous chapter, players' in-game achievements are accounted for. All in-game scores were logged to determine whether a player's team had won or lost (post-hoc constructed factor: Team Performance).

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20 The Inclusion of Other in the Self Scale (Aron, Aron & Smollan, 1992) was also included to the questionnaire; results on this scale are discussed in Chapter 5.

21 (1) *I have a warm connection with [name player2],* (2) *I feel a strong relation with [name player2],* (3) *I feel connected to [name player2],* (4) *I often think about [name player2].*

Observations

During the sessions participants were recorded by cameras to enable observation analysis afterwards. Since players become immersed in the game, they tend to forget that they are recorded (Merkx et al., 2007). Based on the videos, the types and duration of cues exchanged were scored. The classification of behaviours was based on the observation data from a pilot study (Gajadhar, et al., 2009b), and constructed by three experts. Auditory cues were coded as *Speech* (using actual words) and *Non-Verbal Vocalizations*[22] (shouting non-words such as "hey" or "ohhw", and/or audible laughter). Visual cues were rated as *Looking* (heads rotated towards their co-player), *Directed Gestures* (e.g., waving, cheering with arms up, or giving the finger), and *Displacement Activity* (non-directed gestures such as scratching, changing position on the chair, or picking at one's clothes). Ratings were performed by two independent observers; a random sample was rated again by a third observer which resulted in satisfactory inter-observer-reliabilities for visual cues (Kappa=.74) and auditory cues (Kappa=.66). Conflicts were solved by the most votes principle. With the use of the program *Observer XT* by Noldus, the frequency and duration of behaviours was coded. Coded behaviours were automatically linked to a period in the game.

From observations in the field study in Chapter 2 and a pilot study (Gajadhar et al., 2009b), it was noted that the start and end phase of game play were often different from the middle phase in terms of social interactions. The recorded play sessions of these studies were used to define the segmentation for these phases. Game phases were defined as "Begin" (ten seconds before to ten seconds after the start of the game), "Middle" (ten seconds after the start to ten seconds before the end of the game) and "End" (ten seconds before to ten seconds after the end of the game). The content of speech of a randomly chosen sample (N = 23) was coded to give more insight in conversations between players. Two independent observers coded the content of conversation by five themes that were defined by three experts on the basis of clips from a pilot study (Gajadhar et al., 2009b) and the current study. They categorized topics of conversation by their relation to In-Game Performance (e.g., ***"I already killed you ten times"***), In-Game Location (e.g., ***"I am behind you"***), In-Game Tips & Tricks (e.g., ***"you should get the rocket launcher"***), Positive Remarks (e.g., ***"ah, good shot"***) and Negative Remarks (e.g., ***"you are such a loser"***). The inter-observer reliability was satisfactory (Kappa=.87).

22 "*Yes*" and "*no*" were also coded as Non-Verbal Vocalizations, as there were many occasions where participants expressed themselves by non-verbal derivations of these words (e.g, "*yeaoh*", "*jazekers*", "*naaa*").

4.3 Results

Linear Mixed Model Analysis[23] (repeated measures) was performed on observation data and self-reports. Audio Channel, Visual Channel, and Team Performance were included as fixed factors. Familiarity within dyads was used as a covariate, and Participant as random factor. This chapter first reports the analyses of the fixed factors; it then reports the mediation analyses.

4.3.1 Communication channels

Audio Channel

Results on expressed behaviours and social presence with regard to the manipulation of Audio Channel are given in the figures and table below. As expected, social interactions were more present when the auditory channel was opened instead of closed. Results revealed significant differences on both types of vocal cues (speech and non-verbal vocalizations); see Table 4.2. Figure 4.2a reveals that participants talked, shouted, and laughed more in the Audio Channel-open, than in the Audio Channel-closed condition. The increased levels of communication had clear psychological consequences: the manipulation rendered significant differences on all social presence scales. Participants indicated to feel more empathy, behavioural engagement and jealousy when the audio channel was open vs. closed (see Figure 4.2b).

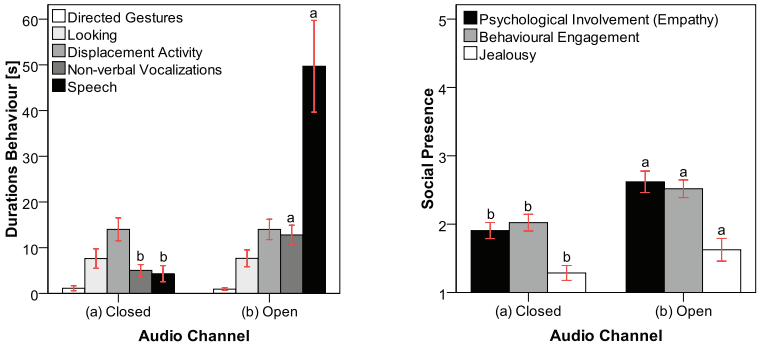

Figure 4.2: (a) Duration of expressed behaviours scored by observers, and (b) social presence as a function of Audio Channel (SE indicated in graph; letters above SE-bar indicate significant difference with the condition that starts with this letter; for Figure b, 1 = not at all, 5 = extremely).

23 In the current thesis data were analyzed with Linear Mixed Models due to the planned mediation analyses. These were performed by including covariates which differ between conditions; a common Repeated Measures ANOVA in SPSS only provides the option to include covariates that are constant over the conditions (such as age, gender, etc.). By not using common ANOVA or MANOVA measures, multivariate testing was not possible.

Table 4.2: Results on expressed behaviour and social presence subscales for Audio Channel.

	Audio Channel				
	Expressed Behaviour		*Social Presence*		
	Speech	Non-Verbal Vocalizations	P.I. Empathy	Behav. Engagement	Jealousy
F	94.52	45.69	47.25	35.24	8.10
p	**.001**	**.001**	**.00**	**.00**	**.01**
R^2	.74	.52	.57	.49	.10
df	1,81.8	1,82.2	1,77.6	1,77.1	1,86.6
$M_{yes}(se)$	49.7(5.0)	12.8(1.1)	2.4(0.1)	2.5(0.1)	1.8(0.1)
$M_{no}(se)$	4.3(0.9)	5.0(0.6)	1.8(0.1)	2.1(0.1)	1.3(0.1)

Effects on feelings of player enjoyment and involvement for the Audio Channel are given in the figures and table. Analyses on player enjoyment related scales showed only a significant effect on Positive Affect (see Table 4.3). Figure 4.3a shows that more fun was experienced when the audio channel was open than when it was closed. On player involvement related scales significant main effects emerged on Boredom, Revised-Flow and Performance Improvement Drive (PID). Figure 4.3b reveals that participants indicated to experience less boredom, more flow and a higher drive to replay the game when the audio channel was open, than when it was closed.

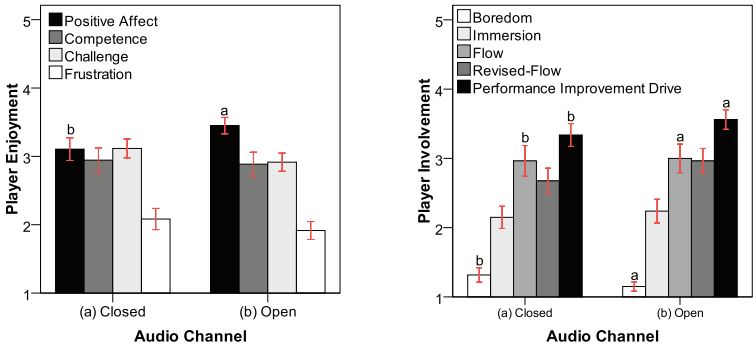

Figure 4.3: (a) Player enjoyment, and (b) player involvement related scales as a function of Audio Channel (1 = not at all, 5 = extremely; SE indicated in graph; letters above SE-bar indicate significant difference with the condition that starts with this letter).

Table 4.3: Results on player enjoyment and player involvement related scales for Audio Channel.

Audio Channel				
	Player Enjoyment	*Player Involvement*		
	Positive Affect	Boredom	Revised-Flow	PID
F	6.63	5.94	7.24	11.21
p	**.01**	**.02**	**.01**	**.001**
R^2	.05	.08	.07	.16
df	1,83.1	1,78.1	1,77.2	1,76.8
$M_{yes}(se)$	3.4(0.1)	1.2(0.1)	3.1(0.1)	3.7(0.1)
$M_{no}(se)$	3.2(0.1)	1.4(0.1)	2.8(0.1)	3.3(0.1)

Visual Channel

Results on expressed behaviours and social presence for the Visual Channel are given in the figures and table below. Social interactions were more present when the visual channel was opened instead of closed. Significant differences were found on Directed Gestures and Looking; also an effect was found on Non-Verbal Vocalizations. Figure 4.4a shows that participants looked more towards each other, and used more directed gestures and non-verbal vocalizations when the video channel was enabled than when it was disabled. Furthermore, social presence indicators revealed differences on P.I. Empathy and Behavioural Engagement. Figure 4.4b reveals that they indicated to experience more empathy and behavioural engagement when communication with visual cues was possible in contrast to when this was impossible. Compared to the Auditory Cue manipulation, effects on social presence resulting from Visual Cue manipulation were smaller (see Table 4.4).

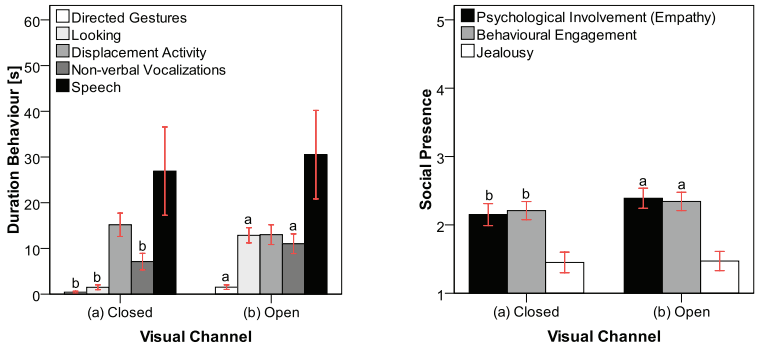

Figure 4.4: (a) Duration of expressed behaviours scored by observers, and (b) social presence as a function of Visual Channel (SE indicated in graph; letters above SE-bar indicate significant difference with the condition that starts with this letter; for Figure b, 1 = not at all, 5 = extremely).

Table 4.4: Results on expressed behaviour and social presence scales for Visual Channel.

Visual Channel					
	Expressed Behaviour			*Social Presence*	
	Non-Verbal Vocalizations	Directed Gestures	Looking	P.I. Empathy	Behav. Engagement
F	15.00	17.27	168.27	7.46	6.05
p	**.001**	**.001**	**.001**	**.01**	**.02**
R^2	.15	.24	.76	.05	.06
df	1,83.0	1,80.6	1,82.1	1,78.3	1,77.6
$M_{yes}(se)$	11.0(0.9)	1.5(0.2)	12.9(0.8)	2.3(0.1)	2.4(0.1)
$M_{no}(se)$	7.1(0.9)	0.4(0.1)	1.5(0.3)	2.0(0.1)	2.2(0.1)

Results on player enjoyment and involvement scales of Visual Channel are given in the figures below. On player enjoyment scales only the effect on Positive Affect approached significance ($F(1,84.2) = 3.16$; $p=.08$, $R^2<.01$), showing a positive trend for Visual Channel (open: $M_{POS} = 3.4$ (0.1); closed: $M_{POS} = 3.2$ (0.1)). In contrast to results for the Audio Channel manipulation, no significant main effects of Visual Channel were found on involvement scales (all Fs <1). Figure 4.5a and 4.5b present the scores of the enjoyment and involvement indicators.

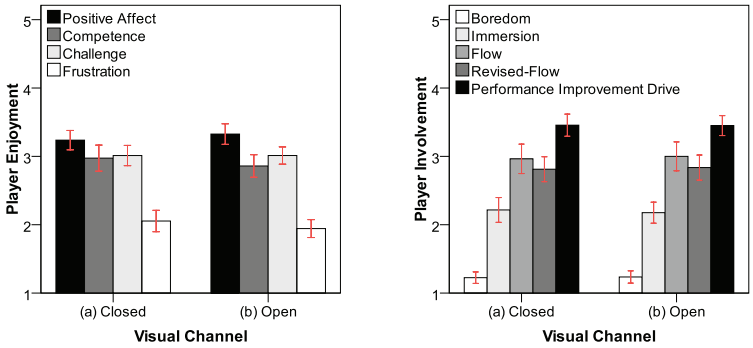

Figure 4.5: (a) Player enjoyment, and (b) player involvement related scales as a function of Visual Channel (1 = not at all, 5 = extremely; SE indicated in graph).

Interaction effects

The analyses did not reveal significant interaction effects between Audio Channel and Visual Channel. However, results showed significant effects between Audio Channel and Team Performance[24] on Jealousy ($F(1,105.7) = 5.18$; $p=.03$, $R^2=.11$) and Performance Improvement Drive ($F(1,81.8) = 6.97$; $p=.01$, $R^2=.07$). Participants who lost their game experienced more jealousy and were more driven to improve their performance when the audio channel was enabled than when it was not; see Figure 4.6a and 4.6b.

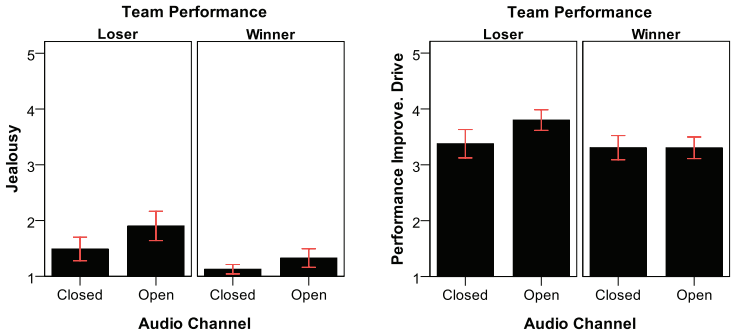

Figure 4.6: (a) SPGQ-Jealousy, and (b) PID as a function of Team Performance and Audio Channel (1 = not at all, 5 = extremely; SE indicated in graph).

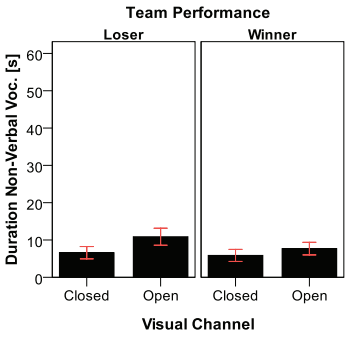

Figure 4.7: Duration of expressed non-verbal vocalizations as a function of Team Performance and Visual Channel (SE indicated in graph; letters above SE-bar indicate significant difference with the condition that starts with this letter).

24 For a complete overview of main effects for Team Performance see the Appendix (Table A.4.2, A.4.3).

4.3.2 Mediation analyses

Effects of social presence in player experience

Results on player experience indicated significant effects of Audio Channel on one enjoyment and three involvement scales. The analyses on the SPGQ scales had already indicated that social presence increased when the audio channel was enabled. To test whether these effects of Audio Channel on player experience were mediated by the subjective sense of social presence of the co-player, the Linear Mixed Model Analyses on the player experience scales were repeated with all three social presence subscales as covariates. In the case of mediation, the covariate(s) should become significant, and the effects of Audio Channel on player experience should disappear (Baron & Kenny, 1986). The analyses revealed that significant main effects on player enjoyment and involvement related scales all disappeared due to the inclusion of social presence subscales as covariates (see Table 4.5). P.I. Empathy became highly significant after mediation analyses with Positive Affect and Revised-Flow. The effect on Performance Improvement Drive decreased but was still significant; here Jealousy approached significance. Although the significant effect on Boredom disappeared when the covariates were included in the analysis, none of the social presence subscales reached significance.

Table 4.5: Results of Audio Channel in the mediation analyses for social presence on player enjoyment and involvement related scales.

Audio Channel				
	Player enjoyment	*Player involvement*		
	Positive Affect	Boredom	Revised-Flow	PID
F	1.23	2.30	1.08	3.99
p	.27	.13	.30	**.05**
R^2	.00	.00	.00	.05
df	103.3	96.9	95.0	93.4
P.I. Empathy	***p=.01***	*p*=.91	***p=.02***	*p*=.88
B. Engagement	*p*=.74	*p*=.52	*p*=.87	*p*=.47
Jealousy	*p*=.33	*p*=.77	*p*=.42	*p*=.08

The Visual Channel manipulation had rendered a significant effect on GEQ-Positive Affect and the analyses on the SPGQ scales had indicated that P.I. Empathy significantly increased when visual communication was enabled. Mediation analysis revealed that the effect of Visual Channel on Positive Affect was mediated by P.I. Empathy, as the

main effect disappeared ($F(1,87.3) = 1.30$; $p=.26$, $R^2=.00$) and the covariate[25] became significant ($p=.01$).

The analyses confirm that social presence mediated the effects of the audio and visual channel on player experience. Additional Sobel tests (1982; 1986) were performed to check for any Type 1 and Type 2 errors (Preacher & Hayes, 2004). Again these results confirmed mediation: Sobel tests revealed that for effects caused by the audio channel, mediation by P.I. Empathy was significant for Positive Affect ($z=3.01$, $p=.01$) and Revised-Flow ($z=2.28$, $p=.02$). Similarly, findings also revealed that the partial mediation by Jealousy was significant for Performance Improvement Drive ($z=2.01$, $p=.04$). For the effect on Positive Affect caused by the visual channel, mediation by P.I. Empathy approached significance ($z=1.78$, $p=.08$). These findings indicate that most differences on player experience due to having the opportunity to use auditory and/or visual cues are fully accounted for by the subjective sense of social presence [26]. In particular feelings of empathy and jealousy seem to impact player experience.

Effects of behaviours on social presence

As mentioned above, results on social presence indicated significant effects for Audio Channel and Visual Channel; the analyses on observation data indicated similar effects. To test whether the effects of Audio Channel on social presence were mediated by the expressed behaviours, the Linear Mixed Model Analyses on the social presence scales were repeated with Speech and Non-Verbal Vocalizations as covariates. Mediation analyses revealed that significant main effects on Jealousy disappeared, and the effects on P.I. Empathy and Behavioural Engagement decreased due to the inclusion of the duration of audible cues as covariates (see Table 4.6). Non-Verbal Vocalizations became highly significant after mediation analyses of Behavioural Engagement and Jealousy. In the analysis of P.I. Empathy, the duration of Speech became significant.

25 Only covariates that showed significant effects in the initial analyses were included for the mediation analysis. Behavioural Engagement and Jealousy were therefore not in the mediation analysis for Visual Channel.

26 To test for causality, for all mediation analyses an extra analysis was added in which the mediator and dependent variable were switched. Because these analyses showed no significant mediation, we may speak of causality in our results.

Table 4.6: Results of Audio Channel in the mediation analyses for expressed behaviour on social presence scales.

Audio Channel			
	P.I. Empathy	Behav. Engagement	Jealousy
F	5.49	9.21	.67
p	**.02**	**.01**	.41
R^2	.09	.13	.00
df	1,96.1	1,78.5	1,109.6
Speech	***p*=.01**	*p*=.95	*p*=.45
Non-Verbal Vocalizations	*p*=.11	***p*=.03**	***p*=.05**

Results for the Visual Channel had only rendered a significant effect on P.I. Empathy. The analyses of expressed behaviours had indicated that the use of non-verbal vocalizations, directed gestures and glances at the co-player significantly increased when the visual channel was enabled. Mediation analysis revealed that for the Visual Channel the effect on P.I. Empathy ($F(1,95.7) = 1.55$; $p=.22$, $R^2=.00$) was mediated by non-verbal vocalizations ($p=.04$), as the main effect disappeared and the covariate became significant; the covariates Directed Gestures ($p=.96$) and Looking ($p=.92$) did not become significant.

The analyses confirm that behavioural expressions mediate the effects of audio and visual channels on social presence. Also here, additional Sobel tests were performed, which confirmed (partial) mediation. The test revealed that for effects caused by the Audio Channel, partial mediation by Speech was significant for P.I. Empathy ($z =2.87$, $p=.01$). Findings also revealed that (partial) mediation by Non-Verbal Vocalizations was significant for Behavioural Engagement ($z =1.91$, $p=.06$) and Jealousy ($z =2.43$, $p=.02$). For the effect on P.I. Empathy caused by the Visual Channel, mediation by Non-Verbal Vocalizations was significant as well ($z =2.27$, $p=.02$). These findings indicate that differences in social presence caused by the audio and video channel are accounted for by the use of expressed behaviours of players [27]. In particular vocal cues that are expressed in digital gaming, affect the sense of social presence that players experience.

27 To test for causality, for all mediation analyses an extra analysis was added in which the mediator and dependent variable were switched. Because these analyses showed no significant mediation, we may speak of causality in our results (see Kenny, 2009).

4.3.3 Timing and content of interactions

Game phases

We have shown that the use of auditory cues plays a dominant role in social presence (even when the possibility of audio communication is disabled). To gain more insight in the underlying processes, an additional analysis was performed in which the distribution of cues over time was explored. It was projected that non-vocal communications would perhaps have a less dominant role in digital play, because this type of interaction occurs less often during the game. In contrast, communications via the audio channel may take place throughout the whole activity. To explore this, the factor *Game Phase* was analysed. The phases "begin" and "end" have a time span of twenty seconds; the middle phase lasts 580 seconds (see also §4.2.4). For the analyses the duration of expressed cues are represented by the percentage they take per phase. For the analyses (LMMA), Game Phase and Team Performance were included as fixed factors. Familiarity within dyads was used as a covariate, and Participant Number as random factor. Figure 4.8a presents the percentage of the duration of behaviours per Game Phase. For both vocal cues, the durations of expressed behaviours were longer at the end than at the beginning or in the middle of a game. Non-vocal cues were expressed less during the game than at the start or at the end. Players looked at each other more at the start of the game, than when the game ended. In contrast, more directed gestures were used at the end of a game than at the start.

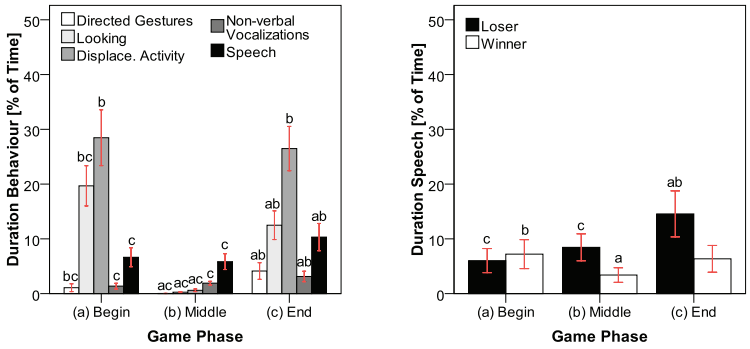

Figure 4.8: (a) Duration of expressed behaviours as a function of Game Phase, and (b) duration of speech as a function of Game Phase and Team Performance (SE indicated in graph; letters above SE-bar indicate significant difference with the condition that starts with this letter).

The analyses[28] showed significant findings (all $p<.001$) on all expressed behaviours. Furthermore, an interaction effect was found between Game Phase and Team Performance on Speech ($p<.001$); see Figure 4.8b. Losers tended to talk more during and after the game than winners did, while at the start of the game there was no difference. These results confirm the hypothesis that communication via audio occurs during all phases in play. They also verify that non-verbal communications mainly take place at the start and end of the game.

Content analysis of speech

To give more insight in conversations between players when the audio channel was enabled, the content of speech during the game of a randomly selected sample[29] (N = 23; 12 losers; 2 female) was coded. Topics of conversations were categorized as relating to In-Game Performance, In-Game Location, In-Game Tips & Tricks, Positive Remarks and Negative Remarks; frequencies are given in Figure 4.9.

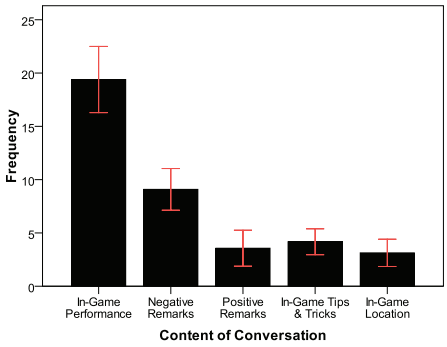

Figure 4.9: Frequency of Content of Conversation between co-players (SE indicated in graph).

The figure shows that conversations were more about participants' In-Game Performances (M = 19.4 (1.6)) than any other theme. Participants were often discussing the score such as "*my team is six kills behind*" or "*wow, I already killed you three times*". They also indicated their health status such as "*oh no, I'm badly injured*" or "*yes, found a health pack, I'm back in business again*". Furthermore, many participants announced the score right after they had killed an avatar or agent, "*there…3-2*" or "*boom, I'm on top again*". Some participants even mentioned the score after nearly every kill. Results also showed that more Negative Remarks (M = 9.1 (1.0)) were used towards co-players

28 Only results are discussed that are related to the factor "Game Phase"; see Table A.4.4 in the Appendix for a full overview of the statistics.

29 It was chosen not to code and analyse data from all participants for the sake of time; only data was used from conditions where audio was enabled.

than Positive Remarks (*M* = 3.6 (0.8)). Participants used many terms of (tongue-in-cheek) abuse in combination with laughter such as "*loser*" and "*stupid*". Furthermore, they regularly provoked each other with remarks such as "*you are as bad at this game as my sister is*" or "*don't cry, don't cry*". Although these remarks seem hostile and aggressive, observers indicated that the tone was always in a humoristic, positive and fun way combined with laughter by both players. In contrast, participants occasionally gave the other the thumbs up, often related to an in-game action: "*nice shot*" or "*hey, you really are on a spree*". Also In-game information – in terms of In-Game Tips & Tricks (*M* = 4.7 (0.6)) and the In-Game Location (*M* = 3.1 (0.6)) – was shared occasionally, yet less than the Negative Remarks. Typical In-Game Tips & Tricks were conversations such as "*you should pick up that rocket launcher*" or "*when you're in the elevator you're often safe*". Communications about In-Game Location were mainly questions such as "*hey, where are you?*" or "*where is my partner at?*".

4.4 Discussion

In this chapter we have investigated whether adding additional communication channels in co-play enhances social presence. In addition, it aimed to study whether and how this impacts player experience and investigated which types of cues had the biggest impact on social presence. Communication channels (auditory and visual) were systematically varied for gamers to interact with their co-player, which provided the opportunity to investigate communication effects on social presence and player experience. Effects of winning or losing and familiarity between co-players were also taken into account. Furthermore, compared to Chapter 3 a different type of game was used than WoodPong. To explain the effects of social interactions on players' feelings, vocal and non-vocal expressions were scored, and social presence and players' in-game experiences were measured. Findings on coded behaviours indicated that cues indeed were expressed towards co-players when the opportunity for communicating was provided. Results from self-reports revealed that social presence was generally higher in settings where communication between players was possible than when this was hindered. Mediation analyses revealed that the increase in expressed behaviours during play was directly linked to a higher level of social presence experienced by players. As a result, the increase in level of social presence directly caused an increase in player's in-game enjoyment and involvement.

4.4.1 Communication channels

Results from the observations showed that vocal communication took place frequently when audio was enabled, and that non-vocal communication occurred when the curtain was opened. However, a significant increase of non-verbal vocalizations was also present when the curtain was opened instead of closed. Thus, although players were aware that they couldn't hear each other, they still were expressing audible laughter and/or making exclamations (e.g., "*ahhh*", "*ohhh*"); this effect only held for losers and not for winners. Feelings of social presence increased when visual and/or auditory cues could be shared, mostly in terms of psychological involvement (empathy) and behavioural engagement; effects of being able to hear each other were stronger than being able to see each another. Feelings of jealousy were also higher when people could hear each other; being able to see others did not affect jealousy. Various components of player enjoyment and involvement (positive affect, boredom, flow and the drive to improve performance) correlated with social presence when auditory cues were enabled; the effect of visual cues was much weaker. Only a marginal increase in fun was indicated by participants when they could see their co-player. These results suggest that visual cues are generally less important than auditory cues impacting player experience in the digital game setting tested here.

Similar as in Chapter 3, mediation analyses revealed that differences between settings on player experience components were caused by differences in experienced social presence. To investigate which expressions and behaviours were responsible for boosting social presence, additional mediation analyses were performed with the use of observation data. Results revealed that when players could hear each other, the sense of social presence was mediated by the duration of expressed vocal cues. Feelings of empathy were mediated by speech, the remaining social presence subscales (behavioural engagement and jealousy) were mediated by other vocalizations. Moreover, the analyses showed that when players could see each other, feelings of social presence were also mediated by the use of non-verbal vocalizations. These findings demonstrate that the use of vocal cues causes feelings of social presence, yet visual cues had little effect. Perhaps not surprising, as vocal communications have a primary role in human relations (e.g., Hauser, 1996; Asif, 2007). In addition, intra-class correlations revealed that players within dyads were able to guess their competitors' feelings of social presence and in-game experience more accurately when they could talk than when this was not possible. The degree to which a person can infer the thoughts and feelings of another person is called *Empathic accuracy* (Ickes, 1993). Our findings show that information needed to be aware of these feelings is mainly retrieved by auditory cues from the other during the game. This result is in line with a study by Gesn and Ickes (1999), who revealed that empathic accuracy was primarily dependent upon verbal, rather than nonverbal, cues.

Explaining the dominant role of auditory cues

The present findings clearly deviate from findings in CMC literature (e.g., Short et al, 1976, Keil & Johnson, 2002; Bente, et al., 2005; Hauber et al., 2005) as social presence did not increase strongly when players could see each other and interact through facial expressions, posture and gesturing. Explanations can be found in the fundamental difference in terms of distribution of attention between CMC and gaming. Compared to – for instance – teleconferencing where communication is the primary activity, the visual attention is not directed towards the co-player but is needed for focusing on the game (see also Chen et al., 2009). Most games rely more heavily on players' eye-hand coordination than ear-hand coordination. Audio cues are omni-directual and do not require head movements to be processed. Moreover, they are easily combined with alternative visual inputs, as they are not competing for the same mental resources. Results from the analyses on behavioural expressions per game phase support the view that visual cues are seldom used for communication during play. Participants only looked towards their co-player and made gestures before the game started or just after it finished. In contrast, verbal communication occurred throughout the entire gaming session.

From these results, it seems that the active role of players makes them focus on the game, keeping them from communicating through gestures and eye-contact. We assume that this is the main reason why feelings of social presence are mainly caused by the vocal interactions between players, and less by non-vocal interactions. Thus, adding the visual channel does not automatically imply an increase in social presence in digital gaming, which seems to contradict *Social Presence Theory* (Short et al., 1976). According to this theory, people perceive media with both auditory and visual cues as having a higher degree of social presence and media with merely auditory cues as having a lower degree of social presence. Although visual cues were not frequently exchanged during play, even the awareness of the possibility of viewing each other's behaviour seemed to have little effect on players' experiences. In fact, the study shows that the importance of communication channels depends largely on the task at hand. Therefore, our findings seem more in line with *Media Richness Theory* (Daft & Lengel, 1986), which states that the social richness of the communication medium has to be matched with the task in order for people to accomplish it satisfactorily. These findings indeed show that we cannot blindly generalize findings from communication studies to digital gaming.

Content of conversations

Results from the content analysis revealed that conversations were dominated by the aspect of competitive experiences in the game. Participants were highly engaged

in discussing their in-game performances and provoking the other co-player. Especially losers made remarks concerning the in-game performances such as, "*I am dead… AGAIN*" or "*I am still six kills behind*". In contrast, negative (playful) remarks such as "*hahaha, you are so stupid*" or "*Oh… I am dead… I hate you*", were exchanged by both players; especially these remarks were often mixed with laughter. Although the remarks may seem hostile and aggressive on paper, the tone of the interactions was always humoristic, fun and positive. The content of the speech can partly be related to the strategy of impression management (Goffman, 1959), as it seems that losers tend to "save their face" by their remarks. The friendly banter may also be a way to avoid potentially awkward or embarrassing situations, by emphasizing that this is just a game (Bateson, 1983). The analysis also revealed that positive remarks were occasionally observed and in-game information was rarely exchanged. These findings clearly can be ascribed to the fun and competitive character of the play setting and configuration.

4.4.2 Limitations

Our results have shown that social presence is mainly induced by vocal interactions in playing digital games. The content of these interactions is closely tied to the competitive character of the play configuration. Since vocal communications for both winners and losers increases at the end of the game, we suggest that these interactions are – similar to findings in Chapter 2 – primarily based on taunting and joking between losers and winners. After all, "negative" feelings such as Schadenfreude, saving face, jealousy and revenge towards other players seem essential in playing competitive multiplayer games. These emotions seem to dominate the content of conversations between players, which results in a more positive game experience for both players. However, games can also be played in teams where co-players are collaborators. In this form of play, "negative" feelings – Schadenfreude, jealousy, revenge – may be less prevalent when co-players operate in the same team. This would imply that perhaps results found on competitive co-play may not hold for collaborative co-play. Our findings show that visual cues play a minor role in explaining social presence. This may suggest that – although these cues are present – they are somehow not important enough for players in competition to use. On the other hand, findings in Chapter 2 showed that players in collaboration sat in groups next to each other, apart from their opponents. Perhaps eye-contact and directed gestures are more important in collaborative play. To give a complete understanding of psychological effects of social cues in digital play, a similar study is needed for players in collaboration.

4.4.3 Conclusion

In line with the study presented in Chapter 3, player experience was influenced by social presence even though a different type of game was used. Whereas the previous study demonstrated this effect between artificial, online play and co-located co-play, the present study illustrated the same effects between semi co-located co-play settings that differed in the opportunities to communicate with co-players. Therefore, as predicted by De Kort and IJsselsteijn (2008); social presence positively affects player experience. Furthermore, our findings confirm that feelings of enjoyment, involvement and social presence in co-play can be enhanced by enabling opportunities for social interactions. In addition, our findings again reveal that the presence of co-players does not necessarily hamper player involvement in the game. On the contrary, we demonstrate that the focus on the play activity is increased when co-players have the opportunity to talk, shout and laugh with each other. Vocal communication plays a dominant role in explaining the sense of social presence experienced between co-players; the role of communication by visual cues seems less important. Although the study has given deeper insight in the role of interactions in co-play, results may not automatically hold for the play configuration of co-players that collaborate. To obtain a more complete understanding of the role of communications in digital play, we therefore will replicate our study, yet this time players will collaborate instead of compete with each other.

Chapter 5
Psychological Effects of Social Cues in Collaborative Play

5.1 Introduction

In Chapter 3 and 4 empirical insights were gained on the behaviour and feelings of players who are engaged in competitive play. In competition, players test their abilities against each other. However, although competition is a central factor in digital games, games are also played in collaboration with others. Collaboration in games allows players to divide goals between group members and rely upon each other, it enables them to perform otherwise impossible actions, and may make players feel that they are part of a team. Switching from a competitive to a collaborative play setting alters the character of the game and social interactions in and around the game. Deutsch (1949) and Bonta (1997) explained that competitive situations may produce levels of conflict, anger and aggression, whereas cooperative situations foster agreement and affiliation. Recent digital game research suggests that for players, who collaborate, feelings of cohesion and camaraderie are promoted and thus the competitive nature of the game is decreased (Anderson & Morrow, 1995; Eastin, 2007). Through affective and behavioural exchanges between opponents, the previous chapters have indeed shown that in addition to increases in enjoyment and involvement, competitive situations led to feelings of jealousy and remarks based on malicious delight. Since these feelings and behaviours may be less present in collaborative play, effects of social cues on players' feelings may be different for players who play in collaboration.

5.1.1 Collaborative play

Studies on psychological effects of competition versus collaboration primarily have been focussed on aggression and violent content in digital games (e.g., Zhang et al., 2010; Anderson & Morrow, 1995; Lim & Reeves, 2010; Eastin, 2007; Schmierbach, 2010). Research on social presence and/or player experience has mainly been conducted in either a competitive or a collaborative setting with different games and different opportunities to interact; this makes direct comparisons between configurations difficult. As one of the few, Lim and Reeves (2010) contrasted the experience of playing in competition with playing in collaboration with other co-players. They did not find differences on self-reports of valence, presence or liking of the co-player. Their study focussed on mediated co-play in which participants were not able to communicate by visual and/or auditory cues, and therefore had only minimal opportunities to monitor each other. Similarly, Anderson and Morrow (1995) tested whether players would behave and perceive game play differently when they were instructed to play in collaboration or in competition. In-game actions were videotaped and coded for aggressiveness of play. Although participants differed in their aggressive behaviour, they did not feel different about the game, their co-player (interpersonal liking) or their own mood state when playing against or with co-players. Also here, participants were not

able to see each other, and were instructed to avoid verbal communication outside the game. In the current thesis we will explore whether players experience games and their co-players differently, depending on whether they play collaboratively or competitively in varying social configurations.

Social interactions in collaborative play

Collaboration should lead to social interactions between players, as they have to coordinate their actions in order to reach the goal of the game (Björk & Holopainen, 2004; Scarpetta, 2008). Competitive games require players to form strategies that directly oppose the other players in the game, as their goals are often in direct conflict. Logically, these strategies will not be shared with co-players who have the role of opponents. However, outcomes for co-players in collaboration rely on their cooperative accomplishments; co-players will therefore communicate about in-game strategies and will behave cooperatively towards their co-players. Decortis, Lentini and Meurice (2010) described that teamwork and interpersonal understanding in collaborative play are highly important for players; both lead to cohesion between the members of a team. In their study, players indicated that feelings of empathy – i.e. trying to understand the feelings of others – are necessary for successful cooperation. Teamwork and the strong feeling of being connected seem to be the key factors that make collaboration different from competition. In literature (e.g., Scarpetta, 2008; Halloran et al., 2004), both factors have been positively related to the use of verbal communications. Many studies (e.g., Gibbs, Hew & Wadley, 2004; Chen et al., 2009) have revealed that communication with voice via headphones indeed is preferred since it helps players in tactical team-based games to create strategy, to inform each other about aims and objectives, and to request or offer assistance. Furthermore, Jensen, Farnham, Drucker and Collock (2000) argued that besides the content of conversations, the use of vocal cues themselves leads to a more positive experience. In contrast to research regarding competitive play, studies on collaborative play did not report findings on malicious delight or provoking of other co-players. They mainly discussed the importance of teamwork in collaborative play, and that vocal communications are an important way to reach this. Since motivations for communication seem different between competitive and collaborative play, interactions may also result in differences regarding feelings of social presence – and thus player experience – within these configurations.

Social presence in collaborative play

There is evidence from developmental psychology to suggest that collaborative and non-collaborative game play have different psychological consequences. In an fMRI

study, Decety and colleagues (2004) showed differences in brain activation when comparing participants who played with or against others. Sommerville and Hammond (2003) noted that preschool children were significantly worse in recalling who was responsible for an action when they cooperated versus when they took turns working independently to build a toy. Both studies partly ascribe their findings to the process of experiencing others as part of the self. Competing with others involves less merging of the self and other, whereas collaboration involves greater self-other merging (de Cremer & Stouten, 2003). *Self-other merging* (or feelings of closeness) is one of the important aspects that induce social connectedness (Aron et al., 1992). Social connectedness refers to the momentary fulfilment of the need for belongingness and relatedness to others based on social appraisals and experiences of sharing and involvement (Van Bel et al., 2009). Williams, Caplan and Xiong (2007) revealed that voice communication in collaborative play has a positive impact on sense of community between pre-existing friends and likely serves as a means for maintaining relationships. Voice users experienced significantly higher levels of happiness and lower levels of loneliness over time, again indicating the importance for people to be connected with others. Since the concept of social connectedness is closely related to social presence[30] (Rettie, 2003), the outcomes of the aforementioned studies may suggest that communications will affect social presence for co-players in a collaborative setting differently than in competitive play. Subsequently, this would imply that findings in Chapter 4 can be different for players in collaboration.

5.1.2 Aim of the study

In the current chapter, we have argued that being in collaboration with co-players may alter the experience of players compared to playing against players as opponents. Team mates share the same goals and depend on each other, while opponents have opposite goals which prevent them to share useful in-game information with each other. We therefore expect that collaborators will be more supportive in the game by giving more information to each other and will be less negative towards each other in remarks compared to the competitors. Cooperation may eventuate in stronger (emotional) connections between players, which may affect feelings of empathy differently than with players in competition. To gain more insight in the effects of different communication channels on social presence and player experience, this chapter sets out to investigate these effects in collaborative play. We will replicate the experiment reported in Chapter 4 in a collaborative instead of competitive context.

30 Social presence may help in fulfilling need for connectedness, but social connectedness does not lead to social presence (i.e., feeling less lonely does not make people appear, or appear more present).

The same analyses are performed as in Chapter 4 on self-reports and behavioural data. Similarly, we present a content analysis on the verbal communications between players in collaboration, which will explain the (presence and absence of) differences found on self-reports and observations. In addition, results on social presence, player experience and behavioural data for players in collaboration will be compared to the results found for players in competition.

5.2 Method

5.2.1 Design and participants

This experiment replicates[31] the experiment described in the previous chapter. A 2x2x2 incomplete mixed groups design was employed, where the Audio Channel (open vs. closed; within groups[32]), Visual Channel (open vs. closed; within groups) and Team Performance (winner vs. loser; between subjects) were used as fixed factors. An incomplete design was used to prevent participants from guessing the manipulations in the experiment. Furthermore, a pilot study revealed that the experiment with four game sessions would become a time consuming activity. We therefore decided to let participants play three out of four conditions. The conditions were randomly assigned and the order was counter balanced; see Table 5.1 for the number of participants per setting.

Table 5.1: Number of participants per setting.

Audio	No	No	Yes	Yes
Visual	No	Yes	No	Yes
N	25	31	31	35

As in the former study, only half of the data was actually used for analysis (the data of all players '1'). The actual sample size was 40 participants (5 female), aged between 16 and 33 (M_{age} = 22.8; SD_{age} = 2.0). Each participant was randomly assigned to three out of the four conditions. Participants were recruited via email by using an online participant database, or approached on the premises of the university. They all specified to have played computer games before.

31 The experiments described in Chapter 4 and 5 were conducted during the same period and chance decided whether participants played against or with each other; this to avoid sampling bias.

32 Audio and Visual Channel were used as within-groups factors to increase power and reduce error variance associated with individual differences.

5.2.2 Manipulations and procedures

Two participants were invited to the lab simultaneously and seated in two adjacent rooms with a window in between. A curtain was used to manipulate the presence of visual cues, and headsets were used to switch off/on the audio channel. The procedures were similar to those in the previous chapter. For a more detailed explanation of the set up of the study, see also the Methods section in Chapter 4 (§ 4.3). In contrast to the previous chapter, in the current experiment, participants played in collaboration against a team of two computer controlled opponents. The option to hurt a team mate in the game was disabled (i.e., friendly fire was turned off).

Figure 5.1: The same setup was used as in Chapter 4 with the difference that both players were now collaborating instead of competing. Opportunity for interaction via auditory cues is manipulated by the headsets; possibility for interaction via visual cues is controlled by a curtain. The player in front is seated in a sound proof lab.

5.2.3 Measurement Instruments

The same combined questionnaire from Chapter 3 and Chapter 4 was used, which probed three categories of experiences: social presence (*psychological involvement empathy, behavioural engagement, and jealousy*), player enjoyment (*positive affect, competence, challenge and frustration*) and player involvement (*boredom, immersion, flow, revised-flow and performance improvement drive*). Because it was hypothesized that self-other merging is higher for players in collaboration than in competition, also here the Inclusion of Other in the Self Scale (Aron et al., 1992) was included to the questionnaire. Scale analyses showed satisfying internal consistencies of all scales per setting (see Appendix A.5.1). As in Chapter 4, ratings on participants' vocal and non-

vocal behaviours were performed by two independent observers; a random sample was rated again by a third observer which resulted in satisfactory inter-observer-reliabilities for visual (Kappa = .83) and auditory (Kappa = .69) cues. Additionally, all in-game scores were logged to determine whether players had won or lost (post-hoc constructed factor: Team Performance). To control for the degree of acquaintance within dyads, Familiarity was measured before the play sessions with four items – such as "*I have a warm connection with [name player2]*" – from the Social Connectedness Questionnaire at the Individual level (SCQ-I; Van Bel et al, 2009); its Cronbach's Alpha was .91.

As in Chapter Four, all "players 2" received the same questionnaire which they had to answer from their co-player's perspective (i.e., [*Name co-player*] *empathized with me*", [*Name co-player*] *felt happy*, etc). Intra-class correlations between data from "players 1" and "players 2" in audio-channel open conditions revealed interdependency on social presence subscales (r_{emp}= .76, p_{emp}< .001; r_{jea}= .58, p_{jea}< .001; r_{beh}= .57, p_{beh}< .001), Positive Affect (r= .72, p< .001), Competence (r= .70, p< .001), Challenge (r= .56, p< .001), Frustration (r= .62, p< .001), Boredom (r= .65, p< .001), Flow (r= .66, p< .001), Revised Flow (r= .34, p< .001) and PID (r= .39, p< .001); correlations were significant and the highest in conditions with the possibility for verbal communication and not significant and lowest in conditions were this was not possible (only for this test the data of "player 2" was used in this study).

5.3 Results

Linear Mixed Model Analysis (repeated measures) was performed on behaviour data and self-reports. Audio Channel, Visual Channel, and Team Performance were included as fixed factors. Familiarity within dyads was used as a covariate, and Participant as random factor. This chapter first reports the analyses on the data of the current study. It then reports the comparison of findings of the previous and current studies, i.e. competitive and collaborative play.

5.3.1 Communication channels

Audio Channel

Results on expressed behaviours and social presence for the Audio Channel are given in the figures and table below. As intended, social interactions were more present when the audio channel was opened instead of closed. The analyses showed significant differences on the duration of both vocal cues (speech and non-verbal vocalizations) with regard to the manipulation of Audio Channel (see Table 5.1). Figures 5.2a reveals that participants talked, shouted, and laughed more in the Audio Channel-open than in

the Audio Channel-closed condition. Furthermore, significant differences emerged on two social presence scales; no difference was found on Jealousy (see Table 5.1). They indicated to feel more empathy and behavioural engagement when opportunities for vocal communications were enabled (see Figure 5.2b).

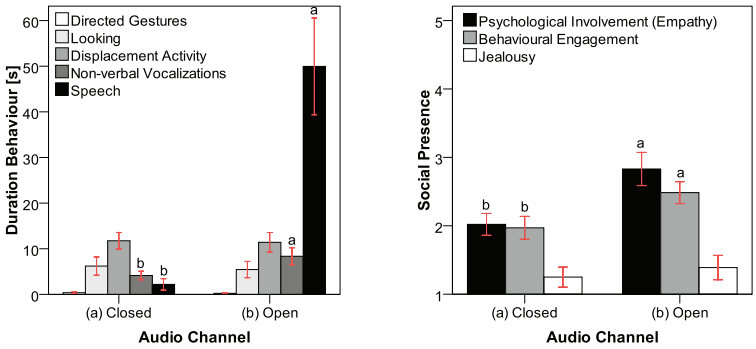

Figure 5.2: (a) Duration of expressed behaviours scored by observers, and (b) social presence as a function of Audio Channel (SE indicated in graph; letters above SE-bar indicate significant difference with the condition that starts with this letter; for Figure b, 1 = not at all, 5 = extremely).

Table 5.1: Results on expressed behaviour and social presence subscales for Audio Channel.

Audio Channel				
	Expressed Behaviour		*Social Presence*	
	Speech	Non-Verbal Vocalizations	P.I. Empathy	Behav. Engagement
F	107.00	21.11	62.12	25.85
p	**.001**	**.001**	**.001**	**.001**
R^2	.82	.33	.64	.38
df	1,81.4	1,78.4	1,77.7	1,79.8
$M_{yes}(se)$	50.0(5.3)	8.4(0.9)	2.8(0.1)	2.5(0.1)
$M_{no}(se)$	2.2(0.6)	4.1(0.5)	2.0(0.1)	2.0(0.1)

Effects on feelings of player enjoyment and involvement for the Audio Channel are shown in the figures and table below. Significant effects on player enjoyment related scales were found in terms of Positive Affect, Challenge and Frustration (see Table 5.2). Figures 5.3a shows that more fun, less challenge and less frustration was experienced

when the audio channel was opened than when it was closed. Furthermore, on player involvement related scales significant main effects emerged on Boredom and Revised-Flow. Figure 5.3b reveals that participants indicated to experience less boredom and more flow when audio communication was possible than when this was not possible.

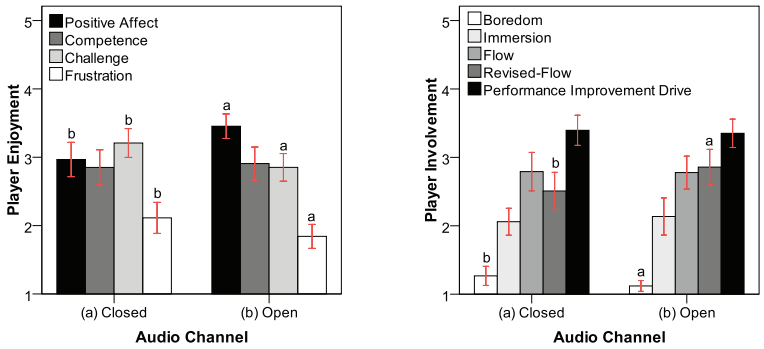

Figure 5.3: (a) Player enjoyment, and (b) player involvement related scales as a function of Audio Channel (1 = not at all, 5 = extremely; SE indicated in graph; letters above SE-bar indicate significant difference with the condition that starts with this letter).

Table 5.2: Results on player enjoyment and player involvement related scales for Audio Channel.

	Audio Channel				
	Player Enjoyment			*Player Involvement*	
	Positive Affect	Challenge	Frustration	Boredom	Revised-Flow
F	14.12	5.92	6.66	4.53	9.57
p	**.001**	**.02**	**.01**	**.04**	**.01**
R^2	.21	.05	.10	.09	.08
df	79.7	76.4	70.5	1,78.3	1,75.2
$M_{yes}(se)$	3.5(0.1)	2.9(0.1)	1.8(0.1)	1.1(0.1)	2.9(0.1)
$M_{no}(se)$	3.0(0.1)	3.2(0.1)	2.1(0.1)	1.3(0.1)	2.5(0.1)

Visual Channel

Effects on expressed behaviours and social presence for the Visual Channel are illustrated in the figures and table below. As hypothesized, social interactions were more present when the visual channel was opened, instead of closed. Significant differences are found on Directed Gestures, Looking, and Non-Verbal Vocalizations (see

Table 5.3). Figures 5.4a illustrates that participants looked more at each other, and more directed gestures and non-verbal vocalizations were used when the channel was opened than when it was closed. Self-reports revealed significant differences on P.I. Empathy (see Table 5.3); Figure 5.4b shows that they indicated to experience more empathy when the other co-player was visible. Compared to the Audio Channel manipulation, also in collaborative play, effects on empathy resulting from the possibility for visual communication are smaller than those from auditory communication.

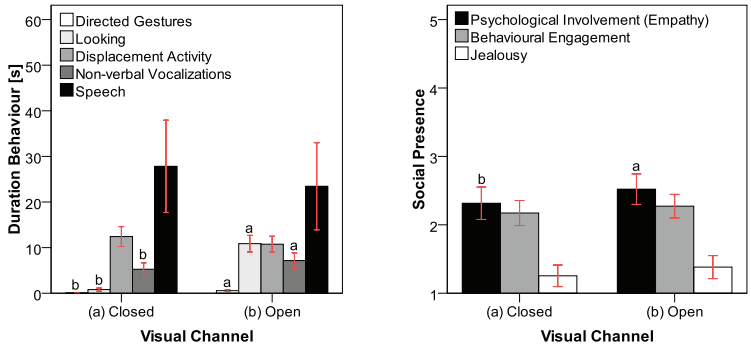

Figure 5.4: (a) Duration of expressed behaviours scored by observers, and (b) social presence as a function of Visual Channel (SE indicated in graph; letters above SE-bar indicate significant difference with the condition that starts with this letter; for Figure b, 1 = not at all, 5 = extremely).

Table 5.3: Results on expressed behaviour and social presence scales for Visual Channel.

Visual Channel				
	Expressed Behaviour			*Social Presence*
	Non-Verbal Vocalizations	Directed Gestures	Looking	P.I. Empathy
F	5.60	23.77	131.97	4.53
p	**.02**	**.001**	**.001**	**.04**
R^2	.08	.10	.74	.02
df	1,77.1	1,83.2	1,79.8	1,76.5
$M_{yes}(se)$	7.2(0.8)	0.6(0.1)	10.9(0.9)	2.5(0.1)
$M_{no}(se)$	5.3(0.7)	0.0(0.0)	0.8(0.2)	2.3(0.1)

In contrast to findings for Audio Channel no significant main effect was found on any player experience subscale (all *Fs* <1). Figure 5.5a and 5.5b present the scores of the

enjoyment and involvement indicators for the Visual Channel.

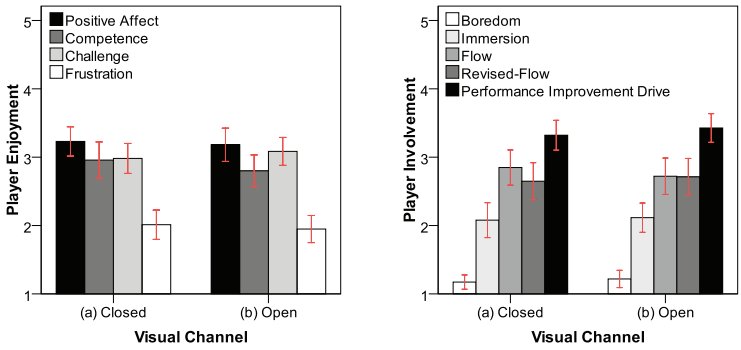

Figure 5.5: (a) Player enjoyment, and (b) player involvement related scales as a function of Visual Channel (1 = not at all, 5 = extremely; SE indicated in graph).

Interaction effects

In contrast to results in competitive play, in collaborative play analyses revealed significant interaction effects between Audio Channel and Visual Channel on P.I. Empathy ($F(1,73.9) = 11.69$; $p<.001$, $R^2=.14$) and Behavioural Engagement ($F(1,75.5) = 5.52$; $p=.02$, $R^2=.09$). Figure 5.6a shows that the possibility to exchange auditory cues raised social presence; the possibility to exchange visual cues raised social presence only when the Audio Channel was closed. However, the possibility to communicate through the visual channel did not increase the level of social presence when opportunities for interaction by vocal communications were enabled. The analyses also revealed a significant interaction on Revised-Flow ($F(1,72.1) = 4.41$; $p=.04$, $R^2=.04$). Similar to the findings on social presence, Figure 5.6b shows that the extra possibility for participants to exchange visual cues only increases the flow experience in the absence of an audio channel.

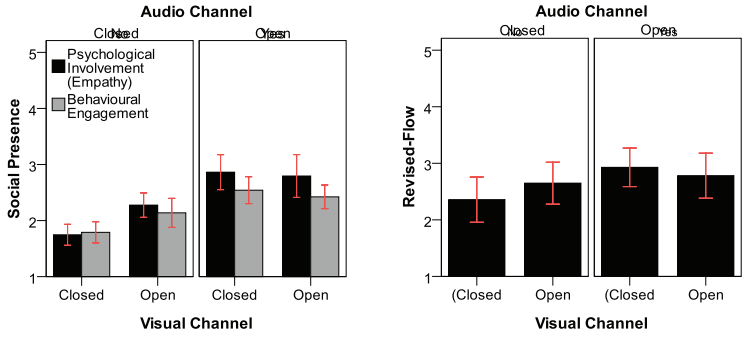

Figure 5.6: (a) Social presence scales, and (b) Revised-Flow as a function of Visual Channel and Audio Channel (1 = not at all, 5 = extremely; SE indicated in graph).

The analyses revealed one significant interaction between Audio Channel and Team Performance[33] on Revised-Flow ($F(1,82.9) = 14.94$; $p<.001$, $R^2=.17$). Losers (but not Winners) experienced less flow when the audio channel was closed compared to when it was opened (see Figure 5.7a). In addition, analyses revealed a significant interaction effect on Behavioural Engagement ($F(1,89.6) = 11.21$; $p<.001$, $R^2=.01$) and an effect that approached significance on P.I. Empathy ($F(1,85.8) = 3.76$; $p=.06$, $R^2=.04$) between Visual Channel and Team Performance. Participants who won their game experienced more behavioural engagement and empathy when the visual channel was opened than when it was closed; for losers no significant difference was found (see Figure 5.7b).

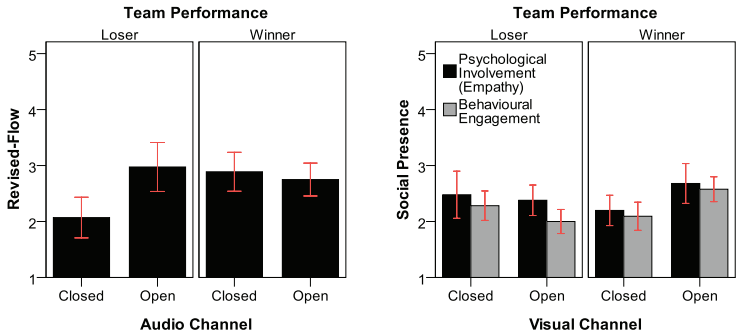

Figure 57: (a) Revised-Flow as a function of Team Performance and Audio Channel, and (b) social presence as a function of Team Performance and Visual Channel (1 = not at all, 5 = extremely; SE indicated in graph; letters above SE-bar indicate significant difference with the condition that starts with this letter).

5.3.2 Mediation analyses

Effects of social presence on player experience

Similar as in the previous chapters, mediation analyses were performed to test whether the effects on player experience were mediated by the subjective sense of social presence of the co-player. To test whether effects of Audio Channel on player experience were mediated by the subjective sense of social presence of the co-player, Linear Mixed Model Analyses on player experience scales were repeated with P.I. Empathy and Behavioural Engagement as covariates. Results revealed that significant main effects on Positive Affect, Boredom and Revised-Flow disappeared due to the

33 For a complete overview of main effects for Team Performance and Familiarity see Table A.5.2 and Figures A.5.1 and A.5.2 in the Appendix.

inclusion of social presence subscales as covariates (see Table 5.4). P.I. Empathy became highly significant after mediation analyses with these scales; for Boredom the covariate Behavioural Engagement approached significance. The effects on Challenge and Frustration were hardly affected by the inclusion of the covariates.

Table 5.4: Results of Audio Channel in the mediation analyses for social presence on player enjoyment and involvement related scales.

Audio Channel					
	Player enjoyment			*Player involvement*	
	Positive Affect	Challenge	Frustration	Boredom	Revised-Flow
F	2.62	7.63	4.28	1.00	.55
p	.11	**.01**	**.04**	.32	.36
R^2	.01	.08	.07	.06	.00
df	1,96.2	1,92.1	1,78.7	1,95.7	1,88.9
P.I. Empathy	***p*=.03**	*p*=.59	*p*=.54	***p*=.03**	***p*=.01**
B. Engagement	*p*=.91	*p*=.26	*p*=.18	*p*=.08	*p*=.87

The analyses confirm that social presence mediated the effects of Audio Channel on positive affect, boredom and flow; the effects on frustration and challenge were not mediated by social presence. Additional Sobel tests confirmed mediation, as they revealed that for effects caused by the audio channel, mediation by P.I. Empathy was significant for Positive Affect (z = 1.80, p=.07) and Revised-Flow (z = 2.24, p=.03). However, for Boredom the test was not significant (z = -0.93, p=.35). Similarly, for the effect on Boredom, mediation by Behavioural Engagement was also not significant (z = 1.19, p=.23). These findings indicate that the increase in fun and flow due to the possibility to interact via the audio channel are fully accounted for by the subjective sense of social presence[34]. In particular feelings of empathy seem to impact these experiences the most. The decrease in feelings of challenge, frustration and boredom are most likely caused by another factor than social presence.

34 To test for causality, for all mediation analyses an extra analysis was added in which the mediator and dependent variable were switched. Because these analyses showed no significant mediation, we may speak of causality in our results (see Kenny, 2009).

Effects of behaviours on social presence

To test whether the effects of Audio Channel on social presence were mediated by the expressed behaviours, the analyses on the social presence scales were repeated with Speech and Non-Verbal Vocalizations as covariates. Mediation analyses revealed that the main effect on Behavioural Engagement disappeared, and the effect on P.I. Empathy decreased due to the inclusion of the duration of the expressed cues as covariates (see Table 5.5). Speech became highly significant after mediation analyses of Behavioural Engagement and P.I. Empathy.

Table 5.5: Results of Audio Channel in the mediation analyses for expressed behaviour on social presence scales.

Audio Channel		
	P.I. Empathy	Behav. Engagement
F	5.58	.74
P	**.02**	.39
R^2	.06	.00
Df	1,88.1	1,94.7
Speech	***p*<.001**	***p*<.001**
Non-Verbal Vocalizations	*p*=.13	*p*=.76

Results for Visual Channel only indicated a significant effect on P.I. Empathy. Mediation analysis revealed that for Visual Channel the effect on this scale ($F(1,82.7) = .07$; $p = .79$, $R^2 = .02$) was mediated by the presence of Non-Verbal Vocalizations ($p < .001$), as the main effect disappeared and the covariate became significant; the covariates Directed Gestures ($p = .73$) and Looking ($p = .57$) did not reach significance.

Additional Sobel tests revealed that for effects caused by Audio Channel, (partial) mediation by Speech was significant for P.I. Empathy ($z = 4.92$, $p < .001$) and that mediation by Speech was significant for Behavioural Engagement ($z = 3.70$, $p < .001$). For P.I. Empathy (Visual Channel), mediation by Non-Verbal Vocalizations was significant as well ($z = 2.22$, $p = .03$). These findings indicate that differences on social presence caused by enabling the audio and/or visual channel are accounted for by the use of expressed behaviours of players. Similar to competitive play, vocal cues that are expressed in digital gaming mainly affect players' sense of social presence[35].

35 To test for causality, for all mediation analyses an extra analysis was added in which the mediator and dependent variable were switched. Because these analyses showed no significant mediation, we may speak of causality in our results (see Kenny, 2009).

5.3.3 Timing and content of interactions

Game phases

Vocal communications plays an important role in the mediation analyses on social presence, even when the audio channel is disabled. To gain more insight in the underlying processes, an additional analysis was performed in which the distribution of cues over time was explored. For the Linear Mixed Model Analyses, Game Phase and Team Performance were included as fixed factors. Familiarity within dyads was used as a covariate, and Participant as random factor. Figure 5.8 presents the percentage of the duration of behaviours per Game Phase. For both vocal cues, at the end the duration of expressed behaviours were significantly longer than at the beginning or middle of a game. All non-verbal cues are significantly less expressed during the game than in the beginning or the end. Furthermore, players look towards each other more often at the start of the game, than when the game ends. In contrast, more directed gestures are used at the end of a game than in the beginning.

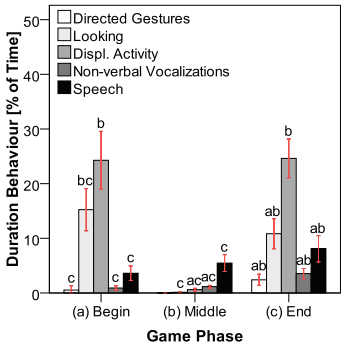

Figure 5.8: Duration of expressed behaviours as a function of Game Phase (SE indicated in graph; letters above SE-bar indicate significant difference with the condition that starts with this letter).

Results[36] showed significant findings (all $p<.001$) for Game Phase on all expressed behaviours. Similar to competitive play, these results show that communication by the audio channel is present during all phases in play. In contrast, non-vocal communications mainly take place at the start and end of the game.

36 Only results are discussed that are related to the factor "Game Phase"; see Table A.5.3 in the Appendix for a complete overview of the statistics

Content analysis of speech

To give more insight in conversations between players when vocal communication was enabled, the content of speech of a random chosen sample [37] (N = 25; 11 losers; 3 female) was coded. Figure 5.9 shows frequencies of Content of Conversation between co-players.

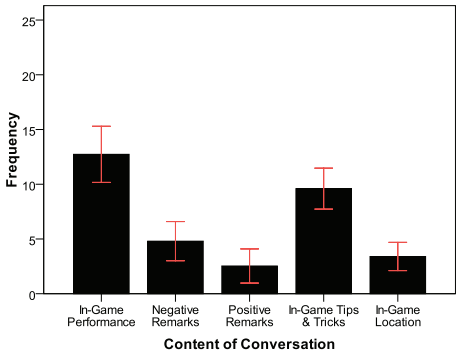

Figure 5.9: Frequency of Content of Conversation between co-players (SE indicated in graph). [38]

Communications mostly concerned participants' In-Game Performances (*M* = 12.7 (1.3)) with remarks such as, "*I think we are winning now*" or "*I killed two already, how many do you have killed*". In contrast to competitive play, participants did not mention the score that often when they had scored points. They also exchanged many In-Game Tips & Tricks (*M* = 9.6 (0.9)) to each other, which were similar to those in competitive play: "*you should get that rocket launcher*" or "*go down, you will find health packets*". Similar as in competitive play, more Negative Remarks – e.g., "*you are the worst team mate ever*" or "*please do your best or I will shoot you too*" – were made towards co-players than Positive Remarks (e.g., "*Good shot*" or "*you're a good team mate*"). In contrast to competitive play, participants did not provoke each other that often with Negative Remarks such as "*stupid*" or "*looser*". In-Game Locations ("*where are you*") were also occasionally discussed.

5.3.4 Competitive vs. collaborative play

To test the differences between competitive and collaborative play, analyses (LMMAs) were repeated on the combined data from the current and previous chapter with Configuration (Competition vs. Collaboration; between subjects) as an additional fixed factor. Furthermore, to verify the hypothesis whether participants in collaboration felt more

37 It was chosen not to code and analyze data from all participants for the sake of time; only data was used from conditions where audio was enabled.

38 For interactions between Content of Conversation and Team Performance see Figure A.5.3 in the Appendix.

as a coherent social unit than those in competition, also the Inclusion of Other in the Self (IOS) Scale was analysed. Results indeed revealed a significant difference for Configuration on the IOS Scale ($F(1,72.9) = 4.33$; $p=.04$, $R^2=.02$). Figure 5.10 reveals that collaborators felt more close ($M = 3.3$ (0.1)) to their co-players than competitors ($M = 3.1$ (0.1)).

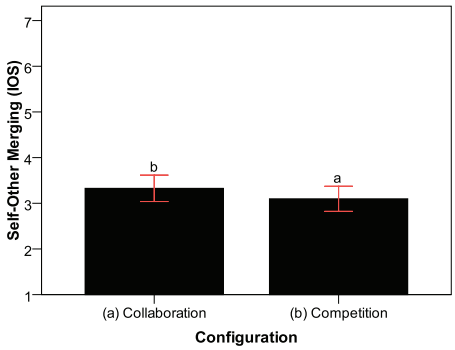

Figure 5.10: Closeness measured by the Inclusion of Other in the Self Scale as a function of Configuration (SE indicated in graph; 1 = not at all, 7 = extremely)).

Results on expressed behaviours showed significant differences on Non-Verbal Vocalizations ($F(1,76.8) = 4.71$; $p=.03$, $R^2=.03$) and Directed Gestures ($F(1,72.9) = 8.94$; $p=.01$, $R^2=.02$). Collaborators used fewer directed gestures and non-verbal vocalizations than competitors (see Figure 5.11a). Furthermore, significant effects were found on the social presence scales P.I. Empathy ($F(1,76.6) = 12.23$; $p<.001$, $R^2=.02$) and Jealousy ($F(1,74.9) = 4.20$; $p=.04$, $R^2=.02$). Collaborators experienced less jealousy and more empathy toward their co-player than players in competition did (See Figure 5.11b). There were no main effects of Configuration on player experience scales.

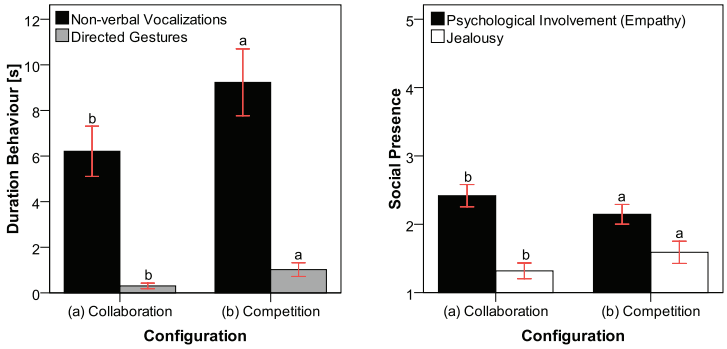

Figure 5.11: (a) Duration of expressed behaviours scored by observers, and (b) social presence as a function of Configuration (SE indicated in graph; for Figure b, 1 = not at all, 5 = extremely).

Communication channels

Analyses revealed a significant interaction between Configuration and Audio Channel for Non-Verbal Vocalizations ($F(1,163.9) = 5.33$; $p=.02$, $R^2=.12$). The increase of durations in shouting and laughing was stronger in competition than in collaboration when the audio channel was available. A similar interaction pattern emerged for one of the social presence scales: Jealousy ($F(1,170.6) = 7.13$; $p<.001$, $R^2=.11$). Here, the manipulation of Audio Channel induced larger differences in competitive than in collaborative play. See Figure 5.12a and 5.12b for the results.

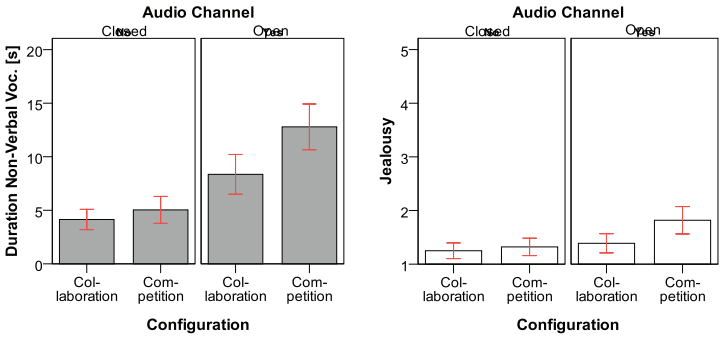

Figure 5.12: (a) Duration of Non-Verbal Vocalizations scored by observers, and (b) social presence as a function of Audio Channel and Configuration (SE indicated in graph; for Figure b, 1 = not at all, 5 = extremely).

Significant interactions also emerged on player enjoyment related scales – Positive Affect ($F(1,165.4) = 5.31$; $p<.001$, $R^2<.01$), Challenge ($F(1,157.8) = 3.41$; $p=.04$, $R^2<.01$) and GEQ-Frustration ($F(1,153.4) = 3.02$; $p=.05$, $R^2<.01$) – and on one player involvement related scale – Performance Improvement Drive ($F(1,154.9) = 5.21$; $p=.01$, $R^2=.01$). Effects of Audio Channel were larger for all enjoyment related scales in the collaborative setting than in the competitive setting. In contrast, the Audio Channel's effect on a player's drive to improve performance was larger playing in competition than in collaboration. See Figures 5.13a and 5.13b for the results.

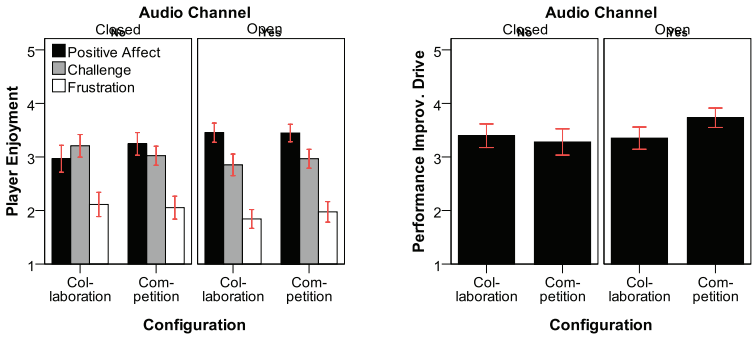

Figure 5.13: (a) Player enjoyment, and (b) player involvement related scales as a function of Audio Channel and Configuration (SE indicated in graph; 1 = not at all, 5 = extremely).

5.4 Discussion

Chapters 3 and 4 centred on competitive play; in this chapter we investigated the influence of social setting on people's feelings of social presence and in-game experiences in collaborative play. Social setting was manipulated by enabling and disabling auditory and visual channels independently, similar to the design of the experiment in Chapter 4. Results from self-reports revealed that social presence is affected more strongly by auditory than visual cues. Mediation analyses revealed that the higher levels of social presence experienced by players were directly caused by the increase in expressed behaviours during play. Higher levels of social presence directly resulted in an increase in player's in-game enjoyment and involvement. Findings were compared to those from the previous chapter, and revealed that the most important difference between competitive and collaborative play lies in what co-players share with each other and the way in which they feel connected to each other. However in general, many similarities were present between results in both play configurations.

5.4.1 Communication channels

Similar to findings in the previous chapter, our results revealed that communication through vocal cues took place frequently when audio was enabled via headsets, and that interactions through non-vocal cues were often present when the curtain was opened. Feelings of social presence increased when auditory communication was possible, mostly in terms of psychological involvement (empathy) and behavioural engagement. As expected, no effects were found on feelings of jealousy. Parallel to the increase of social presence, players indicated to experience more enjoyment and involvement. Mediation analyses revealed that when the auditory channel was open

the increase of psychological involvement (empathy) and behavioural engagement was caused by speech between collaborators. Subsequently, the increase in psychological involvement (empathy) resulted in a direct increase in fun and the experience of flow.

As expected, non-verbal communications occurred when the curtain was opened. Feelings of social presence due to the availability of visual cues only increased when communication through the audio channel was disabled in terms of psychological involvement (empathy). When participants were able to speak to each other, the extra option for visual communication did not enhance feelings of social presence. Behavioural engagement and psychological involvement (empathy) were both significantly higher for winners when they were able to see each other compared to when visual communications were disabled; for losers no significant effect was present. Also no effects of visual cues on player experience were found, which suggests that visual cues hardly have an impact on players' experiences in collaborative play. Mediation analyses for the influence of visual cues showed that the increase of psychological empathy was directly caused by the presence of non-verbal vocalizations when the curtain was opened. Similar as for competitive play, these findings demonstrate that the use of auditory cues causes feelings of social presence, yet visual cues had minor effects.

In addition, intra-class correlations revealed that players within dyads were able to guess their collaborators' feelings of social presence and in-game experience more accurately (i.e. *Empathic accuracy*; Ickes, 1993) when they could talk than when this was not possible. Similar to the results in Chapter Four and other studies (e.g., Gesn & Ickes, 1999), the information needed to be aware of these feelings is mainly retrieved by auditory cues from the other. However, compared to competitive play, in collaborative play correlations are generally higher.

Explaining the dominant role of auditory cues

Results showed that communications by the audio channel are present during all phases in play while non-vocal communications only take place at the start and end of the game; also in collaborative play far more vocal than non-vocal interactions were present. It seems plausible to assume that because of the dominant presence of vocal cues the mediation analyses revealed that these cues cause the effects on social presence; i.e. visual cues were less used and therefore hardly affected feelings of social presence. Mediation analyses explained the increase in positive affect and flow; however they could not explain why play seemed to get less difficult (less challenge and frustration). Results from the content analysis revealed that participants were often giving each other in-game information to be successful in the game when they were able to speak to each other. By giving each other tips and tricks the game may have become easier and therefore less frustrating.

5.4.2 Competitive vs. collaborative play

Although many results are similar to those found in competitive play, some differences were measured between collaborative and competitive play. First of all, we analyzed the Inclusion of Other in the Self (IOS) Scale (Aron et al., 1992) to verify whether competition is different than collaboration in terms of self-other merging. The analysis indeed showed that collaborators felt closer to each other than opponents. Analyses on expressed behaviours revealed that collaborators used less communicative cues than opponents. Interestingly, although fewer cues were exchanged in collaborative play, more empathy was present between collaborators than opponents. To explain this, we introduce the concept of *common ground*, which is defined as the mutual knowledge, mutual beliefs and mutual assumptions that are essential for communication between people (Clark & Brennan, 1991). We suggest that people in collaboration act in coordination with each other towards a shared goal and therefore reach a mutual understanding that is higher than for people in competition. We think that this bond between players as a result of being in the same team increased players' feelings of empathy towards each other during the game. The contrasting goals for opponents may explain why more jealousy is felt in competition than in collaboration.

Furthermore, the opportunity to exchange auditory cues increased fun and flow, and decreased feelings of challenge, frustration and boredom more strongly in collaborative play compared to competitive play. Besides the mediating role of social presence, we think that the informative content of conversations in collaborative play influences players' in-game experiences. Players in collaboration are more willing to exchange in-game tips and tricks with each other than opponents, which results in a more positive player experience. Similar to related studies (e.g., Bay-Hintz et al., 1994) observers noted that players used less negative verbal comments against collaborators than they did to competitors. Although there was no significant increase in positive remarks to each other when players collaborated, the character of the conversations were less negative. This was due to the amount of in-game information collaborators exchanged compared to opponents. Furthermore, conversations between opponents were more often about in-game performances, while this topic was less present in collaborative play. These findings verify the logical competitive attitude when playing with opponents and the cooperative mind-set when playing with team mates.

5.4.3 Limitations

Some limitations have to be mentioned regarding our study. Firstly, as we did not force players to compete against each other in Chapter 4, in this study we did not force players to cooperate. The game itself could easily be played without collaboration.

Our findings therefore are not based on a pure collaborative game where players fully depend on each other. We think that such a game will enhance the differences we found between our studies on competition and collaboration even more.

Furthermore, in the current and previous chapter we have revealed the role of the social richness of settings where both players played with each other in the same game. However, there are situations where all communication channels are available but players are not co-players but play games separately (e.g. in game cafes, see Chapter 2). Observations in Chapter 2 have revealed that players in the same game were highly engaged with each other, almost ignoring other visitors who were playing another game. Thus, besides the opportunity to use communication channels, the connection between players within the game may also be a prerequisite for increasing social presence and affecting player experience. Since our studies have been in social settings where players always played the same game, we cannot provide empirical evidence whether this is the case.

5.4.4 Conclusion

Similar to the studies presented in Chapter 3 and Chapter 4, player experience was influenced by social presence even though participants played in collaboration instead of competition. Our findings again confirm that players' experiences in co-play can be positively enhanced by enabling opportunities for social interactions, which will increase the sense of social presence (psychological involvement- empathy) for both players. Also for collaborative play, we have shown that the presence of co-players does not necessarily hamper player involvement in the game. On the contrary, we demonstrate that the focus on the play activity is increased when co-players have the opportunity to talk, shout and laugh with each other. Similar to competitive play, vocal communication plays a dominant role in explaining the sense of social presence experienced in collaborative play; the role of communication by visual cues also here seems less important. Conversations between collaborators were more about helping each other instead of provoking others and expressing malicious delight.

Although our results suggest that being able to talk with others will increase social presence in digital gaming, this may not necessarily be the case in all situations. As we have mentioned before, it seems highly important for our results that players are connected within the game. To provide empirical evidence for this argument, we will present a final study in which we will investigate how the in-game connection between players affects their sense of social presence, enjoyment and involvement.

Chapter 6
Psychological Effects from social ties inside games

6.1 Introduction

The previous chapters demonstrated that social context is an important determinant of player experience in multiplayer gaming. Positive feelings (i.e. empathy) towards the co-player increase with opportunities for social interaction, often involving talking, shouting and laughing, which consequently leads to higher enjoyment and involvement in the game. Yet of course, players are not only connected outside the game, they also interact with each other via the game itself. In Chapter 3 it was already demonstrated that players experienced more social presence, enjoyment and involvement in mediated than artificial co-play settings. This implies that feelings are also affected by the perception of being *connected* to other individuals through the game, even a game seemingly as devoid of social cues as WoodPong. We hypothesized that it is more meaningful to share experiences with humans, influence each other's game play, and to win or lose from them than when playing with computer controlled co-players (cf. Hoyt, Blascovic & Swinth, 2003; Okita, Bailenson & Schwartz, 2008). In Chapter 4 and Chapter 5 we indeed showed that many interactions around the game involved sharing experiences and discussing in-game achievements. Both topics were also mentioned in Chapter 2 as the main motivations to engage in (online) multiplayer games.

Multiplayer games give us the perception of shared experiences and being in competition with others, which may strengthen our involvement and engagement with co-players. This raises the question however, whether findings in Chapter 3 between artificial and co-located co-play would be similar when in both settings players would be seated next to each other. For instance, possibilities for interactions outside the game could diminish differences found on player experience between these settings. Since social interaction is essential for feelings of social presence in co-located co-play, perhaps the social connection between individuals inside the game then becomes less relevant. However, social presence is not just about being with someone in the same room, but also about sharing emotions, feelings, and seeing the other's responses to your actions and experiences. The chances that this occurs are higher when there is something to talk about (e.g., when players are connected within the game).

Although the connection between mediated co-players inside games seems relevant for feelings of social presence and players' in-game experiences, it's not clear how it affects such feelings in co-located co-play. Therefore, a final study will be presented in which we will address how co-play affects the sense of social presence and player experience through the bond between individuals, both inside as well as outside games. We will do this by focusing on the level of shared experience and social competition between co-located players.

6.1.1 Social ties through games

Shared experience

When others are present in the room, emotional experiences can be shared with them. The intensity of an emotional experience varies between settings where others are co-experiencing the emotional event, as compared to a setting where they are mere observers of the emotional situation (Jakobs et al., 1997). For digital gaming this would imply that co-located co-play (i.e., players playing the game together) may induce different feelings than co-located non-co-play (i.e., playing two separate games). When two players are engaged in the same game they experience the game together (i.e. co-experience), in contrast to a situation in which both players play their own game independently from the other. After all, co-playing implies that the game play of both players may be affected by the same in-game developments and information; specific in-game actions therefore may elicit synchronized behaviours. For instance, a sudden explosion that kills both players inside an FPS game may result in an outburst of laughter and exclamations by them. The synchrony in reactions may cause a heightened sense of psychological involvement (empathy) and behavioural engagement for both players (Biocca et al., 2003); synchrony has been found to increase media satisfaction (Nowak, Watt & Walter, 2009).

Moreover, the abovementioned example illustrates that sharing emotions can be more meaningful when players are connected through the game, than when playing independent from each other. Without further explanations, both players know from each other what causes their reactions; connections through the game therefore may also affect the psychological involvement between players (e.g., "*I know how you feel*"). Furthermore, the "explosion example" also illustrates a specific moment in which both players experience the same feelings (i.e., their avatars are both killed at the same time). The belief of co-players that they share an identical subjective experience with the other is known as *I-sharing*. In literature, I-sharing has been defined as the phenomenon that describes the increase in attraction and liking of the other with whom one shares an identical experience (e.g., Pinel, Long, Landau, Alexander & Pyszczynski, 2006). I-sharing relates to the (relatively) long-term feelings of social connectedness (Van Bel et al., 2009); it may give rise to the experience of belonging and relatedness, which results in positive feelings (Baumeister & Leary, 1995). Thus, besides synchronized behaviours and sharing emotions, I-sharing is also a type of social interaction which may shape player experience in co-located co-play in contrast to independent play.

Competition

Competition is a specific type of social interaction which seems more evident in co-located co-play than in co-located independent play; engaging in a social competitive activity such as digital gaming may shape player experience (Vorderer et al., 2003). In Chapter 1, we have explained that games have a strong evaluation potential because co-players can easily monitor and evaluate a player's performance (cf. Lee, Jeong, Park & Ryu, 2007). The presence of others during social competitive activities may therefore induce social comparison processes (Festinger, 1954; Garcia & Tor, 2009; Garcia, Gonzales & Tor, 2006; Johnson & Stapel, 2007), i.e. the drive to relate and compare abilities or opinions with that of equals. The competitive orientation motivates players to achieve an increase in their own performance or to achieve a status which is slightly better than that of others. Empirical support has revealed that this process is also present in social play settings (e.g., Chafel, 1987). The social challenge of matching one's abilities against another player may enhance a player's feeling of enjoyment and involvement in co-located co-play; the possibility to engage in social comparison after completion of a given task has been shown to influence happiness and confidence (Klein, 1997). Furthermore, the presence of others can induce feelings of social facilitation (Zajonc, 1969). Partial support was provided by Kimble and Rezabek (1992), who found that the presence of others indeed hindered performance for individuals who played a difficult game. In addition, in the previous two chapters it was shown that co-players continuously informed each other about their scores. In-game achievements were the source of many conversations, a result which already surfaced in our field study in Chapter 2. Thus, co-players engaged in competition will have more interactions than those who will play individually as they share more common ground. Playing the same game together allows for a shared context of objects and events which creates a social linkage between people and may prompt interaction. As a result, this may lead to higher levels of social presence, enjoyment and involvement in co-play.

6.1.2 Aim of the study

In this thesis, we have demonstrated that the perception of the in-game connection between players in mediated co-play and the connection between co-players outside the game, are both effective in increasing feelings of social presence. However, the role of the in-game connection between co-located co-players on feelings of social presence is still unclear. It is questioned whether this type of social tie is necessary, since co-located players may already be maximally connected outside the game through sharing the same physical space and being able to exchange all types of social cues. In this chapter we have described co-located co-play as being a more shared experience

with increased feelings of behavioural engagement (e.g., by synchronized interactions) and psychological involvement (e.g., by sharing emotions). Due to the asynchrony of in-game actions and moments between independent games, it is expected that these feelings will be less strong among co-located individuals playing solo-games. Therefore, an experiment was designed in which individuals were co-located, but not always played together and/or were not always able to see each other's scores. It is hypothesized that these factors will vary the strength of the social connection between players, which will affect their subjective shared experience. The manipulations for the option for *co-play* and *visibility of scores* were chosen on the basis of results from the content analyses in Chapter 4 and 5 and the field study in Chapter 2. It is expected that increasing the strength of an in-game connection will heighten the involvement and engagement with the other co-player. Furthermore, this will possibly increase meaningful social interactions as individuals will have more reason to express their emotions and approvals towards each other. Both consequences are expected to lead to an increase in social presence. Thus, an increase in subjective shared experience and social competition will result in a more positive player experience. Our findings will show the importance of the in-game connection between players, revealing its effects on feelings of social presence and player experience. Furthermore, it will reveal the mediating effects of social presence – induced by in-game social ties – on player enjoyment and involvement.

6.2 Method

6.2.1 Design and participants

A 2x2 incomplete experimental mixed groups design was employed, where Co-Play (yes vs. no; within groups[39]) and Score Visibility (yes vs. no; within groups) were used as fixed factors. In the experiment 126 Dutch graduate and postgraduate students (34 female), aged between 16 and 30 (M_{age} = 20.6; SD_{age} = 2.6) participated. We used an incomplete design to prevent participants from guessing the manipulations in the experiment. Participants played two out of four conditions; the conditions were randomly assigned and the order was counter balanced; see Table 6.1 for the number of participants per setting.

39 It was chosen to use Co-Play and Score Visibility as a within-groups factor to increase power and reduce error variance associated with individual differences.

Table 6.1: Number of participants per setting.

Co-Play	No	No	Yes	Yes
Score Visibility	No	Yes	No	Yes
N	30	32	32	32

Participants were recruited via email via an online participant database, or approached at the premises of the university. They all indicated to have played computer games before; only same sex dyads were formed.

6.2.2 Experimental manipulations

Similar to the previous two studies, the game *Unreal Tournament* (Miday & Epic Games, 1999) was used, which was displayed on a 17" monitor display. Unreal Tournament is a highly competitive game, in which teams that 'kill' the highest number of opponents – and are not frequently killed themselves – win the game. The option to hurt team mates in the game (i.e. friendly fire) was disabled. Two maps of the game were chosen for the conditions. Participants used the keyboard and the mouse to control their avatar; instructions were printed on a piece of paper that lay on their desks. They were seated next to each other, and could see and hear each other during the whole session (see Figure 6.1). Cameras were used to record (non)-verbal cues used by the participants. The music and in-game sound effects were played via the headsets. Separate rooms were available for both participants to fill in questionnaires after the game, which prevented participants from influencing each other's reports.

Figure 6.1: A similar setup was used as in Chapter 4 with the difference that both players were able to hear and see each other continuously; also, there was no glass window between the players.

The perception of being in the same virtual world may strengthen the social ties between co-players (cf. Stapel, de Kort & IJsselsteijn, 2008). We therefore manipulated the option for co-play. In the Co-Play-yes condition participants played the game together; they were in the same virtual environment and were able to meet each other in the game. In the Co-Play-no condition they played the same game and same level (clearly mentioned by the experimenter in his introduction), but each player played in an independent virtual environment.

Figure 6.2: Screenshot of Unreal Tournament as it was used during the sessions.

The perception of being in social competition is expected to increase when players can observe each other's in-game scores (cf. Lee, Park, Yeong & Ryu, 2007). Therefore, Score Visibility was manipulated independently from Co-Play. In the Score Visibility-yes condition, players' in-game scores were visible behind their names; scores were updated by the experimenter every 30 seconds. In the Score Visibility-no condition this information was not provided to players (see Figure 6.3).

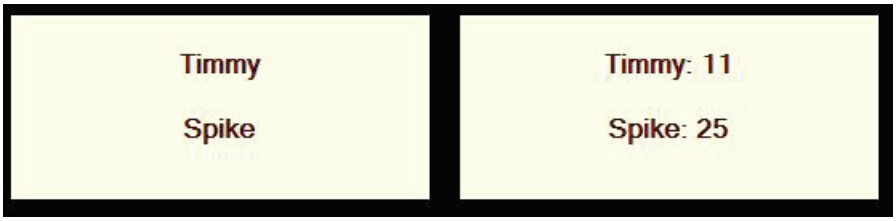

Figure 6.3: (a) part of the display when score visibility is off, and (b) when score visibility is on.

6.2.3 Procedures

The experiment was conducted in the Game Experience Lab of the Human Technology Interaction group (Eindhoven University of Technology). Participants were welcomed in pairs by the experimenter and entered the lab together. They were asked to fill in a consent form and a questionnaire probing their age, gender, familiarity with their co-player, and affinity with computer games. Participants were led to believe that the purpose of the study concerned latency in online games. The game was started and ended by the experimenter from a control room, in which both game screens and both participants could be monitored. Each dyad played in two conditions, which were randomly assigned to participants and were fully counterbalanced. After each condition (ten minutes game play) participants filled out a questionnaire. Lastly, they were debriefed, paid and thanked for participation. The experiment lasted 45 minutes; participants received a standard compensation of €10,- for their participation.

6.2.4 Measurement instruments

Player experience (i.e. player enjoyment and player involvement), social presence and social connectedness were measured with self-reports. The same combined questionnaire that was used in Chapter 3, 4 and 5 was used for all "players 1", which probed three categories of experiences: social presence (*psychological involvement empathy, behavioural engagement, and psychological involvement negative feelings*[40]), player enjoyment (*positive affect, competence, challenge and frustration*) and player involvement (*boredom, immersion, flow, revised-flow and performance improvement drive*). This combined questionnaire consisted of 55 items using 5-point uni-polar scales, ranging from 1 (not at all) to 5 (extremely), to indicate the intensity of the described experience. The internal consistencies of the social presence and player experience scales are given in Table A.6.1 in the Appendix.

To check whether the manipulation of Co-Play and Score Visibility indeed resulted in different strengths of social connection, for all "players 2" the Social Connectedness Questionnaire at the Individual level (SCQ-I; Van Bel et al, 2009) was used which probed the experience of social connectedness with the use of five components (*Relationship Salience, Shared Understandings, Knowing Experiences, Closeness and Dissatisfactions*). All items were rewritten in such a way that the original trait measure was transformed to a state measure. The questionnaire included 20 items using 7-point uni-polar scales, ranging from 1 (not at all) to 7 (extremely), to indicate the intensity of the described experience. Relationship Salience was measured with five items (α=.82) such as "*I was*

40 SPGQ-Jealousy was combined with SPGQ-Revenge ("*I had feelings of revenge towards [name player2]*") and labeled as SPGQ-Psychological Involvement–Negative Feelings.

often aware of my relationship with [name player 1]". Shared Understandings was measured with three statements (α=.90), such as "*I felt that [name player 1] and I shared experiences*". Knowing each other's Experiences was addressed with four items (α=.93), such as "*I often knew what [name player 1] felt*". Four items (α=.88) such as "*I felt I had a warm relationship with [name player 1]*" were used to measure Closeness. Dissatisfaction was approached with three items (α=.66) concerning the quality and quantity of the interaction such as "*My relationship with [name player 1] felt superficial*". Lastly the IOS was used to measure feelings of closeness by the degree of self-other merging[41].

To control for familiarity within dyads, Familiarity was measured before starting with the experiment with four items 42 (α=.92) from the SCQ-I. Furthermore, player behaviour during sessions was recorded by a video camera (video and sound).

6.3 Results

This section first reports the analyses on the data of the fixed factors; it then reports the mediation analyses. Linear Mixed Model Analyses[43] are performed on all self-reports. Co-Play and Score Visibility were included as fixed factors; Familiarity within dyads was used as a covariate and Participant as random factor. Half of the participants filled out the combined questionnaire that probed social presence and player experience (all "players 1"; n = 63, 16 females), while the other half filled out the SCQ-I (all "players 2"; n = 63, 18 females). Since feelings of social connectedness may be sensitive to the order of the conditions, it was decided not to use a within subjects design for the analysis of the SCQ-I. Therefore only the first conditions were included in the analyses of social connectedness.

6.3.1 Co-Play

Results on social connectedness and social presence for co-play are given in the figures below. As expected, social connectedness was stronger for participants in co-play compared to those in individual play. Figure 6.4a reveals that co-players experienced more relationship salience, felt more close to others, felt more certain of how their co-players experienced the game and were more convinced that they reached an understanding with them than players who played independently. The figure also reveals that in co-

41 See Table A.6.2 for the correlations of social connectedness with social presence scales

42 Trait measure; see Methods section Chapter 4.

43 In the current thesis data were analyzed with Linear Mixed Models due to the planned mediation analyses. These were performed by including covariates, which differ between conditions; a common Repeated Measures ANOVA in SPSS only provides the option to include covariates that are constant over the conditions (such as age, gender, etc.). By not using common ANOVA or MANOVA measures, multivariate testing was not possible.

play, fewer dissatisfactions were reported that when participants were playing their own game. Similar findings were found for social presence. Figure 6.4b illustrates that stronger feelings of behavioural engagement (M=2.3(0.1)) and empathy (M=2.9(0.1)) were reported in the Co-Play-Yes than in the Co-Play-No (M_{BEH}=1.8(0.1); M_{EMP}=2.2(0.1)) condition. The analyses revealed significant effects of Co-Play on all social connectedness scales; see Table 6.2. Furthermore, results showed significant differences for Co-Play on P.I. Empathy (F(1,75.0) = 46.01; p<.001, R^2=.72) and Behavioural Engagement (F(1,79.8) = 26.10; p<.001, R^2=.43); no differences were found on jealousy.

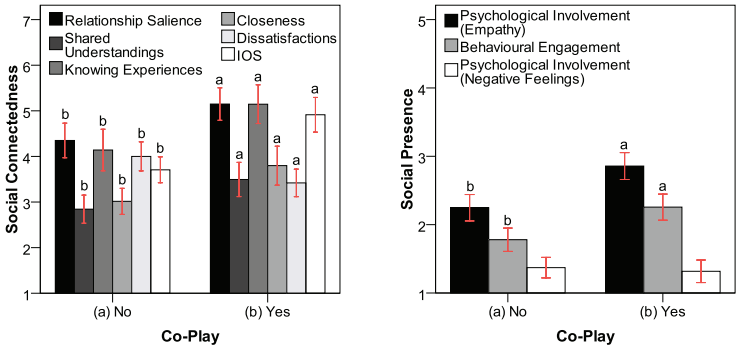

Figure 6.4: (a) social connectedness and (b) social presence as a function of Co-Play (SE indicated in graph; letters above SE-bar indicate significant difference with the condition that starts with this letter; for Figure a, 1 = not at all, 5 = extremely; for Figure b, 1 = not at all, 7 = extremely).

Table 6.2: Results on social connectedness scales for Co-Play [44] [45].

Co-Play	Relation. Salience	Shared Under-standings	Knowing Experiences	Closeness	Dissatis-factions	IOS
F	5.17	4.00	5.61	4.55	4.29	20.97
P	**.03**	**.05**	**.02**	**.04**	**.04**	**.001**
R^2	.21	.20	.23	.24	.35	.19
df	1,58	1,58	1,58	1,58	1,58	1,58
M_{yes}(se)	5.15(0.2)	3.49(0.2)	5.15(0.2)	3.80(0.2)	3.42(0.2)	4.91(0.2)
M_{no}(se)	4.35(0.2)	2.84(0.2)	4.14(0.2)	3.02(0.1)	4.00(0.2)	3.71(0.1)

44 In this thesis Adjusted R-Squared are given since LMMA does not provide the R-Squared based on the Sum of Squares; note that the Adjusted R-Squared (based on variance of residuals) can have also negative values (see also: Kreft & de Leeuw, 1998; Singer, 1998).

45 Degrees of freedom are not integers, because the MIXED command in SPSS uses the Satterthwhaite approximation when calculating df for these tests (see West, Welch & Galecki, 2007).

Results on player enjoyment and player involvement for co-play are presented in the figures below. Figure 6.5a shows that more positive affect, more challenge and less frustration was experienced when participants were playing the same game compared to when playing the singe player game. Figure 6.5b reveals that players felt more immersion, more flow and were slightly less driven to improve their performance in the Co-Play-yes condition than in the Co-Play-no condition. The analyses revealed significant differences on player experience for Co-Play. For player enjoyment scales significant differences were found on Positive Affect, Competence and Frustration. For player involvement related scales significant effects were present on Immersion, Revised-Flow and Performance Improvement Drive (PID); see Table 6.3 for the significant results.

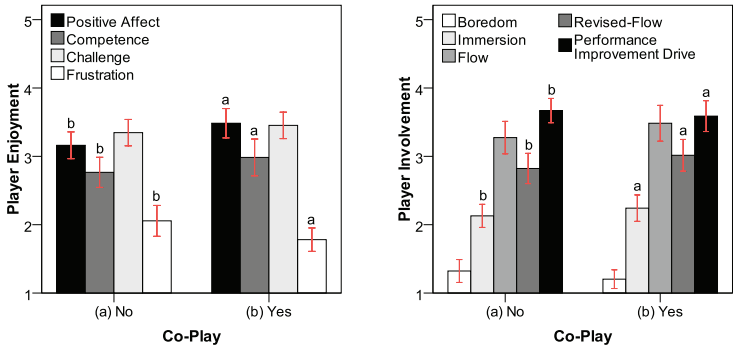

Figure 6.5: (a) Player enjoyment, and (b) player involvement related scales as a function of Co-Play (1 = not at all, 5 = extremely; SE indicated in graph; letters above SE-bar indicate significant difference with the condition that starts with this letter).

Table 6.3: Results on player enjoyment and involvement related scales for Co-Play.

Co-Play						
	Player Enjoyment			*Player Involvement*		
	Positive Affect	Competence	Frustration	Immersion	Revised-Flow	PID
F	5.56	4.29	5.11	4.65	5.19	3.99
p	**.02**	**.04**	**.03**	**.04**	**.03**	**.05**
R^2	.10	.08	.09	.09	.12	.05
Df	1,76.5	1,75.1	1,82.3	1,67.8	1,69.8	1,68.2
$M_{yes}(se)$	3.5(0.1)	3.0(0.1)	1.8(0.1)	2.2(0.1)	3.0(0.1)	3.6(0.1)
$M_{no}(se)$	3.2(0.1)	2.8(0.1)	2.1(0.1)	2.1(0.1)	2.8(0.1)	3.7(0.1)

6.3.2 Score Visibility

Results on social connectedness and social presence for score visibility are given in the figures below. As expected, social connectedness was slightly stronger for participants when score visibility was enabled. However, the effect seemed weaker than when co-play was enabled. Figure 6.6a illustrates that having information of each other's scores reduced experienced dissatisfactions during the game and slightly enhanced the feeling of being more certain of how co-players experienced the game. Furthermore, similar findings were found for social presence. Figure 6.6b shows that when participants were able to observe their own scores and those of others, they became more psychologically involved – both in terms of empathy and negative feelings –, than when this information was not visible. Manipulations of Score Visibility revealed significant differences on social connectedness and social presence scales in terms of Dissatisfactions, P.I. Empathy and P.I. Negative Feelings. Effects on Knowing Experiences and Behavioural Engagement approached significance; see Table 6.4 for the results.

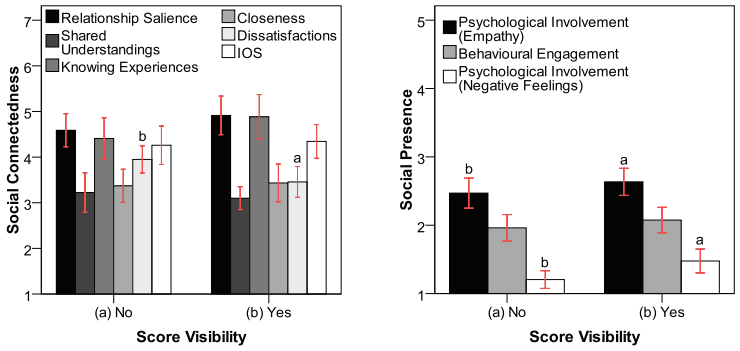

Figure 6.6: (a) social connectedness and (b) social presence as a function of Score Visibility (SE indicated in graph; letters above SE-bar indicate significant difference with the condition that starts with this letter; for Figure a, 1 = not at all, 5 = extremely; for Figure b, 1 = not at all, 7 = extremely).

Table 6.4: Results on social connectedness and social presence scales for Score Visibility.

Score Visibility					
	Social Connectedness		*Social Presence*		
	Knowing Experiences	Dissatis-factions	P.I. Empathy	B. Engagement	P.I. Negative Feelings
F	3.16	5.73	5.01	3.74	6.32
p	.08	**.02**	**.03**	.06	**.01**
R^2	.02	.02	.08	.05	.12
df	1,58	1,58	1,77.1	1,82.5	1,99.0
$M_{yes}(se)$	4.9(0.2)	3.5(0.2)	2.6(0.1)	2.1(0.1)	1.5(0.1)
$M_{no}(se)$	4.4(0.2)	3.9(0.1)	2.5(0.1)	2.0(0.1)	1.2(0.1)

Results on player enjoyment and player involvement for score visibility are shown in the figures below. In contrast to findings for Co-Play, the analyses did not reveal any significant effects of Score Visibility on player enjoyment and involvement related scales.

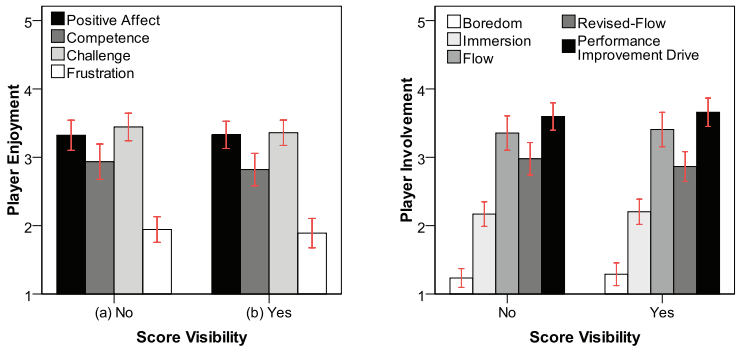

Figure 6.7: (a) Player enjoyment, and (b) player involvement related scales as a function of Score Visibility (1 = not at all, 5 = extremely; SE indicated in graph; letters above SE-bar indicate significant difference with the condition that starts with this letter).

Interactions

Significant interaction effects emerged between Co-Play and Score Visibility on Positive Affect ($F(1,82.5) = 3.08$; $p=.08$, $R^2=.06$), Competence ($F(1,80.7) = 4.25$; $p=.04$, $R^2=.02$) and Flow ($F(1,69.5) = 4.78$; $p=.03$, $R^2=.02$). Figure 6.8 shows that co-play enhanced fun, competence and flow when score visibility was absent; however it did not impact these feelings in when scores were visible.

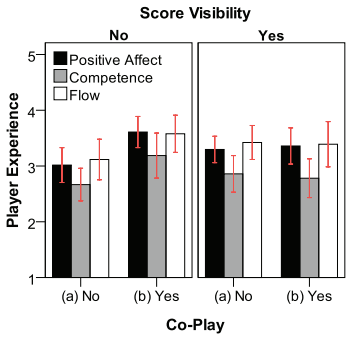

Figure 6.8: Player enjoyment related scales as a function of Score Visibility (1 = not at all, 5 = extremely; SE indicated in graph).

6.3.3 Mediation analyses

To test whether the effects of Co-Play on player experience are mediated by the players' sense of social presence, the analyses on player experience subscales were repeated with P.I. Empathy and Behavioural Engagement as covariates. Mediation analyses revealed that the main effects on Positive Affect, Competence, Frustration and Revised-Flow fully disappeared, in contrast to the effects on Immersion and Performance Improvement Drive (PID). P.I. Empathy became significant in the mediation analysis of Positive Affect and Revised-Flow; it approached significance for Competence. Behavioural Engagement also became significant in the mediation analysis of Positive Affect. See Table 6.5 for the results.

Table 6.5: Results of mediation analyses with social presence on the (a) player enjoyment and (b) involvement related scales for Co-Player Presence.

Co-Play			
	Player enjoyment		
	Positive Affect	Competence	Frustration
F	1.40	1.16	2.09
p	.24	.28	.15
R^2	-.04	-.01	.00
df	97.0	95.4	101.7
P.I. Empathy	***p*=.01**	*p*=.08	*p*=.23
B. Engagement	***p*=.02**	*p*=.39	*p*=.98

Co-Play			
	Player involvement		
	Immersion	Revised-Flow	PID
F	3.79	.43	6.21
p	.06	.51	**.02**
R^2	.06	-.04	.21
df	82.4	84.6	82.9
P.I. Empathy	*p*=.21	***p*=.03**	*p*=.67
B. Engagement	*p*=.06	*p*=.50	*p*=.58

The analyses confirm that social presence mediated a number of effects of Co-Play on player enjoyment and involvement. Additional Sobel tests revealed that for effects of Co-Play, mediation by P.I. Empathy was significant for Positive Affect (z=2.25, p=.02) and approached significance for Revised-Flow (z=1.76, p=.08); the mediation was not significant for Competence (z=1.51, p=.13). In addition, mediation by Behavioural Engagement was also significant for Positive Affect (z = 2.01, p=.04). These findings indicate that the differences on player experience in terms of fun and flow are caused by differences in players' experienced social presence due to the manipulation of the strength in social connection by being in the same virtual world [46].

6.4 Discussion

This chapter investigated to what extent the social connection within games affect players' experiences in co-located co-play. It was hypothesized that interactions between co-players within the same game-space enhance players' in-game enjoyment and involvement, similar to social interactions outside the game. Moreover, we hypothesized that a more positive player experience would be a direct result from an increase in social presence. After all, besides being with someone in the same room, social presence is also about sharing emotions, feelings, and seeing the other's responses to your actions and experiences. The chances that this occurs are higher when there is something to talk about (e.g., when players are connected within the game). To investigate this, an experiment was conducted in which the perception of shared experiences and social competition were manipulated to vary the strength of the in-game connection between players. Individuals played in the same physical space, but not always together and/or they were not always able to see each other's scores. As expected, these manipulations showed differences in strength of social ties inside and by the game; findings revealed

46 To test for causality, for all mediation analyses an extra analysis was added in which the mediator and dependent variable were switched. Because these analyses showed no significant mediation, we may speak of causality in our results (see Kenny, 2009).

that a strong social connection between co-players in games leads to a more positive player experience. Furthermore, similar to previous chapters, the study showed that the increase in player enjoyment and involvement was largely mediated by social presence.

6.4.1 Psychological effects from in-game social ties

Shared experience

The role of the social connection between players inside games was investigated by manipulating the extent to which they could share the same game-space and/or the extent to which they could compare their scores in the game. As expected, compared to independent play, co-play resulted in higher levels of social connectedness, which indicates stronger social ties among players when they share the same game. The manipulation caused individuals to experience higher levels of social presence – behavioural engagement and empathy – in co-play as compared to playing in separate games. Parallel to the increase in social presence, participants indicated to experience more positive affect, more challenge, and less frustration when they were both present in the same virtual world compared to when playing a single player game; they also felt more immersion, more flow and were slightly less driven to improve their performance in co-play. Mediation analyses revealed that both empathy and behavioural engagement caused the increase in fun; no effects emerged on negative feelings of social presence (i.e., jealousy and revenge). The increase in flow was also fully mediated by the increase in feelings of empathy, similar to findings in Chapter 4 and Chapter 5. These outcomes demonstrate that sharing the same game increases feelings of enjoyment and involvement.

Behavioural synchrony, sharing emotions and I-sharing were discussed as one of the important theoretical explanations to indicate why shared experience would affect player experience. Studies (e.g., Lakens & Stel, 2011; Van Bel et al, 2010) have revealed that these behaviours will lead to more involvement and positive feelings towards the other, which seems parallel to our findings. We therefore suggest that the occurrence of synchronized behaviour, sharing emotions and I-sharing could serve as possible underlying mechanisms for influencing player experience in co-play. Further research is necessary to investigate this possibility.

In line with findings on collaborative play in Chapter 5, effects on frustration were not mediated by social presence. Therefore, the decrease in frustration could not be ascribed to an increase in levels of social presence. We suggest that co-play was less frustrating as participants could share meaningful in-game information (*e.g., "you should not go down there, you're an easy target then"*) with each other compared to

independent play. This may also have caused the increase in subjective competence in co-play; similar to frustration, differences in competence could also not be ascribed to differences in levels of social presence.

Social competition

Our second manipulation involved social competition induced by the possibility for being able to see each other's scores during the game. Having information on these scores reduced feelings of dissatisfactions and slightly enhanced feelings of being more certain of how others experienced play; no significant effects were found on the other SCQ-I scales. In general, the effects of the score visibility manipulation on the strength of the social connection seemed small compared to the option for co-play. Nevertheless, findings revealed stronger feelings of social presence among players when score information was visible than when this was absent (cf. Lee et al., 2007), in terms of psychological involvement (empathy and negative feelings). These effects were also small compared to those on co-play vs. independent play; moreover, they did not translate in significant main effects on player enjoyment and involvement related scales.

Our findings show that the co-experience of playing in the same game elicits positive and large effects on players' feelings; this is not the case for the experience of being in social competition. This may imply that social competition – in contrast to the view of Vorderer and colleagues (2003) – is a factor that hardly distinguishes co-located co-play from co-located individual play. It is mainly the possibility to share experiences with others that seems to explain the attractiveness of co-located co-play. However, many studies have argued and shown that social competition is a strong drive to engage in co-located co-play. We therefore question whether our manipulation of social competition was successful; we will discuss this in the next section.

6.4.2 Limitations

There were some limitations to the presented experiment. First of all, our findings for social competition are in contrast with findings in Chapter 2, other related studies and our hypotheses. It was expected that the absence of scores on the screen would strongly decrease feelings of competition, and thus decrease the perception of being connected. Only in the individual play condition, this manipulation did show a modest effect. However, we cannot be sure we excluded all confounds in our experiment regarding inducing social competition. Since the experimenter instructed participants to perform at their best, this may have caused participants to feel socially competitive in all conditions. Furthermore, as the participation was co-located we could not fully control for any post-game conversations between participants in the short period after

their games ended and before they were redirected to fill out questionnaires. Since conversations surrounding digital gaming are mainly about in-game performances, these short communications (e.g., "*I had a lot of kills, and you?*") may have induced competitive feelings as well. These factors may have caused that the presence of in-game scores did not enhance the perception of being connected to the other as we would have expected.

Second, we have used a popular First Person Shooter game for the experiment. However, games from other genres that are less fast paced may offer breaks or moments in which players have the time to take a glance at their neighbour's screen. This could enhance the perception of having shared experiences and being in social competition as well. Although results will be affected by this, we strongly argue that our main findings are valid for the gross of games available.

6.4.3 Conclusion

In previous chapters the importance of interactions in co-play was shown for players' feelings of enjoyment and involvement. This chapter reveals that it is not only the availability of communication channels, but also the shared game experience within the same game space that enhances feelings of social presence and makes co-play more positive. Player enjoyment and involvement were increased by enhancing the strength of the social ties between players inside and by the game; also here social presence mediated the increase in enjoyment and involvement. Regarding these findings, it can be concluded that co-located co-play is more fun and engaging than any other setting, because social presence is then maximal experienced due to the powerful social connection between players inside and around the game.

Chapter 7
General Discussion

7.1 Gaming as a social activity

From the first release of games, computer games were criticized especially for their presumable link with social isolation (Orleans & Laney, 2000; Selnow 1984). However, just like in traditional board games, opportunities for communications are also present in multiplayer games (Durkin & Aisbett, 1999; Tychsen et al, 2006). Better yet, social interactions have a central role in playing digital games and therefore gaming can be approached as a social activity. During play, gamers have ample opportunities for social interaction with their peers. Play is a teaching ground to learn the importance of social rules, the benefits of cooperation, social coordination and strategy. Several studies (e.g., Colwell, Grady & Rhaiti, 1995; Shimai, Masuda & Kishimoto, 1990) have revealed that children who often played digital games behaved more sociably than those who did not play. Moreover, through play, we may learn self-control, and useful strategies to cope with frustration or loss. Many of the traditional games facilitate the development of such skills – from schoolyard play to traditional board games. Today, digital games offer an important addition to existing play experiences, as an immensely popular and ubiquitous form of entertainment. The shift from solo-play to multi-play games introduced the social component of playing together - either in competition or in collaboration - with co-players. The widespread penetration of the Internet now allows for social play without the restriction of co-players having to be in the same physical space. The reason why people are motivated to play with others has its roots in the fundamental human need for affiliation, our need to belong (Baumeister & Leary, 1995; Ryan et al, 2006). Playing together is fundamentally different than playing alone, a fact which has its consequences in the way play is experienced. Social context effects on players' feelings indeed have surfaced in recent game studies (e.g., Ravaja et al., 2006; Ravaja, 2009). Although these studies clearly reveal a consistent increase in enjoyment when playing with human others, literature on digital games did not yet offer an empirically validated explanation as to why such effects occur.

7.2 Overview of results

In this thesis we have systematically investigated the role of social context in *player experience* (i.e. the degree of experienced enjoyment and involvement in play). Based on a theoretical framework (Chapter 1) and a field study (Chapter 2), we have designed a series of controlled experiments to study effects of social context on player experience. By consistently focussing on the interactions between players in and around digital gaming and how these affect their player experience, we have shown that it matters whether players are playing with a real or artificial other (Chapter 3), are seated remotely or side by side (Chapter 3), in competition or collaboration (Chapter 4 and 5), and whether they are playing a game

together or separately (Chapter 6). In each of these empirical studies we have shown that these effects on player experience are consistently mediated by *social presence* (i.e., the sense of being together). In this chapter, we will discuss our main results in light of the earlier mentioned framework. We will explain that a co-player's presence enhances player enjoyment, player involvement, and social presence. Furthermore, we will discuss how the increase in feelings of social presence mediates the effects on player experience. We will end this chapter by discussing limitations in our studies and providing recommendations for future research. Our insights have relevance not only to the relatively new field of digital gaming, but to media psychology in general. Furthermore, our findings will be useful to game designers who aim to positively enhance players' experiences in digital play.

7.2.1 Social context effects on player experience

In Chapter 1 we argued that social context is important in player experience as it relates to the basic need for social contact and intimacy. The human need to belong seems to be the core motivation for engaging in play with others (Ryan et al., 2006); having social interactions is crucial for developing feelings of relatedness. We therefore investigated the role of social interactions in and around social play. In line with previous studies (Jansz & Martens, 2005), our experiments showed that having social interactions indeed is the most important motivation for people to engage in play with others (Chapter 2). When players can interact with each other, they experience more fun, competence, challenge, engagement, immersion and flow than when there is no option for interactions with human others at all (Chapter 3). Experiments revealed that for players in competition, communications through the audio channel were most important to increase feelings of fun, flow and the motivation to improve one's performance (Chapter 4). Similar findings were present for players in collaboration; interactions via the audio channel increased fun and flow, and decreased challenge, frustration and boredom (Chapter 5). Social interactions through the visual channel were not frequent and hardly affected player experience in both competitive and collaborative play.

Besides the connection between players outside the game (via the audio and visual channel), the perception of being connected to each other within games increases feelings of enjoyment and involvement as well. When communication via the audio and visual channel is absent (i.e. mediated co-play), the perception of sharing experiences with a human other is strong enough to increase the levels of fun and engagement in the game as compared to playing against a computer (Chapter 3). When communication via all channels is available (i.e. co-located setting), sharing a game – playing it together – decreases frustration and raises feelings of fun, subjective competence, immersion, flow and the motivation to improve one's performance (Chapter 6).

In line with related studies (Ravaja et al., 2006; Ravaja, 2009), the enjoyment in games was enhanced when social interactions between players were present. However, in contrast to theories by some scholars (e.g., Sweetser & Wyeth, 2005), our results empirically and consistently showed that the presence of a co-player did not prevent players from being focused on the activity of playing the game. If anything, players became more engaged, immersed and were more on top of their game (i.e. flow) when others were present (Chapter 3, 4, 5, and 6); this finding was present for competitive as well as for collaborative play.

The player experience framework

To understand the underlying process which may explain our findings, we used a theoretical framework presented by de Kort and IJsselsteijn (2008). They propose that player experience is shaped by social interactions surrounding the game. Their framework indicates that opportunities for social interactions – e.g., monitoring, gesturing and verbal communications – will affect feelings of social presence. Furthermore, de Kort and IJsselsteijn (2008) suggest a direct relation between social presence and player experience. To explain the increase in player enjoyment and involvement in the socially richer play settings, we turned to the concept of social presence. The first milestone in this process was to indicate that an increase in social interactions between players – through the game, the audio channel and visual channel – indeed enhanced feelings of social presence.

7.2.2 Co-player effects on social presence

To understand the social behaviour in (mediated) environments, Biocca and colleagues (2001; 2003) argued that a robust and detailed theory and measure of social presence was needed. However in contrast to CMC literature, relatively little attention has been given to social presence in digital gaming research. Most research has been focused on communication media in work environments (e.g., Short et al., 1976; Keil & Johnson, 2002; Bente et al., 2005). We questioned whether findings on interactions in CMC research would also hold for interactions in digital gaming. Our results indeed confirmed that – such as argued in related CMC studies on agents and avatars (e.g., Hoyt et al., 2003; Lim & Lee, 2009) – feelings of empathy, behavioural engagement and jealousy (i.e. social presence) increased by the mere perception of being connected to other individuals through the game (Chapter 3). In line with *Social Presence Theory* (Short et al., 1976), our studies have shown that the availability of richer social cues and the availability of different channels (audio and video) enhanced social presence during play. Feelings of empathy, behavioural engagement and jealousy in general were higher

when communication channels were enabled in competitive play (Chapter 4). Similar findings on empathy and behavioural engagement were present for collaborative play; feelings of jealousy were not affected by opening communication channels (Chapter 5). Thus, a number of findings for social interactions in CMC are comparable to interactions in digital gaming.

However, our studies revealed the dominant role of the audio channel in social interactions during games; adding the video channel to audio hardly affected the sense of social presence. The minor role of the visual channel is in contrast with Social Presence Theory, which states that audio and video are the most natural and rich channels for communication that will enhance feelings of social presence (see Short et al., 1976). In our studies, opening this communication channel did not result in an increase of gesturing or looking towards each other during the game (Chapter 4 and 5). We suggest that a players' visual channel was already heavily taxed as most of the game input entered via this channel; turning away one's head from the screen would therefore result in a diminished performance. Our findings seem more in line with Media Richness Theory (Daft & Langel, 1986), which states that the social richness of the communication medium has to be matched with the task in order for people to accomplish it satisfactorily. However, Media richness theory is aimed at situations where exchange of information is crucial for succeeding the task. This seems in digital gaming only the case in collaborative play, in which game play fully depends on two players working together. On the other hand, the "task" is not just winning a game, it is also about having fun, enjoying oneself. In this way, even without the exchange of functional information, Media Richness may still be relevant.

The dominant role of auditory cues (speech, exclamations and laughter) during play was shown in mediation analyses for feelings of social presence; the increase in feelings of empathy, behavioural engagement and jealousy were mediated by speech and/or non-verbal vocalizations (Chapter 4 and 5). Since non-vocal cues (gestures and looking towards each other) were not used, a minor role of the visual channel on feelings of social presence during the game seems logical. In general these findings are in line with predictions from the player experience framework, which assumed a direct relationship with social affordances and social presence (de Kort & IJsselsteijn, 2008). However, in line with Media Richness Theory, the provided social affordances in a setting – such as visual and audio channels – have to be employed to increase the sense of social presence. The presence of a channel itself is not sufficient to increase this feeling such as is expected according to Social Presence Theory; it is the exchange of social cues between individuals that explains this effect.

Social presence dimensions

Our results have shown that a co-player's presence increases feelings of social presence in terms of behavioural engagement and psychological involvement. The effects on behavioural engagement were smaller than those on psychological involvement – empathy. Empirical findings indeed revealed large increased feelings of psychological involvement in co-play based on empathy, i.e. the ability to understand and mirror another person's feeling. These findings are supported by results from our field study, in which participants mentioned that one of the biggest advantages of having social interactions outside games is that emotions of others are more easily perceived which made play more fun (Chapter 2). However, considering the importance of (social) competitive elements in playing computer games (Vorderer et al., 2003), digital gaming also induces a sense of psychological involvement based on negatively toned emotions (De Kort et al., 2007). Our studies revealed that these feelings indeed are present and play an important role in games by the many playful competitive remarks (Chapter 2 and 4) and the increased sense of jealousy and/or revenge during play (Chapter 3, 4, 6). Moreover, even in collaborative play, players indicated to still experience a small degree of jealousy towards each other (Chapter 5). Interestingly, results showed that jealousy was absent when players have the perception to compete against an agent (Chapter 3); thus, jealousy seems to only be present in human co-play.

In sum, effects of psychological involvement and behavioural engagement (i.e. social presence) develop due to the perception of sharing experiences with others (Chapter 3 and 6) and the expressions of emotions that are perceived and expressed via interpersonal dynamics (Chapter 4 and 5). According to the player experience framework a direct link should be present between social presence and player experiences (see Chapter 1), which would explain why player enjoyment and involvement were affected by the differences in social context in our studies. Our last step was to provide empirical evidence for this argument.

7.2.3 Social presence effects on player experience

De Kort and IJsselsteijn (2008) have theorized that player experience will be directly affected by changes in players' sense of being with others. Studies have revealed that the presence of others may induce processes such as social facilitation, evaluation apprehension, and increased self-awareness, which impact on performance and affect (e.g., Cottrell, 1972; Carver & Scheier, 1981). Affective states are influenced by observable affective states of others through mechanisms of emotional contagion (Hatfield et al., 1992), which may induce strong feelings of affiliation (e.g., Chartrand & Bargh, 1999). Moreover, sharing experiences with others and recognizing similarities in terms

of interest or affect induces affinity and interpersonal attraction (Moreland & Zajonc, 1982) and engenders an even stronger feeling of belonging (Raghunathan & Corfman, 2006). On the other hand, with the presence of others comes also the potential for pride or shame over performance, and impression management mechanisms (Goffman, 1959) to save face in the case of potentially negative perceptions of one's personality or capacities.

Whether individuals give others the impression that they are competent, similar, or likable, the reason for these processes to emerge is that people have the desire to relate with others. By having social interactions, and thus increased feelings of social presence, these processes are initiated and can install feelings of belongingness, which generally results in the experience of positive emotions (Baumeister & Leary, 1995). In our opinion, this also holds for co-play in digital gaming. Thus, an increased sense of social presence is core for explaining feelings of enhanced enjoyment and involvement. By the use of mediation analyses we statistically demonstrated that player experience indeed is mediated by feelings of psychological involvement (Chapter 3, 4, 5, 6) and behavioural engagement (Chapter 6). Thus, the theoretical framework presented by de Kort and IJsselsteijn (2008) is valid for the causal relation between social presence and player experience.

Mediation for player enjoyment and involvement

In Chapter 1, we have argued that player experience can be divided into feelings that probe enjoyment or involvement. Our findings revealed that these feelings indeed are not always mediated by psychological involvement in a similar way. In Chapter 3, the awareness of an opponent being human induced a higher sense of psychological involvement, which subsequently increased both engagement with and enjoyment of the game. However, jealousy emerged as mediator of co-player manipulations for player involvement, whereas empathy emerged as a mediator for player enjoyment. Players seemed to get more focused on the activity as the presence of the human opponent became more apparent and elicited stronger feelings of rivalry. Simultaneously, players enjoyed the increased feelings of being together as they experienced more empathy towards the other. These findings are in line with results from our field study, which showed that digital gaming is a mix of experiencing social fun and social competition (Chapter 2).

A recurring outcome in all empirical studies is the mediating role of psychological involvement for effects on positive affect (*the experience of being happy*) and revised-flow (*the experience where one is performing at best, is alert, and is in effortless control*). Perhaps this is not remarkable, since a brief comparison between these feelings shows

that they are both experiences that relate to a positive emotional state (see also Chapter 3). To experience flow people need goals to achieve, while this is not necessarily the case to experience positive affect. However, digital games are all about scores and achievements (Chapter 2); positive affect may therefore be more closely related to flow in digital gaming. This could explain the many similarities we found between positive affect and flow in our studies. Furthermore, in our field study it was mentioned that play becomes "smoother" (i.e. increased flow) and more fun when co-players could provoke, share emotions, help others and make jokes with each other in co-play (Chapter 2). Physically and mentally operating as one group – whether in collaboration or in competition – creates bonds between co-players and provides them the fulfilment of the need to belong they search for when they engage in play. When this is reached, then the game becomes increasingly fun and will run more smoothly.

7.2.4 To a broader context

We have shown that feelings of enjoyment and involvement (i.e. player experience) are both enhanced by an increased sense of social presence for players in competition as well as for those in collaboration. Social presence is increased in play settings, by the perception of playing with human co-players and the presence of social interactions with them. When results are combined, we conclude that the central factor that makes co-play feel different than individual play, is the perception that in co-play we are sharing experiences with others. In a sense, connecting game computers to each other is almost the same as connecting two minds to each other. It is the way the setting and activity allows us to perceive the other's emotion that seems to determine the degree of social fun we will experience. In a broader sense, our findings support the view that research on next generation communication interfaces amongst other things will more frequently have to be focused on the sense of the other (see e.g., Biocca, 2000). For instance, are there possibilities for verbal and non-verbal communication actions, in what way do we get feedback of the others' that are (virtually) there, and how will they affect our experiences when using the interface? Methods and tools discussed in this thesis can be of use to investigate these questions. More strongly, the findings also support the view that digital games are an excellent tool for conducting social studies (see e.g., Noy, Raban & Ravid, 2006). A heightened sense of social presence may strengthen social processes induced by interactions during the game. Feelings of being together can easily be varied by hindering/enabling the exchange of social cues, and games give a clear score on task performance (for both players). Recently, studies indeed have been conducted in a gaming environment where co-player's presence was manipulated. For instance, Cole and colleagues studied social facilitation effects

in co-located and mediated settings on gambling behaviour (Cole, Barret & Griffiths, 2011). We expect that in the near future digital games will be more used as a tool for conducting experiments in social studies.

7.3 Limitations and suggestions for future research

This thesis has some limitations with respect to whether our findings can be generalized to the entire game population and whether they hold for games in other genres. We will briefly discuss them below, together with some suggestions for future research.

7.3.1 Age and gender

We have consistently revealed that social presence mediates feelings of enjoyment and involvement in digital gaming. However, we have mainly conducted our studies with stereotypical male adolescent gamers, while the population of gamers is comprised of all generations and sexes (Nielsen, 2007). The question therefore is whether our findings can be generalized across age (i.e., children, adults, seniors). A recent empirical study by Gajadhar, Nap, de Kort and IJsselsteijn (2010) indeed showed that seniors experience multi-play differently. They conducted an experiment which followed the design and procedures as employed in Chapter 3. Although results showed differences between player experience of young adults and seniors, the mechanism of social presence mediating feelings of enjoyment and involvement remained intact.

Similarly, the question is whether our findings can be generalized across gender as well (i.e., male, female). For instance, it is well-known that men – in contrast to women – less easy share their feelings with other men. Since sharing experiences is key for the enjoyment in digital gaming (see Chapter 6), our results may differ from experiments conducted with mainly females. However – similar to the age-factor – we expect that the mechanism will hold as well. This is based on the fact that digital gaming is a *shoulder to shoulder* and not a face to face activity (O'Connell, 2011). Men tend to share personal feelings during shoulder-to-shoulder conversations more easily than when having a face-to-face conversation. We therefore argue that gender will not affect our conclusions, as men seem to share their feelings with the co-player as (relatively) easy as women would do. Furthermore, a recent study (Vanden Abeele, Gajadhar, & de Schutter, 2009) quantitatively and qualitatively revealed that females particularly enjoy the social interaction in digital games, while men enjoy the social competition. Since the presence of social interaction and social competition both are expected to increase feelings of social presence, the result of playing with others for both genders will always be a more positive experience than when they would play

alone. Nevertheless, we emphasize that the ratio male/female participants in future studies has to be more equal to account for gender effects.

7.3.2 Type of games

A second limitation of this thesis is that we have used two different games (WoodPong and Unreal Tournament) that – logically – do not cover the whole genre of available games. For instance, party-games (e.g., Wii Sports, SingStar) represent a relatively new genre of games which are played in highly social co-located settings. Although these games include competition, they are purposely designed to enhance social interactions between people to increase the enjoyment. Regarding our results we expect that social presence effects would have been much stronger present when we would have used these types of games for our studies. Furthermore, these games can be played with two to four, or even to up to eight people simultaneously on commercially available consoles; this introduces the factor of "number of co-players" which has not been discussed in the current thesis. In addition, online games can be played with one, two, or up to thousands of other people. We have only focused on one to three co-players, where the maximum of human co-players was set on one. Massive Multiplayer Online Role Playing Games (MMORPGs) are extensively investigated in literature (e.g., Yee, 2007). With so many players present in such games, it is difficult to get a mental representation of all individual co-players, as was the case in our studies. It would therefore be interesting to investigate how the social presence mechanism works in games with large groups of (co-)players.

7.3.3 The spatial layout of play settings

Besides the choice of games, some limitations in the generalizability of the findings have to be made regarding the spatial layout of our play settings. The marginal effect of enabling the visual channel in co-located co-play may in part be affected by the spatial layout of the physical setting of the experiments. These configurations reflect the typical setting in game cafes where players are often seated side-by-side and where turning towards one's co-player dramatically reduces visual attention to the screen. In contrast, games on consoles such as Wii or Kinect may afford more visual engagement as there is turn taking and increase of peripheral awareness of the other. In co-located settings such games are played on a single screen, whereas in our designs (except for the study in Chapter 3) two screens were used. Perhaps in shared-screen configurations a greater role for the visual channel can be expected. On the other hand the study by Chen and colleagues (2009) indicated that even when eye movement is easy, as when facing another in a tabletop session, eye contact may be limited as the game is what requires full attention.

In addition, in Chapters 4 and 5 there was a window between players to allow visual, but block auditory communication. The minimal use of visual cues there might have partly been the result of this barrier when compared to a free and open view. The glass may have suppressed visual exploration. However, although we did not report such data in Chapter 6, in that study similar patterns were visible while there was no glass window between players.

7.3.4 The Social Presence in Gaming Questionnaire

Some limitations have to be mentioned regarding the way we have measured social presence. We used the Social Presence in Gaming Questionnaire (SPGQ; de Kort et al., 2007), which focuses on social presence *effects* (e.g., empathy, jealousy, etc.). It differs from the questionnaire proposed by Biocca and colleagues (2001) by – besides the inclusion of negative feelings (i.e., jealousy) – the absence of a co-presence scale. Co-presence relates to a feeling of interpersonal awareness (Biocca et al., 2003). However, an increase in – for instance – behavioural engagement assumes the presence of another social entity by itself. This was statistically supported by the dimensionality analysis of the SPGQ, where items from the co-presence scale matched either the *Psychological Involvement* or the *Behavioural Engagement* subscale (de Kort et al., 2007). As a result, we have measured social presence by asking participants about the effects they experienced that are caused by the increasing awareness of the other.

Furthermore, some items from the original *Psychological Involvement Negative Feelings* subscale did not solely measure negative feelings[47]; these items were therefore excluded from analyses in this thesis, as they could also target positive feelings. We therefore suggest to study the SPGQ more closely in future studies and explore whether the existing questionnaire can be further refined.

7.4 Conclusion

We started our thesis by discussing that, similar to traditional play, social interaction is important in digital play. To understand this form of play, player experience models should account for the possible effects of co-players in games. To support our view, we systematically investigated how social context shapes player experience and social presence in a digital gaming context. We manipulated the social context of play settings to induce different levels of social presence in various ways (non-human vs. human co-player, online vs. co-located co-player, hearing vs. seeing the co-player, competitive vs. collaborative co-player, playing separately vs. playing dependently). Our results

47 For instance "*I was influenced by the other's mood*" and "*I influenced the mood of the other*".

show a mechanism of social interaction inducing feelings of social presence, which mediates player experience (positive affect and flow). Social presence is therefore key to understand player experience in digital gaming; psychological involvement revealed as a central construct in our findings. These findings will be useful to game designers who aim to positively enhance players' experiences in digital play. Furthermore, our findings on social presence are not only in line with the player experience framework (de Kort and IJsselsteijn, 2008), but also with Media Richness Theory (Daft & Lengel, 1986). This thesis therefore will not only contribute to the relatively new field of digital gaming, but to social presence in media psychology in general. In conclusion, we have shown that digital gaming is a form of media that cannot solely be understood without accounting for the social context which is played in.

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Appendix

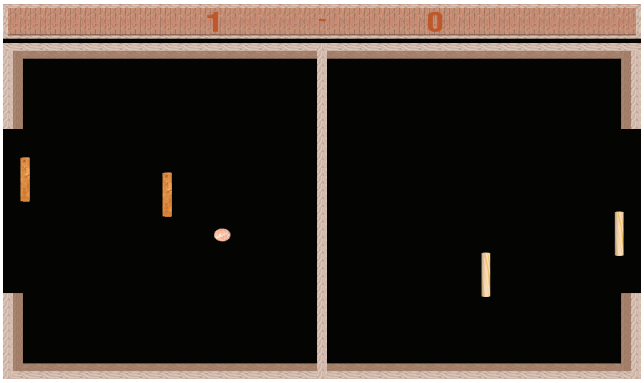

Figure A.3.1: A screenshot of the game WoodPong.

Table A.3.1: Internal consistencies (Cronbach's Alpha) of the social presence scales per setting.

	Artificial	Mediated	Co-located
P.I. Empathy	.66	.77	.78
B. Engagement	.90	.91	.85
Positive Affect	.82	.74	.84
Competence	.88	.88	.86
Challenge	.53	.66	.73
Frustration	.87	.80	.85
Boredom	.77	.90	.66
Flow	.87	.92	.93
Immersion	.68	.69	.74
Revised-Flow	.63	.70	.70
PID	.83	.73	.81

Table A.3.2: Correlations between social presences, player enjoyment and involvement scales.

	P.I. Empathy	B. Engagement	Jealousy
P.I. Empathy	1	.35**	.35**
B. Engagement	.35**	1	.15(*)
Jealousy	.35**	.15(*)	1

	Positive Affect	Competence	Challenge	Frustration
Positive Affect	1	.69**	.54**	-.35**
Competence	.69**	1	.26**	-.34**
Challenge	.54**	.26**	1	.04
Frustration	-.35**	-.34**	.04	1

	Boredom	Immersion	Flow	Revised-Flow	PID
Boredom	1	-.19*	-.19*	.07	-.28**
Immersion	-.19*	1	.49**	.36**	.26**
Flow	-.19*	.49**	1	.34**	.42**
Revised-Flow	.07	.36**	.34**	1	.19*
PID	-.28**	.26**	.42**	.19*	1

(*).05<*p*<.08; *p<.05; **p<.001

Table A.3.3: Results on player enjoyment and involvement related scales for Player Performance.

Player Performance					
	Player Enjoyment			*Player Involvement*	
	Positive Affect	Competence	Frustration	Revised-Flow	PID
F	18.12	44.69	13.22	12.38	3.80
p	**.001**	**.001**	**.001**	**.001**	**.05**
R^2	.18	.41	.21	.18	.11
df	1,118.7	1,116.7	1,105.2	1,117.1	1,114.9
$M_w(se)$	3.4(0.1)	3.2(0.1)	1.7(0.1)	2.8(0.1)	3.3(0.1)
$M_l(se)$	2.9(0.1)	2.2(0.1)	2.2(0.1)	2.3(0.1)	3.6(0.1)

Table A.4.1: Internal consistencies (Cronbach's Alpha) of the social presence scales per setting.

Audio Channel	No	No	Yes	Yes
Visual Channel	No	Yes	No	Yes
P.I. Empathy	.70	.76	.74	.78
B. Engagement	.90	.90	.85	.79
Positive Affect	.81	.78	.79	.84
Competence	.91	.84	.95	.90
Challenge	.78	.64	.76	.73
Frustration	.82	.69	.77	.68
Boredom	.87	.81	.77	.68
Flow	.97	.97	.93	.95
Immersion	.86	.83	.82	.79
Revised-Flow	.63	.76	.77	.67
Perf.Impr.Drive	.88	.87	.70	.91

Table A.4.2: Results on expressed behaviour for Team Performance.

Team Performance						
	Expressed Behaviour					Social Presence
	Speech	Non-Verbal Vocalizations	Displace. Activity	Directed Gestures	Looking	Jealousy
F	19.43	3.82	10.74	4.93	4.02	35.56
P	**.001**	**.05**	**.001**	**.03**	**.05**	**.001**
R^2	.22	.04	.21	.10	.00	.31
Df	1,111.4	1,111.0	1,114.7	1,113.9	1,104.1	90.0
$M_w(se)$	16.9(2.9)	7.6(0.8)	11.9(1.1)	1.2(0.2)	8.4(1.0)	1.2(0.1)
$M_l(se)$	41.6(5.9)	10.9(1.2)	16.2(1.2)	0.8(0.2)	6.8(0.9)	2.0(0.1)

Table A.4.3: Results on player enjoyment related scales for Team Performance.

Team Performance					
	Player Enjoyment				Player Involvement
	Positive Affect	Competence	Challenge	Frustration	Revised-Flow
F	25.94	43.11	5.44	9.85	19.43
P	**.00**	**.00**	**.02**	**.00**	**.001**
R^2	.19	.32	.06	.15	.14
Df	1,110.3	1,113.9	1,110.9	1,108.5	108.0
$M_w(se)$	3.6(0.1)	3.4(0.1)	2.8(0.1)	1.9(0.1)	3.2(0.1)
$M_l(se)$	3.0(0.1)	2.4(0.1)	3.2(0.1)	2.1(0.1)	2.5(0.1)

Table A.4.4: Results on expressed behaviours for Game Phase.

Game Phase					
	Speech	Non-Verbal Vocalizations	Displace. Activity	Directed Gestures	Looking
F	8.24	8.37	79.75	21.79	58.39
p	**.001**	**.001**	**.001**	**.001**	**.001**
R^2	.07	.08	.54	.21	.37
df	2,318.5	2,320.8	2,319.9	2,318.1	2,318.9
$M_{beg}(se)$	6.6(0.9)	1.4(0.3)	28.5(2.5)	1.1(0.4)	19.7(1.8)
$M_{mid}(se)$	5.8(0.7)	1.9(0.2)	0.6(0.1)	0.0(0.0)	0.3(0.1)
$M_{end}(se)$	10.3(1.2)	3.1(0.5)	26.5(2.0)	4.1(0.8)	12.5(1.3)

Table A.5.1: Internal consistencies (Cronbach's Alphas) of the social presence, player enjoyment and player involvement related scales per setting.

Audio Channel	No	No	Yes	Yes
Visual Channel	No	Yes	No	Yes
SPGQ-P.I. Empathy	.75	.73	.86	.90
SPGQ-B. Engagement	.90	.88	.90	.89
GEQ-Positive Affect	.83	.90	.85	.78
GEQ-Competence	.92	.90	.97	.87
GEQ-Challenge	.86	.70	.83	.82
GEQ-Frustration	.82	.85	.74	.66
GEQ-Boredom	.69	.89	.79	.79
GEQ-Flow	.97	.93	.93	.92
GEQ-Immersion	.88	.79	.88	.81
Revised-Flow	.70	.86	.80	.81
PID	.90	.89	.83	.92

Table A.5.2: Results on player enjoyment related scales for Team Performance.

Team Performance					
	Player Enjoyment			Player Involvement	
	GEQ-Positive Affect	GEQ-Competence	GEQ-Challenge	Revised-Flow	PID
F	10.02	27.31	14.06	3.85	8.20
p	**.01**	**.001**	**.001**	**.05**	**.01**
R^2	.16	.38	.14	.08	.03
df	101.4	97.5	101.6	99.2	95.0
$M_{win}(se)$	3.4(0.1)	3.2(0.1)	2.8(0.1)	2.8(0.1)	3.2(0.1)
$M_{los}(se)$	3.0(0.1)	2.5(0.1)	3.3(0.1)	2.5(0.2)	3.6(0.1)

Table A.5.3: Results on expressed behaviours for Game Phase.

Game Phase					
	Speech	Non-Verbal Vocalizations	Displace. Activity	Directed Gestures	Looking
F	13.04	26.13	60.55	11.82	51.67
p	**.001**	**.001**	**.001**	**.001**	**.001**
R^2	.07	.16	.52	.01	.40
df	2,276.9	2,279.5	2,279.2	2,279.8	2,277.7
$M_{beg}(se)$	3.6(0.7)	0.9(0.2)	24.3(2.6)	0.5(0.4)	15.2(1.9)
$M_{mid}(se)$	5.5(0.8)	1.2(0.1)	0.6(0.1)	0.0(0.0)	0.1(0.0)
$M_{end}(se)$	8.1(1.1)	3.5(0.5)	24.6(1.8)	2.4(0.5)	10.8(1.4)

Table A.6.1: Internal consistencies (Cronbach's Alphas) of the social presence, player enjoyment and player involvement related scales per setting.

Audio Channel	No	No	Yes	Yes
Visual Channel	No	Yes	No	Yes
P.I. Empathy	.78	.70	.72	.76
B. Engagement	.63	.57	.81	.78
P.I. Negative Feel.	.62	.69	.95	.85
Positive Affect	.73	.63	.75	.65
Competence	.88	.92	.95	.85
Challenge	.60	.61	.75	.62
Frustration	.75	.78	.63	.79
Boredom	.77	.87	.80	.73
Flow	.82	.63	.80	.88
Immersion	.81	.62	.76	.77
Revised-Flow	.83	.76	.77	.78
PID	.86	.86	.90	.91

Table A.6.2: Pearson correlations between social presence scales and social connectedness scales.

	P.I. Empathy	B. Engagement	P.I. Negative Feelings
Relationship Salience	.37**	.41**	.25**
Shared Understandings	.40**	.27*	.31*
Knowing Experiences	.57**	.48**	.39**
Closeness	.65**	.47**	.33**
Dissatisfactions	-.40**	-.28*	-.36**
IOS	.43**	.29*	.27*

*p<.05; **p<.001

Summary

Understanding Player Experience in Social Digital Games:
The Role of Social Presence

Including others in a playful activity fundamentally changes the concept of play into social play. This thesis focuses on social play in digital gaming. Previous studies have revealed the crucial part of social interaction in play, as the intrinsic need to belong seems to be the core motivation for engaging in such activities. Besides interacting with the game and focusing on the game content, gamers are confronted with emotions, behaviours, opinions and performances of others that can easily be perceived when playing side by side (*co-located co-play*). However, the widespread penetration of the Internet also allows for social play without the restriction of co-players having to be in the same room (*mediated co-play*). In online co-play settings a smaller amount of social information can be exchanged compared to co-located co-play. These settings therefore differ in the way gamers can interact with each other, which has an influence on how digital gaming is experienced. Focus groups, contextual inquiries, and four experimental studies were employed to uncover which aspects of social play in digital gaming make mediated and co-located co-play feel different.

The first study was conducted to explore the motivations of gamers to physically meet others to play digital games, compared to meeting them online. Based on interpersonal communications, focus groups and contextual inquiries, findings revealed that the appeal of co-located above online co-play results from the sociable, warm, sensitive, personal and intimate interactions that are possible when playing side-by-side. Furthermore, co-located co-play offers the possibility to experience social fun before and after game play, which often is not afforded in online co-play. The first lab experiment was conducted to empirically demonstrate to what extent player experience is influenced by the way co-players are present; e.g. as a virtual (human controlled), mediated or co-located co-player. Results on self-reports indicated that playing side-by-side significantly adds to the enjoyment and involvement in games compared to playing against a virtual (i.e. computer controlled) or distant co-player. These results could be explained by introducing the concept of social presence, which is defined as the feeling of being together with another individual. Results demonstrated that social presence mediated the enjoyment in social play. In the second and third lab experiment the possibilities for verbal and non-verbal interaction were manipulated between co-players in co-located co-play. One experiment investigated this for competitive play; a the other for collaborative play. Self-reports showed that interactions through auditory

cues positively influenced player experience. Interestingly, the presence of visual cues of one's co-player had no significant influence on play. Observation data of players confirmed that audio cues (e.g., talking, laughing) were far more often used than visual cues (e.g., eye contact, making gestures); visual cues were only used before and after play. Furthermore, we demonstrated that social presence – due to interaction by audio cues – mediates the enjoyment in social play. A final lab experiment was conducted to investigate the importance of the connection between players through the game for our results in the previous chapters. In this experiment players were co-located, but not always played together and/or were not always able to see each other's scores. Results showed that a subjective shared experience increases the strength of the social connection between players, and positively affects feelings of social presence, enjoyment and involvement. Similar to the previous findings, social presence mediated the increase in feelings of enjoyment and involvement.

In sum, our set of studies offered empirical support for when, why and how social interaction influences players' experience in co-play settings. Furthermore, the results indicate the importance of social presence as a mediating factor of enjoyment and involvement in social play. This provides new theoretical insights for communication experiences in other media, and social presence in general. Furthermore, findings may be useful to game designers who may want to enhance players' experiences in during digital play.