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**What social interaction tells about experience:
Exploring Player Experience in social gaming.**

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Declaration of scientific integrity

The author hereby declares that she/he has read and fully adhered the [Code for Good Practice in Research of the University of Basel](#).

Abstract

Is it more enjoyable, emotional or engaging to play video games with friends over the internet? Is a player more immersed into a video game because a co-player is present? Social interaction is a profound part of the activity for many gamers. But is it necessary to be connected with your co-players face-to-face or is voice chat enough for a good Player Experience (PX)? Prior research about multitudes of aspects of PX in social gaming showed that there is no simple answer to this question. Aspects of PX like engagement, emotions, enjoyment, immersion and flow seem to be linked to social interaction. Depending on the type of social interaction, PX is affected differently. PX is a complex structure and difficult to generally apply on the two social gaming settings of mediated and co-located gaming. This thesis introduces a possible differentiation of social interaction in video game research and proposes which aspect to differentiate and why.

Keywords; PX, Engagement, Enjoyment, Emotions, Flow, Immersion, Social Interaction, Social Gaming

Introduction and Research Question

Since the creation of the first videogames, gaming evolved massively. From just a hobby for a small group of people to stadiums filled with fans during e-sports events, gaming has reached a prominent position in the entertainment industry. It is also a medium for social purposes despite numerous singleplayer games. Research found that the social aspect in general is one of multiple motivations to even play games (Demetrovics et al., 2011).

Research about social gaming deals with the aspects of *Player Experience (PX)* in multiplayer games such as *enjoyment, engagement, flow* and many more. The social interaction between the players is focused as well as its impact on PX. Multiplayer games are games, which one does not play alone but with co-players. They can vary on dimensions like group-size, the type of play (cooperative vs. competitive) and the location of the activity (mediated vs. co-located). Especially the location of the gaming activity is of importance for this thesis.

Previous research mostly differentiated the location (or setting) in two distinct types, namely co-located and mediated gaming. Co-located gaming describes the activity of gaming with co-players who are in a close physical distance, which makes it possible to interact with each other without technological help to mediate the interaction. Mediated gaming is dependent on a mediator that facilitates the interaction between the co-players. Thus, the players do not need to be in the same room in order to be able to play together. Along with the development and distribution of broadband Internet game developers have gained new possibilities to create games in a more accessible mediated multiplayer setting. It is possible to play with other people from all around the world in several different ways of social interaction. Whether it is over text chat, voice chat or even face-to-face chat, social interaction in mediated gaming seems to vary. However, these differentiations are not represented in current literature, which merely distinguishes between mediated and co-located gaming (Cairns, Cox, Day, Martin, & Perryman, 2013; De Kort & Ijsselsteijn, 2008; B. Gajadhar, de Kort, & IJsselsteijn, 2008; B.

J. Gajadhar, Nap, de Kort, & IJsselsteijn, 2010). One could argue that with the variability of social interaction within mediated gaming and co-located gaming, PX in general would be affected differently. More specifically, if there were a relation between social interaction and aspects of PX such as engagement, enjoyment, flow, *immersion* and *emotions*, they could be predicted by the level of cues of social interaction. For instance, players would be more engaged, if the degree of social interaction were higher, meaning gamers would be playing co-located or with more cues of interaction.

In the following thesis I am going to try to elucidate the relation between the levels of social interaction in gaming with the aspects of PX. Particularly engagement, enjoyment, emotions and flow as well as immersion are going to be included. Furthermore, I am going to discuss the relations within PX regarding social gaming to additionally illustrate the complex structure of PX. From this I apprehend the following research question (RQ):

RQ: Does the level of social interaction in gaming predict Player Experience (PX)?

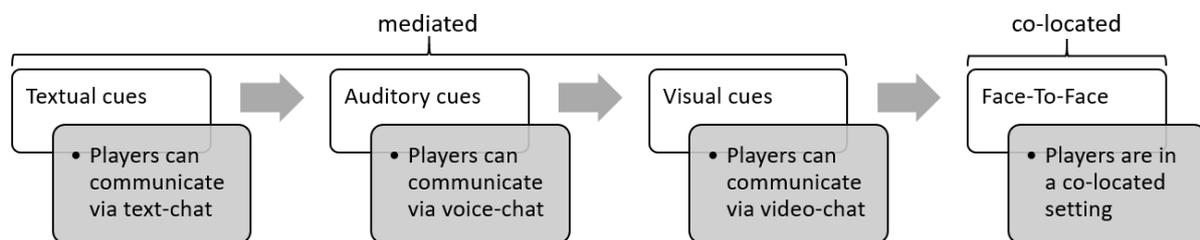


Figure 1. Levels of social interaction. This figure illustrates the proposed ordinal designed scale of social interaction in social gaming. From left to right more cues lead to a greater social interaction and at most to a virtually co-located setting finally ending in the literally co-located setting.

An Overview on Social Gaming

In the context of this thesis social gaming is defined as playing video games in a social setting. Be it playing a real time strategy game like *Age of Empires* (Microsoft, 1997) over an Internet connection solely with a stranger, raiding a dungeon with dozens of friends in *World of Warcraft* (Blizzard, 2004) or having a tournament of *Counter Strike* (Valve Corporation, 1999) in a sports hall with either friends or strangers, social gaming has various dimensions and can be differentiated in numerous ways. In the following, different aspects of social gaming from the literature are going to be introduced.

Levels of social interaction, as indicated by the type of cues, range from playing co-located on a couch to playing mediated through the Internet with a friend from the other side of the planet, which can be differentiated by the type of mediation. For instance, mediated gaming can range from text chat with little cues of social interaction to face-to-face chat with auditory and visual cues of social interaction. As illustrated in *Figure 1*, I propose a scale of levels of social interaction, in which more cues of social interaction approach the experience of the co-located setting. The scale is designed like a process because with each step new cues are added to the existing ones. When communicating over text chat with a co-player, one has textual cues of social interaction, which approaches the most basic setting of communication in social gaming. When engaging in voice chat, which is the current standard of communication, the players experience auditory cues of social interaction, meaning they can hear each other's voices. In a possible next step, people would add visual cues by face-to-face chatting while playing video games. This kind of exists already, however it is only in a one-way interaction available so far. With the success of video gaming streaming services like Twitch.tv (Twitch.tv, 2011), where one player streams his or her video game over the internet to an audience while also being filmed, this asymmetric social interaction started to appear. In this setting, the streamer experiences communication with his audience only over textual cues while the audience experiences the streamer over auditory as well as visual cues.

In current research, the two most common settings are the co-located versus the mediated setting with either textual, auditory or even less cues of social interaction (Cairns et al., 2013; De Kort & Ijsselsteijn, 2008; B. Gajadhar et al., 2008; B. J. Gajadhar et al., 2010). When experiencing all the possible cues of social interaction, the players are in a co-located setting. For the co-located gaming there is a report indicating that social interaction is a key factor in the player's motivation (Vaida & Greenberg, 2009).

Another aspect in social gaming is the genre. Different genres offer different forms of interaction. When playing a competitive game, PX differs from playing cooperatively. Competitive games can bring out different forms of communication depending on whether the coplayer is friendly or hostile, which then creates intense emotional situations (Carter, Gibbs, & Wadley, 2013). Cooperative games will expect from you to cooperate with your teammates, acquire knowledge about each other's skills and communicate more effectively (Kaye, 2016). Furthermore, there is an influence on subsequent behaviour depending on whether the game is in a competitive or cooperative social context (Ewoldsen et al., 2012).

To summarize, there are multiple dimensions of social gaming, which could all have an impact on PX. To narrow the yet broad nature of this topic, this thesis is mostly going to focus on the aspect of the type of social interaction in social gaming. A possible influence on PX could be the difference between cooperative and competitive gaming as well as a possible influence of group size when playing co-located or mediated.

The Player Experience

Previous research concerning video games struggled with a generally valid definition for PX. One rather holistic approach as an example is the framework of Sánchez et al. (2009). Their playability model includes various aspects of PX (Sánchez, Zea, & Gutiérrez, 2009). Most of the PX aspects proposed in this thesis are part of their model. However, for the discussion of the research question not all parts of the model are of relevance. This thesis focuses on the aspects of engagement, enjoyment, emotions, flow and immersion but takes the right to use the term *Player Experience (PX)* for simplicity reasons when speaking about the experience in general. In the following chapters I am going to describe those aspects and their relation to social gaming. Moreover, I am going to draw the connection from each aspect of PX to social interaction and discuss its implications. Finally, I am going to illustrate the relations within PX to show its accumulated, complex structure and am going to state its relevance.

Emotions

For PX, emotions are a well-researched factor (Madeira, Arriaga, Adrião, Lopes, & Esteves, 2013; Ravaja, Saari, Salminen, Laarni, & Kallinen, 2006; Ravaja, Saari, Turpeinen, et al., 2006). Emotions have a strong connection to enjoyment and do not necessarily need to be positive. Negative emotions, like fear and frustration, can enhance players' experience as well as positive emotions (Bantinaki, 2012; Bopp, Mekler, & Opwis, 2016). Video games can induce a variety of emotions in players, regarding their preferences as well as physical and vocal outbursts (Merks, Truong, & Neerinx, 2007). In a social context, players show more and more energetic emotions than playing solo (Lazzaro, 2004). This could have a significant meaning for the difference between social gaming with high or low physical proximity. One could argue, that perception of emotions in a group could be a strong factor for PX in social

gaming and that the perception of emotions varies between co-located and mediated gaming. In relation to social gaming there are different emotions, which can be placed in a social context. Schadenfreude, the phenomenon about gloating over misfortune of others, is one off three reported social emotions by Lazzaro (2004). Naches describes the feeling of pride over an accomplishment of a friend. Amusement is the third social emotion. In the wide range of video games, it is obvious that they can trigger different emotions. When playing competitively, Schadenfreude is rather to be expected than Naches. Analogue, cooperative gaming is more likely to induce team-work related emotions like Amusement and Naches (Lazzaro, 2004).

Social Interaction and Emotions. Regarding the emotional aspect of the differentiation between co-located and mediated gaming, a good point to start with is arousal. Arousal is associated as a determinant of emotional states (Schachter, 1964). Therefore, in connection to emotion, it is important to include physical and cognitive arousal in the aspect of this research question as well.

One approach is the theory of social facilitation. It describes, amongst other things, the phenomenon that the mere presence of other people creates a state of increased arousal (Zajonc, 1965, 1980). The presence must be physical which could be taken as an argument to state that mediated social gaming differs concerning arousal. Similar results have been found in a more recent study (Ravaja, Saari, Turpeinen, et al., 2006), which also suggests, that the heightened arousal level when playing in a social setting elicits more positive emotions and is dependent on the nature of the acquaintance. Ravaja et al. (2006) explain that the positive emotions are triggered from the enjoyment of winning in front of the others. Consequently, the absence of physical presence of the partner in social gaming should lead to lesser levels of arousal and less positive emotions. When putting this hypothesis on the levels of the social interaction model (*Figure 1*) it would mean that depending on the level of cues, arousal would be affected.

An additional input about the differentiation of emotion in social gaming offers the phenomenon of emotional contagion (Hatfield, Cacioppo, & Rapson, 1993). It claims that through the processes of empathy and mimicry, people tend to copy affective states from the corresponding person through the perception of facial expressions and other non-verbal communication (Ramanathan & McGill, 2008). In the social interaction of cooperative gaming, positive emotions can swap from one person to another through the perceived reinforced reaction of the teammate, as long as the feelings are congruent (Raghunathan & Corfman, 2006). This could be explained through the mirror neuron system, which describes the fundamental process of learning through watching and afterwards imitating others, which functions with audio-visual cues (Cattaneo & Rizzolatti, 2009). In addition to this, social presence of others leads to physiological linkage which describes the synchronization of physiological signs like heartbeat, cortisol, blood pressure and respiration (Ekman et al., 2012). To my knowledge, physiological linkage in a mediated context has not been a topic in research. Regarding the findings of Aiello & Svec (1993), in which mediated social presence affect arousal, a positive finding about mediated physiological linkage would not surprise because it is not described as a process merely based on visual stimuli. For example, the perception of a romantic partner's emotions can lead to physiological linkage (Timmons, Margolin, & Saxbe, 2015), which should be possible over a mediated setting as well.

Discussion. In the context of this thesis, more cues of social interaction should lead to more arousal on the basis of the social facilitation theory. But other research contradicted the hypothesis that social facilitation is only possible in a co-located setting (Aiello & Svec, 1993). Aiello & Svec (1993) reported that social facilitation mediated through the Internet is possible. They concluded that, when people perceive that they are electronically monitored during work without either auditory or visual stimuli of social presence, task performance seems to be worse. One could argue that social facilitation effects occur analogue in social gaming mediated through the Internet when perceiving social presence through auditory

stimuli (voice chat) without being co-located. Therefore, regarding arousal and according to this argument there would probably be no difference when playing co-located or mediated because social facilitation can exist only with the feeling of social presence. Regarding the core aspect of social facilitation that task performance is affected by social presence, more recent research shows that there is no influence on task performance, respectively success, in social gaming (Emmerich & Masuch, 2018). However, this does not generally contradict the theory that there can be an influence on arousal by social facilitation. One could still argue that further research about the effect of social facilitation in gaming regarding the level of social interaction cues should be pursued. The level of arousal could differ when experiencing social presence over various levels of social interaction.

The second part, which was mentioned in the emotions section, was about emotion contagion and physiological linkage. Researchers (Hatfield et al., 1993; Raghunathan & Corfman, 2006; Ramanathan & McGill, 2008) found those results with all the cues of social interaction which are present in a co-located setting, namely visual and auditory and maybe even more cues (e.g. olfactory and tactile). One could argue that emotion contagion should still be possible when interacting in a mediated situation. Nonetheless the probable absence of visual stimuli (in voice chat) and even auditory stimuli (in text chat) argue for a lesser effect, meaning that the more cues of social interaction are present, the higher is the emotional contagion. The same points can be made for physiological linkage and maybe overall emotions in social interaction. For future research it would be interesting to examine a possible implication of olfactory and tactile stimuli on emotion contagion and physiological linkage in social gaming.

To sum up, the aspect of emotions in PX, the model of level of social interaction as introduced in *Figure 1* seems to apply. As for arousal, it cannot finally be stated but would be interesting to pursue in the future.

Engagement

In video game research, an important factor for PX is how engaged a player is in his game. In the following, I am going to introduce different definitions of engagement in video game research. Firstly, there is no generally used definition of engagement in video game research. One is the definition of Brown & Cairns (2004). As Brown & Cairns constitute, engagement is built upon two barriers. The first barrier comprises access. Access means that the games features should meet the player's preferences. In addition to this, the game controls should be accessible for the player. If the barrier is high and thus, access is low, the player most certainly does not want to engage in the game. But if the first barrier is overcome, the second barrier for engagement must be dealt with. Involvement, which is the second barrier, describes the player's effort, focus and commitment toward the game. If both barriers are overcome, the possibility for engagement is high (Brown & Cairns, 2004). Another definition was created during the development of the *Game Engagement Questionnaire* (Brockmyer et al., 2009). They split engagement into other often-used terms in video game research. Involvement, immersion, flow, presence, psychological absorption and dissociation together enhance engagement. However, they define engagement as an indicator of the player's involvement in the game (Brockmyer et al., 2009). An especially high form of engagement is found in people with problematic online game play or online video game addiction for whom the possibility of social interaction may be a factor for those negative consequences (Blinka & Mikuška, 2014). Blinka & Mikuška (2014) described groups of gamers which differ in their level of engagement as well as their social motivation. They found that higher engaged players often have a higher social motivation to play with others. Similar findings have been published by various researchers (V. H.-H. Chen, Duh, Phuah, & Lam, 2006; Domahidi, Festl, & Quandt, 2014; Haagsma, Pieterse, Peters, & King, 2013; Hsu, Wen, & Wu, 2009). In social gaming, social interaction is assumed to play a significant role in the player's

motivation to play a game (Demetrovics et al., 2011) and therefore maybe for the player's engagement as well.

Social Interaction and Engagement. Social interaction has an influence on the player's engagement. The presence of others acting as an audience can have an impact. When having the possibility to assess your status in the game (if you are winning or not) e.g. by cheering, booing or silence by the audience, your engagement may change to the positive. The nature of the reaction seems to be of no importance. Audience activity, if positive or negative, relates to a higher engagement (on the part of the player). Hence, the missing of audience activity relates to lower engagement (Kappen et al., 2014). However, in this study a third party in the social interaction represented the audience. This does not conclude that the audience effect on engagement happens when your audience is your co-player at the same time. But explaining the audience-effect on the basis of interactive assessment of status in the game it could be applied to the interaction between a pair of co-located players in which one observes the actions and decision-making of the other and gives an assessment of the other's status through emotional utterances (e.g. laughing out loud when winning or swearing when losing). Playing mediated robs the player of the unconditional influence of a co-located audience in some way. Feedback about your status could be withheld when communication is given over voice chat only (e.g. muting the microphone), whereas in co-located play an assessment of the status would be easier to perceive by your co-player via visual cues of the co-player's emotional states and would therefore enhance engagement.

Discussion. When experiencing feedback from your co-players via social interaction, the player's engagement seems to enhance. This corroborates the hypothesis that social interaction is of importance for the player's engagement as well as their motivation to play. Regarding the link to the levels of social interaction, engagement could correlate to the level of cues.

Contradicting the theory of higher engagement in co-located games is the fact, that players in *Massively Multiplayer online Role-Playing Games MMORPG* belong to the more engaged side of the spectrum with a large number of reported hours per week played (Smahel, Blinka, & Ledabyl, 2008). Chen (2006) examined players in Massively Multiplayer online Role-Playing Games (MMORPG). It is important to note that MMORPG are always played online and mostly in a mediated and not co-located setting. Then again, players reported that social interaction was their most important factor regarding engagement. This could be interpreted as that the baseline of engagement in MMORPG is particularly high. If the players experienced more cues of social interaction (e.g. visual) or even played in a co-located setting, maybe their engagement would be even higher. If engagement is generally different in co-located or mediated play cannot finally be stated. However, with supporting and opposing arguments, the discussion about the influence of levels of social interaction on engagement is relevant. The differentiation seems to be not binary but scaled, so that with more cues of social interaction engagement can be enhanced. The hypothesis that levels of social interaction can predict engagement in PX would have to be examined in future research. Furthermore, the evolution of mediated audience platforms like *Twitch* (Twitch.tv, 2011) could be interesting. On this platform, the aspects of the audience seem to evolve more and more to the likes of the co-located setting. More interactive possibilities and ways to stream one's own game makes it more complicated/challenging to distinguish between the co-located and the digital interaction in the future (Recktenwald, 2018).

Flow

A related factor to engagement is the construct of flow. Flow in video game research describes the optimal experience conditioned by the proper balance between the game's challenge and the player's ability (Nakamura & Csikszentmihalyi, 2014). Playing a too difficult or too easy game is less enjoyable than playing a game that challenges one's abilities

accordingly (J. Chen, 2007). Set into the social context, flow can be experienced in a group. Analogue to the challenge and ability balance, there can be certain factors present enabling the experience of group flow. Within a group, the knowledge about the individual skills of each player should be aware by the group members (Kaye & Bryce, 2012). Collective competence has to be available to achieve a common goal. In addition, individual competence can be shown to either in- or outgroup regarding the cooperative or competitive nature of its game (Kaye & Bryce, 2012). When comparing flow to group flow, playing solo can lower a player's flow experience but should not influence the post-gameplay mood (Kaye, 2016).

Social Interaction and Flow. It is easy to imagine that social interaction in co-located setting compared to a mediated setting would lead to less flow because of the interruption of immersion through social interaction cues. The diversion by the social presence could rip the players out of the virtual world back into the real one (Sweetser & Wyeth, 2005). However, there are findings supporting the hypothesis that the mere perception of social interaction enhances the experience of flow (Weibel, Wissmath, Habegger, Steiner, & Groner, 2008). In this study, the perception of social interaction was manipulated. Participants were told that they would play a multiplayer game against another participant, although they only played against a computer. In the control group, participants had to play against a computer without being deceived about who they are playing against. Results indicated that flow amongst other factors was increased in the manipulation group, which is thus supporting the hypothesis that the perception of social interaction enhances the experience of flow.

Discussion. Social interaction likely enhances the experience of flow. Nonetheless, it is important to discuss the findings of Weibel et al. (2008). These findings lead to the question if the mere feeling of playing against another person with no cues of social interaction whatsoever is responsible for the enhancement of flow in PX. This could be interpreted as a huge indicator that the differentiation of social interaction cues, if either verbal or non-verbal through text or voice chat, has at least for flow less of an impact on PX than expected in this

thesis. However, one could interpret that those findings merely suggest that social interaction generally leads to a greater feeling of flow. This interpretation is corroborated by the findings of Kaye (2016) who suggests that the experience of flow in a group is higher than compared to playing alone. For future research it would be interesting to add a third group in which players played against each other and analyse, if additional cues of social interaction (e.g. voice and text chat) affect the experience of flow or even other aspects of PX.

Immersion

Another factor in PX constitutes immersion. It stands for the feeling of being absorbed into the game and thus being immersed in the virtual world (Brown & Cairns, 2004).

Immersion seems to be strongly linked to flow but still differs enough to be a distinct component of PX (Brown & Cairns, 2004). Immersion in the context of this thesis is of relevance because it is, amongst other aspects of PX, dependent on the player's attention.

One could hypothesize that playing with co-players would be distractive enough to lead to a lesser experience of immersion.

Social Interaction and Immersion. Regarding immersion, which is connected to flow (Nacke & Lindley, 2008), enjoyment (Draper, 1996) and other aspects of PX (Liszio, Emmerich, & Masuch, 2017), social interaction is reported to be of little difference when playing either in an co-located or mediated setting (Cairns et al., 2013). In their study, Cairns et al. (2013) found results, which indicate that social play enhances immersion but that neither the level of social interaction nor the level of acquaintance is responsible for their findings. Social interaction or the social presence itself leads to a higher immersion in PX, although the difference in cues of social interaction is not of great influence.

Discussion. Social interaction seems to enhance the feeling of immersion, which therefore contradicts the initial hypothesis. However, other research suggests that playing individually leads to a higher immersion in PX compared to playing with a co-player (Liszio

et al., 2017). It is thus opposing the positive relation of social interaction and immersion.

However, it is essential to point out that this research was conducted in a VR setting, which is hard to compare to a non-VR setting. A general answer to the research question is at this point hardly possible because of opposing arguments in different genres. Nevertheless, for most general games in a non-VR setting I would argue that social interaction could lead to a more immersive PX. In addition, I would interpret that social interaction seems to be more binary for immersion compared to other aspects of PX. The level of social interaction itself does not matter but its mere existence, meaning that it is important whether there is social interaction rather than what type of social interaction there is.

Enjoyment

Enjoyment is another important aspect in video game research for PX and social interaction appears to be important for enjoyment (V. H.-H. Chen et al., 2006). Even though it may not be the case in every video game genre (Liszio et al., 2017), for this research question it is important to look into the aspect of enjoyment as well. The definition of enjoyment in video game research is often described by the often referenced Lazzaro (2004). She tried to explain enjoyment as four keys to fun. One of them is called the social experience key.

Regarding to her writings, even playing a game one does not like is possible to enjoy if it is played with someone else (Lazzaro, 2004). The game therefore serves as a reason to enjoy social interactions without standing in the center of attention. Kaye and Bryce (2012) tried to further explore the parts of social interaction responsible for enjoyment. Social belonging or the feeling of being part of a group formed one part. The social integration or possibility to meet people alongside enjoying a mutual activity formed the second. Social networking or the provision of a platform to talk about non gaming-related topics concluded the formed relation between social interaction and enjoyment in gaming.

Social Interaction and Enjoyment. The question whether the level of social interaction predicts enjoyment has mostly been answered by Gajadhar et al. (2008). In their study, they manipulated social presence by letting the participants play against a computer or against another player either co-located or mediated (B. J. Gajadhar, de Kort, & IJsselsteijn, 2008). The player's enjoyment when playing co-located was significantly higher than when playing mediated. Gajadhar et al. (2008) explained their findings by the direct increase of social interaction cues and possibilities when social presence was given in the co-located setting.

Discussion. The level of social interaction is positively linked to the player's enjoyment in PX. However, this is not always the case. Depending on the player's nature, social presence can have lesser effects. In a follow up study, the findings revealed that when taking seniors as participants, PX would not be affected whether they played in a co-located or a mediated setting. Thus, if the player's enjoyment in social play depends on social presence it also depends on the player itself. Age could be an important factor as well as the player's personality (Zammito, 2010) or motivations (Wang, Khoo, Liu, & Divaharan, 2008). Despite this opposing argument, I would still hypothesize that higher levels of social interaction lead to more enjoyment in PX. Nonetheless, future research should control variables like age, personality and motivation and differentiate level of social interaction as introduced in this thesis.

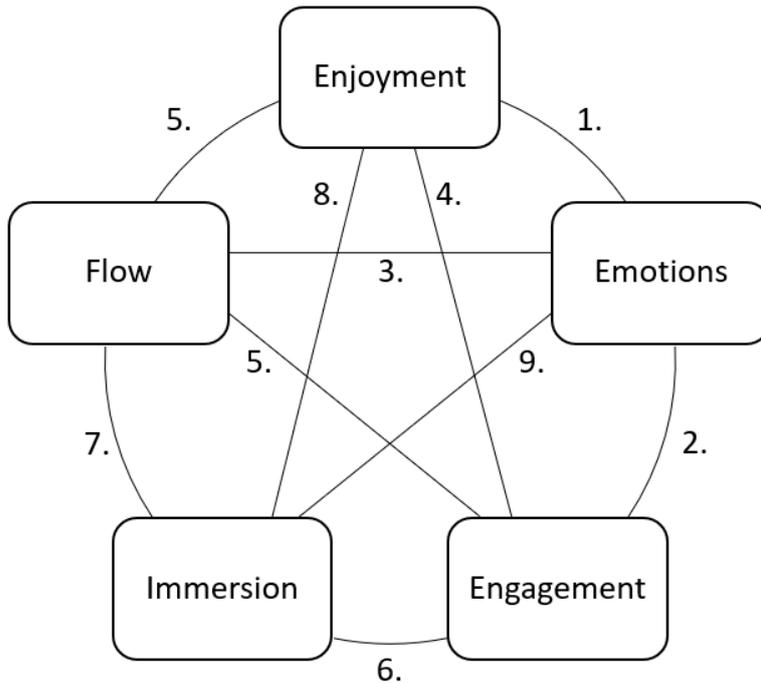


Figure 2. Schematics of relations between aspects in social gaming experience. The lines between the circles demonstrate that there has been a reported relation between the respective aspects. The numbers marking the lines and therefore the connection between the aspects reference the list in the following chapter.

Relations between the Aspects of PX in Social Gaming

PX in social gaming is made of a variety of factors. Based on the referenced literature, these factors often correlate with each other. As illustrated in *Figure 2*, there are specific relations between factors accumulating to PX. Certain relations specifically belong to a social context, whereas others generally describe PX in social gaming. This is relevant to illustrate the complex nature of PX in a social setting and furthermore corroborates the proposal for a more holistic approach in video game research. In the following I will present research from current literature, which indicate relations between the aspects of PX.

1. Emotions most likely lead to an enjoyable experience (Madeira et al., 2013). Whether the experienced emotions are negative or positive do not seem to matter because negative emotions can lead to positive experiences as well (Allison, Carter, & Gibbs,

2015; Bopp et al., 2016). In a social context, emotions can lead to enjoyment too (Lazzaro, 2004).

2. The relation between emotions and engagement appears in different ways depending on the definition of engagement. Some state engagement in gaming is sort of an affective state when the player neither experiences boredom because of low engagement nor anxiety because of high engagement (Chanel, Rebetez, Bétrancourt, & Pun, 2008). Similar results have been published in learning research. Positive affective states positively correlate to higher engagement in learning where engagement is defined as an affective state as well (Sabourin & Lester, 2014). Others define engagement by the quantity of hours played in-game or the quality of involvement in-game (Blinka & Mikuška, 2014; Brockmyer et al., 2009). Relating to both definitions, emotions lead to higher engagement quantity- and quality-wise (Carter et al., 2013).
3. The relation between emotions and flow is mentioned in Kaye's work (2016). She describes flow as an important factor for the emotional outcome of the game and thus for the player's experience. In the social context, group-flow dependent factors like effective teamwork and cooperation are partly responsible for the players or groups emotions.
4. Engagement and enjoyment are positively related. Higher engagement in the game means most likely higher enjoyment regarding PX (V. H.-H. Chen et al., 2006). In the context of social gaming this relation is essential. Engagement and enjoyment in social gaming is connected through social interaction. Engaged gamers are more likely in this state through social interaction, thus enjoying their experience (V. H.-H. Chen et al., 2006). Other research suggests a connection of enjoyment and engagement, respectively the loyalty to a game, when optimal flow conditions are experienced (Choi & Kim, 2004).

5. In the relation between engagement and enjoyment, flow plays an important role as well. The proper balance between challenge and skill reinforces players' engagement as well as their enjoyment (V. H.-H. Chen et al., 2006).
6. Immersion appears to relate to the highest level of engagement. When being most engaged in a game the report suggests to equate that experience with immersion (Brown & Cairns, 2004).
7. The same findings also suggests that immersion has strong links to the concept of flow (Brown & Cairns, 2004). Aspects like attention, the sense of time as well as the sense of self are of importance for both concepts of flow and immersion.
8. Brown & Cairns (2004) link enjoyment and immersion but insist that immersion not necessarily leads to enjoyment.
9. Immersion can also be related to emotional involvement (Brown & Cairns, 2004). Immersion can also result in negative affective states such as anxiety (Jennett et al., 2008).

To sum up, all the addressed aspects in PX appear to somehow relate to each other. Possible interactions cannot be excluded. For future research it is recommended to approach the concept of PX in a more holistic way rather than focusing on single aspects of PX.

General Discussion

This thesis is an approach to answer the question whether the various levels of social interaction affect PX differently and thus if PX can be predicted through social interaction. Does mediated gaming differ from playing games in a co-located setting regarding the named aspects of PX?

To create a holistic image of PX in social gaming, several different aspects must be included. Engagement, emotions, enjoyment, flow and immersion are the chosen aspects of this thesis to give an overview. However, one must know that this only serves as an approximation, because there are numerous missing factors that are not included in this thesis due to the breadth of the topic (e.g. Player's Motivation, Player's Personality, Player's Demographics). To answer the research question, many aspects had to be discussed individually as well as in a holistic approach. The biggest and most significant difference between the co-located and mediated settings is the means of social interaction. As illustrated in *Figure 1*, communication over voice-chat or text-chat and even face-to-face-chat differs from being in the same room at the same time. With the development of newer and better communication technology regarding mediated gaming, margins between the levels of social interaction could get thinner over the years. Some reports even indicate that with face-to-face chat, some factors regarding social experience do not seem to differ anymore (Bharadwaj & Vemuri, 2012). But at this point it is still hard to make a sound statement on account of the everchanging and fast-evolving technology.

The level of social interaction reaches from primitive communication with your co-player by signalling your avatars in-game location, defined as *pinging* (Leavitt, Keegan, & Clark, 2016), to the fuller social interaction in social *Virtual Reality (VR)* games (Liszio et al., 2017) with auditory and visual cues of one's co-player. It could even lead to a virtually co-

located setting with full visual cues of your co-players appearance to approach a similar experience to the literal co-located setting.

For enjoyment, engagement, parts of emotion as well as flow it is more likely that the model of level of social interaction as introduced in *Figure 1* could be applied. I propose that for future research regarding those aspect of PX in social gaming researchers keep in mind that not all kinds of social gaming affect PX the same way. Firstly, how the participant communicate with each other must be explained in the methods section. It is important to keep in mind that comparing results between experiments in which participants communicated in different ways could be prone to errors. Secondly, to fully understand the effect of levels of social interaction I would recommend comparing more than just co-located and mediated gaming. For instance, in the first group social interaction could be withheld completely. In the second group, participants could interact via text chat. In the third group, voice chat would be added and in the last group, participants would play co-located. This way, the spectrum of social interaction would be better applied, and smaller differences could be found. For immersion and parts of emotion, future research could examine a possible connection based on the proposition made in this thesis, although there are theoretical limitations (Aiello & Svec, 1993; Cairns et al., 2013). Regarding the complex structure of PX, researcher should keep in mind that various aspects might correlate or interact with each other.

Summary and Conclusion

Even though, research on the general topic of the difference between co-located and mediated communication has been there for quite along time (Kiesler & Sproull, 1992) it is still interesting to observe in different situations.

PX is a rather complex structure of multiple aspects. Comparing PX based on the setting of mediated and co-located gaming was hard to begin with. Most of the aspects in PX relate with each other or act differently regarding their settings. Be it the genre (Carter et al., 2013; Liszio et al., 2017), the level of social interaction (B. Gajadhar et al., 2008) or the player (B. J. Gajadhar et al., 2010) PX can be affect in various ways. Initially, I thought the distinction of mediated and co-located gaming is clear enough to draw a general conclusion. However, both settings seem to induce similar experiences on the aspects of PX. Enjoyment in PX can be differentiated more easily regarding the setting.

Co-location seems to be the most enjoyable setting for gamers. However, this conclusion is limited by the fact that when taking demographics into account, the influence of social interaction on PX appears to depend. I conclude from this, that other variables like age, gender, motivation and many others are relevant factors that need to be included in future research in order to achieve a more holistic knowledge. Nevertheless, it is possible to partially apply the aspect of enjoyment to the levels of social interaction and maybe even predict enjoyment by manipulating the level of social interaction.

In a social context, emotional contagion seems to be dependent on social interaction cues. A differentiation between co-located and mediated gaming is valid, but the distinction is rather on a spectrum of social interaction cues (the more cues the more emotional contagion) than binary distributed. With new technologies the phenomenon of emotional contagion could evolve around the boundaries of the setting. The same is valid for physiological linkage with arousal. But it seems to be hard to generally apply theories from outside video game research

as Emmerich (2018) contradicted the proposed adaption of social facilitation to a video game setting. Whether social facilitation regarding heightened arousal applies to social interaction in gaming will have to be examined in future research as well.

The part of engagement that is dependent on social interaction shows similar development. More cues of social interaction enhance engagement. However, similar to the aspect of enjoyment this does not predict engagement in general. For instance, in MMORPG, where the social interaction aspect is crucial for engagement, less cues of interaction suffice for high levels of engagement. This does not necessarily contradict the hypothesis that levels of social interaction correlate positively with engagement but explains that other aspects influence engagement as well.

Compared to emotions and engagement, flow seems to be rather binary than on a spectrum at first. The bare feeling of social presence affects flow. In both co-located and mediated settings, the feeling of social presence is provided, thus it is enabling an impact on flow. If additional cues of social interaction further affect or predict flow cannot be fully concluded but it is likely to take place and would be an interesting topic for future research.

For immersion applies the same phenomenon that social interaction affects immersion, although the setting, whether playing co-located or mediated, is of little influence.

Finally, it can be stated that the complex structure of PX, which I tried to illustrate, cannot easily be applied on the simple differentiation between co-located and mediated gaming. I would argue that there is a difference indeed because of the spectrum of cues in social interaction. A simple differentiation between co-located and mediated gaming is just not generalizable to the end that social interaction itself is not simply binary but differs depending on the quantity of cues. As illustrated in *Figure 1* it is important for future research to make the necessary distinctions. Even the proposed more detailed scale of social interaction turns out to be too simplified, because even less than textual chat should be considered as social interaction as research has shown (Leavitt et al., 2016) or that just the mere feeling of

social presence could lead to an experience of social interaction and thus affects PX as explained in the discussion about flow (Weibel et al., 2008).

Technological advancements will make it more difficult to pin down a general situation in which and how this differentiation can be made. Developments in VR and *Augmented Reality* will most likely minimize the gap between virtual and real-life social interaction in the future. Despite this advancement, the need for future research about the differentiation between mediated and co-located gaming should still be pursued. Especially because there will still be games played either mediated or co-located with different levels of social interaction even though the differences will most likely shrink.

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