Immersion in Games

The Effect of Ambient Lighting Systems

Frank Forsingdal Albertsen and Henrik Wolff Jepsen

June 6th, 2014

Master Thesis

Supervision by Tony Brooks and

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English Abstract

This report explores the effect ambient lighting systems has on immersion in games as well as the definition of immersion and how it can be measured. A semi-structured interview is used to establish the meaning of immersion according to ten Danish gamers. The collected data is analysed through grounded theory and the results used to devise an Immersion questionnaire. The questionnaire was used in an experiment to examine whether playing games with an ambient lighting system has an effect on the players immersion. This was done by exposing 16 participants to three different ambient lighting conditions. The experiment was video recorded and followed by a questionnaire. The results from the experiment revealed no statistically significant difference between the conditions.

Danish Abstract

Denne rapport undersøger effekten omgivende belysning systemer har på immersion i spil, såvel som definitionen af immersion, og hvordan det kan måles. En semi-strukturerede interview bruges til at fastslå betydningen af immersion i henhold til ti danske gamere. De indsamlede data analyseres ved hjælp af grounded theory, og resultaterne bruges til at udtænke et Immersion spørgeskema. Spørgeskemaet blev anvendt i et eksperiment for at undersøge, om at spille spil med et omgivende belysnings system har en effekt på spillernes immersion. Dette blev gjort ved at udsætte 16 deltagere til tre forskellige lysforhold. Eksperimentet blev optaget på video og efterfulgt af et spørgeskema. Resultaterne fra forsøget viste ingen statistisk signifikant forskel mellem betingelserne.

Keywords: Immersion, engagement, ambient lighting systems, Ambilight, flow, presence

Acknowledgment

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1. Introduction

Figure 1. A picture of the configuration of a Lightpack demonstrating the various colours.

With the advance of the computer and gaming industry several types of peripherals and accessories have become available. Some of these peripherals such as mechanical keyboards serve practical purposes while others like surround sound headphones are more focused on the user experience. One of the more recent trends is ambient lighting systems such as Phillips's Ambilight which was introduced in 2004. The system analyses the colours shown on the screen of a TV and projects corresponding colours in a dynamic halo of light onto the wall behind the TV to increase the viewing experience. (Bruyneel & Lanoye, 2012) Since then a number of similar systems have become available, e.g. Lightpack and Cyborg Gaming Lights. The systems have different features, such as the ability to blink when receiving an email or flash red when taking damage in a game.

The aim of this report is to look into the effect an ambient lighting system can have on the gameplay experience. In order to do this immersion has been chosen as the focus because it is a part of the gameplay experience that is widely used when promoting and reviewing video games (Cheng & Cairns, 2005) and because it is affected by the audio-visual experience (Ermi & Mäyrä, 2011). According to Brown and Cairns (2004) immersion is a powerful experience when gaming, however, though immersion seems to be understood by gamers and alike, there are different opinions on what immersion is.

The report will first examine the concept of immersion presenting related work about how immersion has been defined and explored by others. This will be followed by the methods used to interview Danish gamers about what immersion is to them, data which was analysed using grounded theory. Through the analysis of the interviews four major categories were identified as

parts of immersion. These categories and the associated subcategories and themes were used as the basis for a questionnaire to measure immersion. This questionnaire was used as a part of an experiment. The experiment consisted of three conditions, exposing participants to different types of ambient lighting while playing a game for 30 minutes while being video recorded, after which they were asked to fill out the questionnaire. The recordings were analysed to check for a correlation between emotions shown and the reported immersion.

1.1. Research Questions

The goal of the project is twofold; to explore what immersion is, and to examine how immersion is affected by an ambient lighting system. In order to explore this the following research questions were developed:

- How does ambient lighting systems affect immersion in games?
- How does immersion relate to the overall gameplay experience in games, and how does it relate to or differ from the other types of gameplay experience (flow, presence etc.)?

The scope of this report will cover the definition of immersion and propose a way to examine the effects an ambient lighting system has on immersion in videos games. It is not within the scope of this project to produce statistically significant data, instead a primarily qualitative approach has been taken.

This chapter has given an introduction to the content of this report. The following chapter will provide an insight into how immersion has been studied, what work has been done to define it as well as how it can be measured.

2. Theoretical Framework

In order to be able to analyse and measure the effect ambient lighting systems have on immersion it is necessary to know what immersion is and, almost as importantly, what it is not. The goal of this chapter is clearly define what the term immersion refers to in this report. In order to do this the gameplay experience and its different dimensions will be explored.

2.1. Exploring the Gameplay Experience

The experience of playing a game is referred to as the gameplay experience. According to Ijsselsteijn, De Kort, Poels, Jurgelionis and Belloti, (2007) it is hard to measure the gameplay experience because it is not just one experience, but many that are affected by individual differences. These experiences can be referred to as engagement experiences and include Flow, immersion, cognitive absorption, and presence (Qin, Rau & Salvendy, 2009). Though the gameplay experience in a game is similar to the user experience of a software product the users gameplay experience cannot be measured adequately through usability metrics such as time spent on task, however Flow and immersion potentially might (Ijsselsteijn et al. 2007).

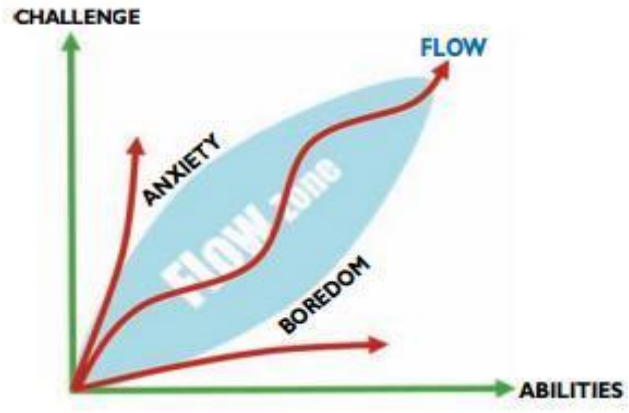

Figure 2. A diagram that shows the idea behind GameFlow, the balance between ability and challenge (Retrieved from Chen, 2007)

Flow is an optimal experience, a state of enjoyment, where the challenge in an activity matches the skill of the person performing it (Csikszentmihalyi, 1990). If the challenge level is too high it can induce frustration, and boredom if set too low. According to Ijsselsteijn et al. (2007) one of the main difficulties in game design is to match the challenge of the game to the player to ensure that the player stays in Flow during as much of the game as possible, however according to Ermi and Mäyrä (2011) experiencing Flow in digital games is a very rare experience and the Flow-like phenomena experienced in games is better dubbed micro-flow or GameFlow. Jennett et al. (2008) state that Flow is like immersion and that when in the Flow state, people become so

absorbed in their activities that irrelevant thoughts and perceptions are shut out. According to Jennett et al. (2008) Flow also has overlaps with immersion when it comes to distortion of time and that immersion is a precursor for Flow, they argue that Flow is an optimal, and therefore extreme, experience whereas immersion is not always so extreme.

Jennet et al. (2008) state the following:

> A person can be highly engaged in playing a videogame but still be aware of things like needing to leave the game soon in order to catch a bus or go to a lecture. The player is still immersed in the game to some extent but they are not immersed to the exclusion of all else and therefore not in flow. (p. 642)

Sweetser and Wyeth (2005) looked at flow in relation to Csikszentmihalyi (1990), but with a focus on computer games. They developed a model for evaluating player enjoyment in games based on what they call GameFlow. Sweetser and Wyeth (2005) defined eight elements which would determine GameFlow: Concentration, challenge, skills, control, clear goals, feedback, immersion, and social interaction. Most of these terms are known to be a part of flow (Csikszentmihalyi, 1990), but the element social interaction is a new term related to flow. (Sweetser and Wyeth, 2005) Sweetser and Wyeth (2005) state that social interaction is not an element of flow, but it is highly featured in the area of user-experience in games.

They state, “People play games to interact with other people, regardless of the task, and will even play games they do not like or even when they don’t like games at all.” (Sweetser & Wyeth, 2005, p. 4)

Immersion can be described as the players involvement or engagement in a videogame (Ijsselsteijn et al., 2007), a feeling which can lead to a distorted sense of time (Brown & Cairns, 2004). Immersion shares qualities with both presence and Flow (Qin et al., 2009). Steuer (1992) defines presence as being closely related to our perceptions to an external space beyond the limits of the sensory organs. According to Steuer (1992) presence is divided into two states: natural perception and telepresence which is the mediated perception of an environment. Witmer and Singer (1998) attempted to measure reported presence by using factors that they believed were a part of the phenomenon; control, sensory, distraction and realism. Their findings

suggested that the naturalness of the interactions with the virtual environments and how much they mimicked the real-world affected the reported presence. This is somewhat similar to the findings of Ijsselsteijn et al. (2007) who state that the sound and graphics in games supports the user's sense of immersion. Lombard and Ditton (1997) indicate in their study that an increased sense of presence can result in an increase of one of more factors related to factors such as, e.g. social interaction and realism in the environment. Slater (1999) describes presence as a psychological sense of being in a virtual environment. The transcendence of the users mind into the game, the feeling of being absorbed by the environment. Presence is "a sense of being there" in a mediated environment including virtual reality (Cox, Cairns, Berthouze & Jennet, 2006). In relation to Cox et al. (2006) Lombard and Ditton (1997, Chapter 1.3) identified three types of transportation, generally known as "telepresence", they have defined these types as: "You are there", in which the user is transported to another place; "It is here", in which another place and the objects within it are transported to the user; and "We are together", in which two or more communicators are transported to a common space (such as in immersive video conferencing).

According to Ermi and Mäyrä (2011) the definitions of presence and immersion are very close and the two terms can be used as synonyms. Jennett et al. (2004) state that presence is a small part of the gaming experience, often only viewed as a state of mind, they argue that immersion is an experience in time. Jennett et al. (2004) also state that presence is possible without immersion, that a person would be able to feel present in a virtual environment but not experience a lost sense of time which is one of the criteria for immersion. Ermi and Mäyrä (2011) state that presence depends on a metaphor of transportation, and therefore prefer to use the term immersion when talking about digital games because it "... more clearly connotes the mental processes involved in gameplay." (Ermi & Mäyrä, 2011, p. 095)

Fog and Bjørner (2012) state that players could feel presence or sensory and spatial immersion in a game without being engaged. Their term of investigation was sensory engagement, which they state can be experienced when the player is immersed in a game world through audio-visual element of games, also known as presence. Therefore Brown and Cairns (2004) statement about engagement is supported by the study by Fog and Bjørner (2012), in which they state that a player's experience of engagement is related to the player's willingness to continue to play.

Slater's (1999) definition of presence and immersion differs from most other sources, because he defines immersion as "*The extent to which the actual system delivers a surrounding environment, one which shuts out sensations from the "real world"*". (Slater, 1999, p. 1). Witmer and Singer (1998) made a paper referring to Slater's (1999) definition of these terms stating that they did not agree with the notion of immersion, to which Slater (1999) responded with the statement that is was "*simply a difference of terminology*" (p. 1). Witmer and Singer (1998) defines immersion as a feeling whereas Slater (1999) defines it as the systems function, from which he then presented two separate terms for these, 'System immersion' and 'Immersive response'. Slater (1999) defines presence as three aspects: The sense of "being there", the extent to which the VE becomes the dominant one, and the participant memory of having visited the VE's 'place'. The first aspect corresponds to Lombard and Ditton's (1997) definition "you are here", as mentioned above, but from here on his definitions become more related to Brown and Cairns' (2004) and Ermi and Mäyrä's (2011) definitions of immersion.

2.2. Defining Immersion

According to Brown and Cairns (2004) immersion has three stages, engagement, engrossment and total immersion. The engagement stage requires the user to invest time, effort and attention in order to learn the game and its controls. The second stage, engrossment, is the point where the player's involvement is so deep that the controls seem invisible and lost track of time. Total immersion is when the player is cut off from reality and the game is all that matters. The latter is according to Brown and Cairns (2004) a rare experience while the other two are more likely to occur. According to Jennett et al. (2008) immersion is when a person is so engaged in a game that they do not notice things around them, such as the amount of time that has passed or another person trying to get in contact with him/her, some people describe themselves as being "in the game" and that immersion is often viewed as critical to game enjoyment. However the model of immersion by Brown and Cairns (2004) is under critique by T. Bjørner, from Fog and Bjørner (2012), he is currently working on a journal article yet to be published about immersion in a game perspective, in where he critiques Brown and Cairns model of immersion:

> "According to Brown and Cairns (2004), immersion is a degree of involvement with the media that moves along a path of time. The problem with this path is that it only shows

> the degree of involvement rising, where each level is available if certain barriers are overcome. Moreover, Brown and Cairns' (2004) model is missing a description that shows what happens when the involvement is completely lost and how to recover the different levels again. "(T. Bjørner, personal communication, May 28, 2014)

Ermi and Mäyrä (2011) divide immersion into three dimensions: Sensory immersion, challenge-based immersion, and imaginative immersion. Sensory immersion refers to the visual and audial properties of an experience such as a game or movie. Challenge-based immersion refers to engagement in the game caused by the cognitive and motor challenges presented in e.g. games. Imaginative immersion refers to the immersion into the narrative of the experience. Computer games is able to induce all of these three kinds of immersion. A statement from Mcmahan (2003) in which she states that three condition create a sense of immersion in a virtual reality or 3-D computer game conflicts with Ermi and Mäyrä (2011). The first is the user's expectations of the game or environment must match the environment's conventions fairly closely; second, the user's actions must have a non-trivial impact on the environment; and third, the conventions of the world must be consistent, even if they don't match those of "meatspace".

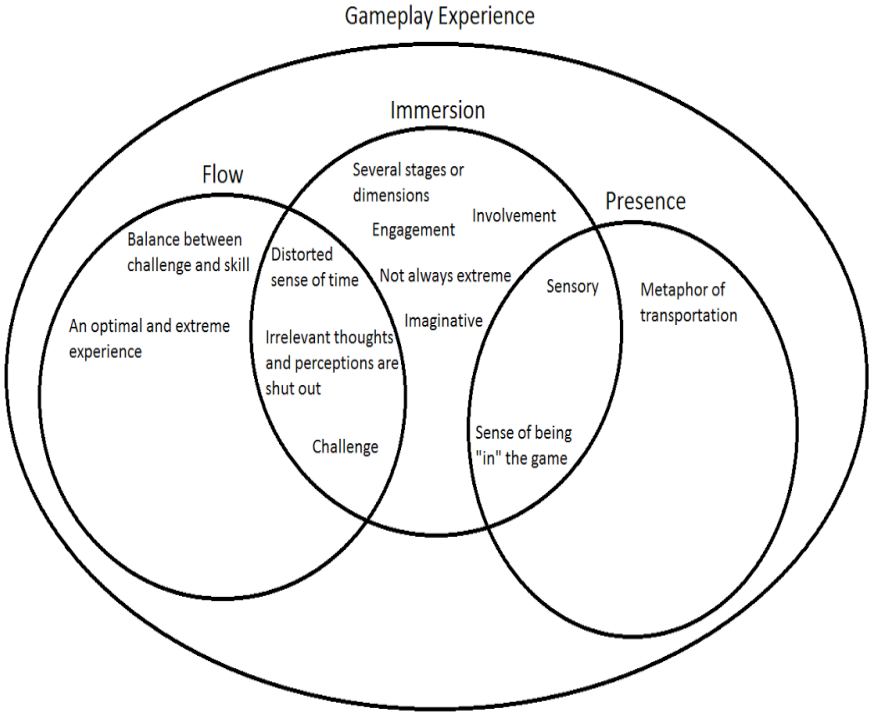

Figure 3. A visual representation of how the engagement experiences are connected. (Brown & Cairns, 2004; Qin et al, 2009; Jennet et al, 2008; Ermi & Mäyrä, 2011)

For this project the chosen focus is immersion. This choice has been made because Flow through its definition should not be significantly affected by the audio-visual dimension of playing a videogame and while presence is affected by this, we position ourselves in line with Ermi and Mäyrä (2011) and agree that the term presence indicates that the player is not only immersed and therefore highly focused on the events of the game, but actually feels like he/she is present within the game.

The terms immersed and immersion will henceforth in this report be used to describe phenomena where a player is highly engaged in a videogame because of the sensory, challenge-based or imaginative experiences in line with Ermi and Mäyrä (2011), a state where the player might feel a distorted sense of time and find himself less prone to be distracted by things outside the game in line with Brown and Cairns (2004).

2.3. Measuring Immersion

Weffers-Albu, De Waele, Hoogenstraaten and Kwisthout (2011) tested how the subjective and objective immersion was affected by Ambilight while watching movie content on a TV. According to Weffers-Albu et al. (2011) there is a correlation between higher arousal and stress levels with physiological responses such as heart- and respiration rates. Furthermore Weffers-Albu et al. (2011) refer to studies indicating that great difference in luminance ratios can cause discomfort due to eyestrain and that using surrounding illumination can therefore increase comfort. This notion is supported by Elmo Diederiks in a presentation about Ambilight (This happened NL, 2009). The two conditions, TV with Ambilight and Classic TV, were compared by using a Phillips Ambilight TV, and in the Classic TV condition switching off the Ambilight setting and instead set up static background light to provide a similar viewing comfort. Audio level and seating positions were fixed between the two conditions. (Weffers-Albu et al., 2011)

Cox et al. (2006) studied if eye tracking could be used to measure immersion. In the experiment the participants' absorption and openness to experience were assessed. The participants were divided equally between two conditions and will be given an immersion questionnaire after 10 minutes of performing the, respectively, immersive or non-immersive task. A similar study was carried out by Jennet et al. (2008)

According to Cheng and Cairns (2005) immersion is notoriously difficult to define or measure, because asking a gamer to self-report their game experience, is likely to break the sense of immersion, therefore they tried to break immersion instead, in order to understand what the experience of immersion was and what specifically removed the immersion, by manipulating the use of behavioural and graphical realism in the game.

2.4. Grounded Theory

According to Strauss and Corbin (1998) Grounded Theory consists of three coding phases after the raw data collection and transcription, in order to build a theory. The first is Open Coding, second is Axial Coding and third is Selective Coding.

Open Coding consist of the initial analysis of the data. In order to handle the data it is divided into phenomena, concepts, categories and properties. These are then split into dimensions and subcategories. These steps help theory building by conceptualizing, defining categories and develop categories in relation to their properties and dimension and later relating categories through hypotheses or statements and thereby building the foundation and structure for theory building. (Strauss & Corbin, 1998)

The initial step is to label phenomenon to group similar events, happenings and objects under a common heading, also referred to as tendencies. (Tullis & Albert, 2008, Strauss & Corbin, 1998)

Axial Coding is the next step of the analysis, breaking the phenomenon into subcategories in order to answer questions about the phenomenon such as when, where, why, who, how and with that consequences, thus breaking the data into variables.

Selective Coding is the process of integrating and refining the theory, by organizing the data around a central explanatory concept, based on the criteria for choosing a central category (Strauss & Corbin, 1998, p. 147)

This chapter has given an overview of the theoretical framework used in this project. There are different opinions about how immersion should be defined and how much it has in common with the other engagement experiences. The next chapter will introduce the methods that has been applied in this project to answer the research questions.

3. Methods

This chapter will explain the methods that has been applied in the project in order to answer the research questions stated in the introduction. In order to study what immersion is 10 participants were interviewed about what they thought immersion was, this data was analysed using grounded theory and the results was used to create an immersion questionnaire. The questionnaire was used as part of an experiment where participants played Batman: Arkham Asylum (Rocksteady Studios, 2009) in different conditions to study how ambient lighting systems affect immersion.

3.1. Immersion Interview.

Design.

After playing their favourite game the participants were interviewed in a semi-structured interview about their opinions on immersion. The data was analysed qualitatively using grounded theory (Strauss & Corbin, 1998), this inductive approach was used to identify main themes among the participants' answers about what immersion is. The experimental design for the interviews was chosen so that it was similar to Brown and Cairns (2004) and Ermi and Mäyrä (2011) who also used a combination of interviews and grounded theory to explore what immersion is. Alternatives could have been other qualitative methods such as case studies or thematic analysis.

Participants.

The participants in the study were mostly respondents to a post on the social media website www.facebook.com. The post asked for male and female participants who plays any kind of video games daily to partake in playing their favourite game followed by some questions about their experience. The participants had an average age of 22 with ages ranging from 18 to 30. A total of ten people participated in the interviews, six male and four female. Brown and Cairns

(2004) mention a ratio of four male and three female to approximately represent the male/female ratio of gamers and we therefore attempted to approach that ratio.

Setup.

The equipment used for playing the game varied for each participant depending on their preferred platform. The equipment that was used in all interviews was a smartphone with an audio recording application, a sheet of paper (for the interviewer) with an introduction to the interview as well as the interview questions (see appendix 8.1), and a PC or gaming console depending on the chosen game. Most participants were interviewed in their own home, but some were interviewed in different locations based on the participants' requests.

Procedure.

Time schedule and location was determined by the participants. Each participant was given a brief introduction to the events that were planned and asked to give verbal consent to being audio recorded. The participants were then asked to play their favourite game of choice for up to thirty minutes to prime the participant for the interview. The interview was semi-structured, meaning the interviewer had a sheet of paper containing the questions and on case-by-case basis judged if the various questions had already been covered by previous answers. After the interview was done the participants were thanked for their participation, the audio recording was stopped.

Analysis.

After collecting the data it was first transcribed and inserted into a spreadsheet to sort the answers from each participant to each question. The raw data is then analysed in line with Strauss and Corbin (1998) in three phases.

First, open coding where the data is divided into phenomena, concepts, categories and properties, and then further split into dimensions and subcategories, while giving the tendencies headings in order to create the main structure of the theory (Figure 4). This was

Figure 4. A picture of a part of the grounded theory analysis

done by the use of post-its, each category or heading had its own and was placed on the table sorted by negative comments (Red) and positive comments (purple and green).

The next step is to analyse the data further and break these headings into subcategories in order to get the when, where, why, who and how. This step was also done with the use of post-its (yellow). Finally these subcategories is sorted into concepts and organized around a central explanatory concept based on the six criteria set by Strauss and Corbin (1998). This step was done by sorting the post-its into categories, then collected on several pieces of paper to sort them from each other. Each stack was then categorized and given a heading, these heading were then transcended onto post-its themselves in other to have less paper to move around. Using these they were collected under common headings, in order to build new headings based on these, to collect the meanings of each categories to build the theories main building blocks from these. Finally ending up with nine categories which was placed into the four main categories in other to sum up our interpretation of immersion.

3.2. Effect of Ambient Lighting Systems Experiment

Design.

The goal of the experiment was to establish how the ambient lighting system affected immersion of participants playing the game

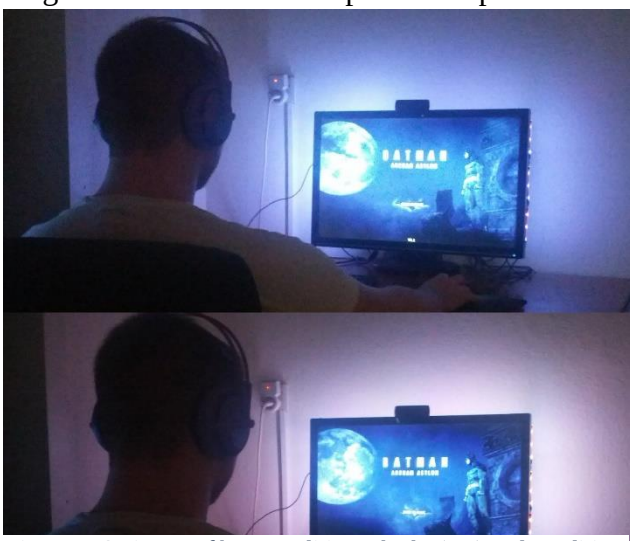

Figure 5. A picture of how condition 1 looks (top) and condition 2 (bottom)

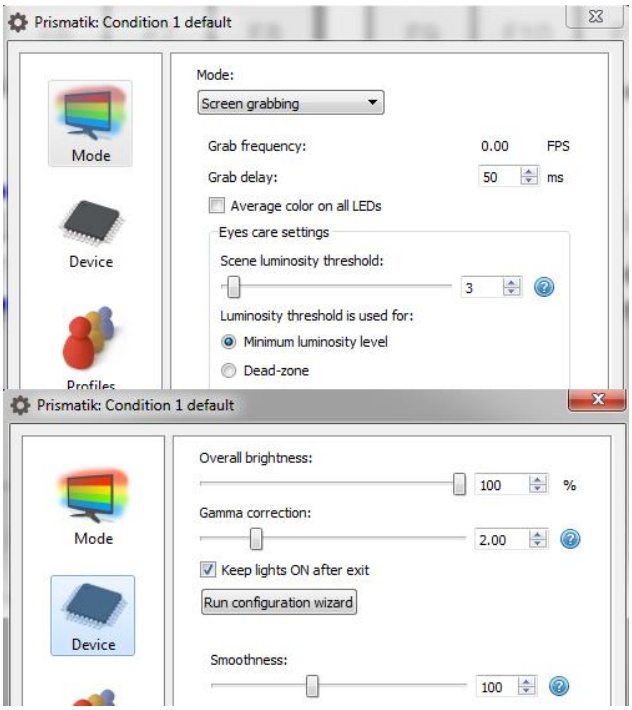

Figure 6. Settings for condition 1

Batman: Arkham Asylum (Rocksteady Studios, 2009). This was accomplished by exposing participants to the game through three different conditions with the ambient lighting system configured to three different settings. The settings for condition one, the default settings, can be seen in figure 6. The experiment was video recorded through two cameras, one placed on top of the monitor, recording the participants face, and one placed to the back and left of the participant, recording the monitor and its content as well as the light from the ambient lighting system. After playing the game the participants reported immersion was collected through a questionnaire, see appendix 8.3.

Participants.

All the participants can be described as (at minimum) being casual gamers in the sense that they all play videogames for several hours per week. The participants were not screened except for this small "requirement". The participants ranged in ages from 18-31.

Setup.

For the experiment the following apparatus was used:

- An ambient lighting system; a Lightpack (Woodenshark, 2013) configured to one setting per condition (three total). The default Lightpack settings was used for condition 1.
- For condition 2 the mode was changed from "Screen grabbing" to "Mood lamp" with a constant white colour and the overall brightness was decreased from 100% to 20%.

- For condition 3 the default settings was restored, and the grab delay was then increased from 50 ms to 1000 ms. The Lightpack was using firmware version 7.5 at the time of the experiment. In order to use the Lightpack software to read the screen is required. Prismatik (available from the Lightpack website) version 5.10.6 for Windows was used for this
- A PC with the following specifications was used to run the game:
    - Operating System: Windows 7 Ultimate 64-bit (6.1, Build 7601) Service Pack 1
    - Processor: Intel(R) Core(TM)2 Quad CPU Q6600 @ 2.40GHz (4 CPUs), ~2.4GHz
    - Available OS Memory: 4096MB RAM
    - DirectX Version: DirectX 11
    - Card name: ATI Radeon HD 5850
    - Display Memory: 2808 MB
- The game used for the experiment was Batman: Arkham Asylum (Rocksteady Studios, 2009), which is a third-person action-adventure single-player game.
- A paper showing the main controls for the game (see figure x).
- The consent form for the experiment stating that the session would be video and audio recorded as well as which context the data would be used in (see appendix x).
- For the video (and audio) recording a laptop running Vidblaster (Versteeg, 2014), a streaming/recording software that is able to combine multiple video feeds, was used to record through two webcams. The video feeds was combined in Vidblaster to create a picture-in-picture effect and saved as one file.

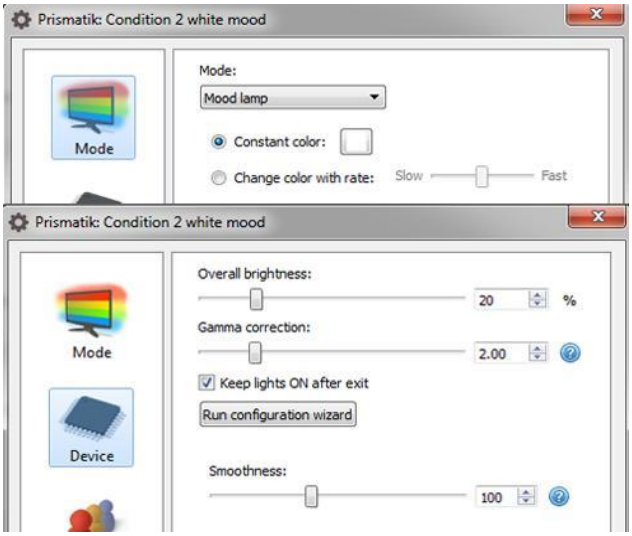

Figure 7, Settings for condition 2

Procedure.

The participants were welcomed to the apartment where the experiment would take place and informed to read a consent form and apply their signature, in order to confirm that they were in an agreement about the use of the recordings that would take place.

The participants were asked to take place in the chair in front of the PC and asked if they preferred mouse and keyboard or an x-box controller when playing, they were then provided a piece of paper with an overview of the controls for the given controller. The participants were then instructed about the procedure, how long they would be playing and that they would be interrupted when the time had passed. The participants played for 30 minutes, while their faces as well as the monitor and the ambient lighting system was recorded. When the 30 minutes were up, the participants were interrupted, asked if they had encountered any problems during the period of the experiment, and then asked to fill out the post-session questionnaire (see appendix). After filling out the questionnaire they were thanked for their participation and any questions they had about the experiment was then answered.

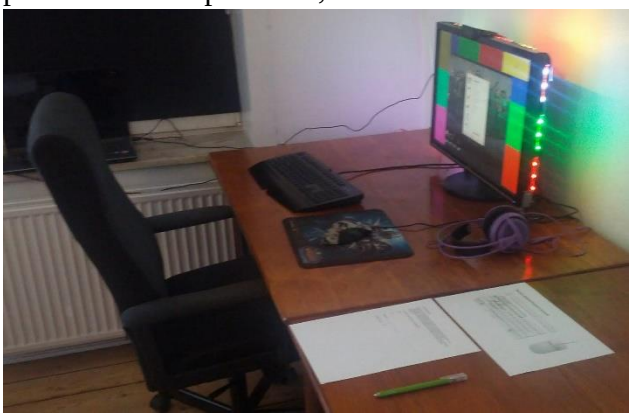

Figure 8. A picture of the setup used in the experiment. The post-session questionnaire was placed out of sight. One webcam was placed on top of the monitor, the other to the left and back of the participant.

Analysis.

The experiment was analysed with a basis in interaction analysis (Jordan & Henderson, 1995), using tendencies and behavioural analysis to analyse the participants' actions. Facial expression were observed and noted in order to determine if the participants was immersed or if any of the facial expression were related to e.g. frustration about the setup or the participants being distracted by the surroundings, or in condition three, the delay of the ambient lighting system grabbing. This data was used in relation to the post-questionnaire to determine whether or not there was a correlation.

The facial expression used in this analysis was: Anger, disgust, happy, sadness, contempt, joy, embarrassment, fear and surprise. Each participant's video was watch first individually, then together in order to compare any data found and catch something the other might have missed. Each emotion was discussed and compared to Matsumoto, Keltner, Shiota, O'Sullivan and Frank's (2008) descriptions of facial muscles and other nonverbal behaviours involved in the emotions considered universal.

Figure 9. Examples of emotions seen in the analysis of the experiment

Furthermore notes were made about other notable incidents that could be useful during analysis to e.g. explain certain phenomena. An example of other expressions not covered by the emotions can be seen in figure 10.

Figure 10. An example of expressions that could be important but could not strictly be classified as emotions.

4. Results

4.1. Immersion Interviews

The raw data that was collected from the interviews was broken down into categories to become the first step, producing the initial step and data for the analysis. Step one consists of the "raw" categories, the participants answers broken down.

Figure 11. A picture of the first set step of the raw categories.

Then the labels were set into new categories based on Open and Axial Coding. We will call it, "the first iteration". Setting all the categories into new categories e.g. all graphic related statements would be gathered under a new category called "Graphics".

This type of iteration was done five times in order to produce the four central explanatory concepts; Enjoyment, Engagement, Social Interactive Experience and Absorption, and the one central category: Immersion - The gameplay experience.

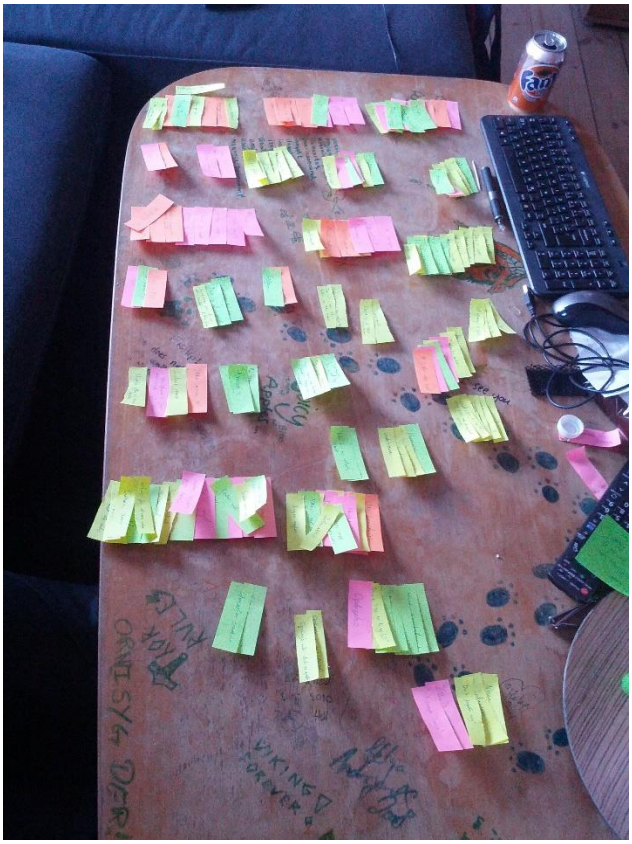

Figure 12. Gathering the categories.

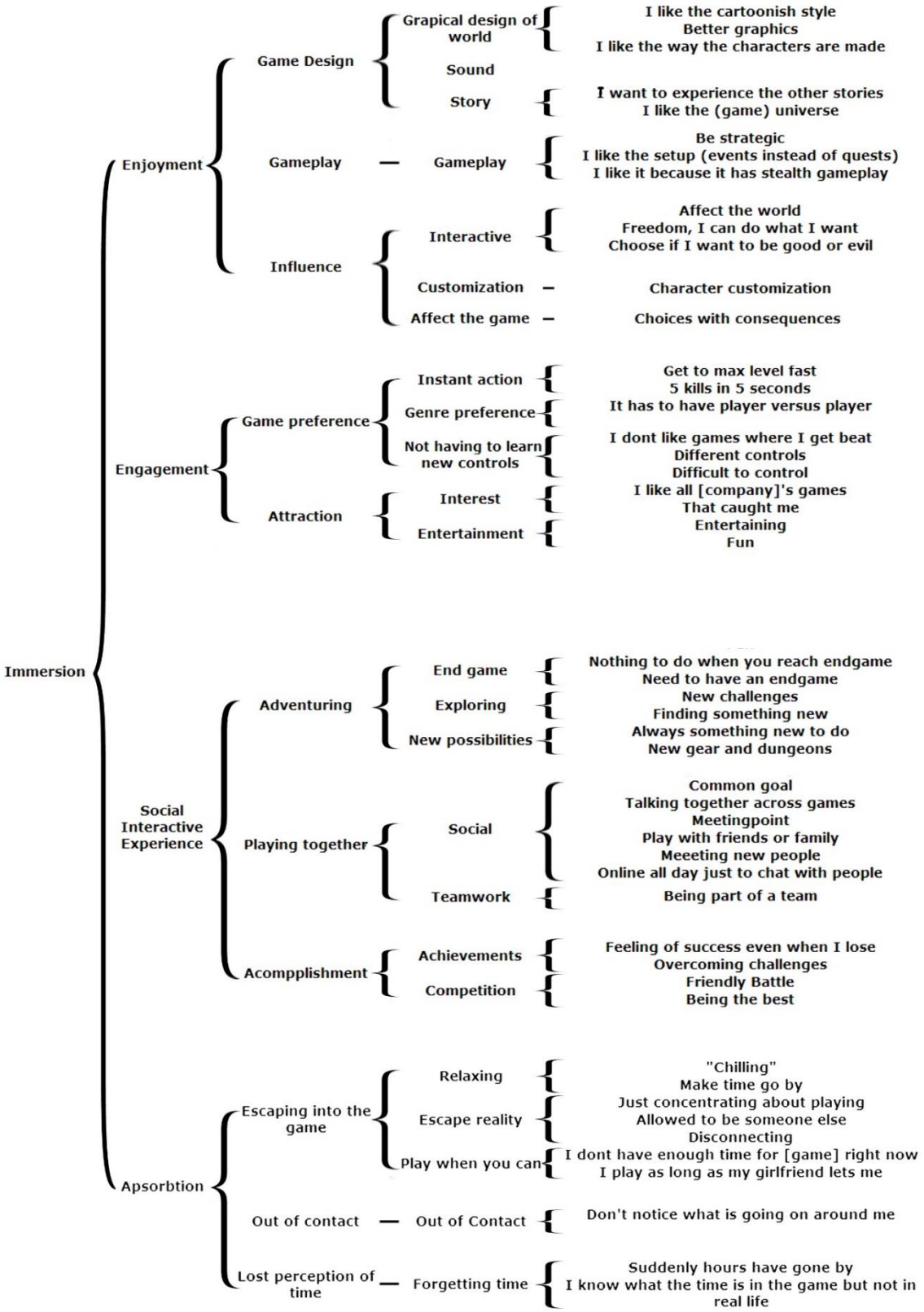

Figure 13. The results of the grounded theory analysis. The right most column shows representative comments for the respective category.

Total Amount of Emotions Shown by all Participants	
Verbal Expressions	14
Nonverbal Emotions	140
Anger	18
Disgust	9
Fear	12
Happy	22
Sadness	4
Surprise	18
Embarrassment	1
Contempt	56
Joy	0

Figure 14. A table that shows the total amount of different emotions found in the analysis of the immersion experiment across all conditions.

The results from the facial expressions has shown that the most common facial expression is contempt. Tendencies were shown when the participants would look outside the screen, be

looking for something else than what was on the screen at the time or when they impatiently tapped the mouse and keyboard because they wanted to skip cut scenes and conversations in order to progress faster or initiating another cut scene, several time during the sessions and occurring throughout most participants.

Some participants showed a tendency to bite their lips or move their tough out of their mouths when facing specific sections in the game.

The participants had a tendency to switch between to static facial expression when facing either a cut-scene or playing the game.

During the analysis a total of 369 pictures of the participants were captured for further analysis of expressions and meanings in relation to interaction analysis.

Figure 15 summarizes the amount of emotions registered for each participant.

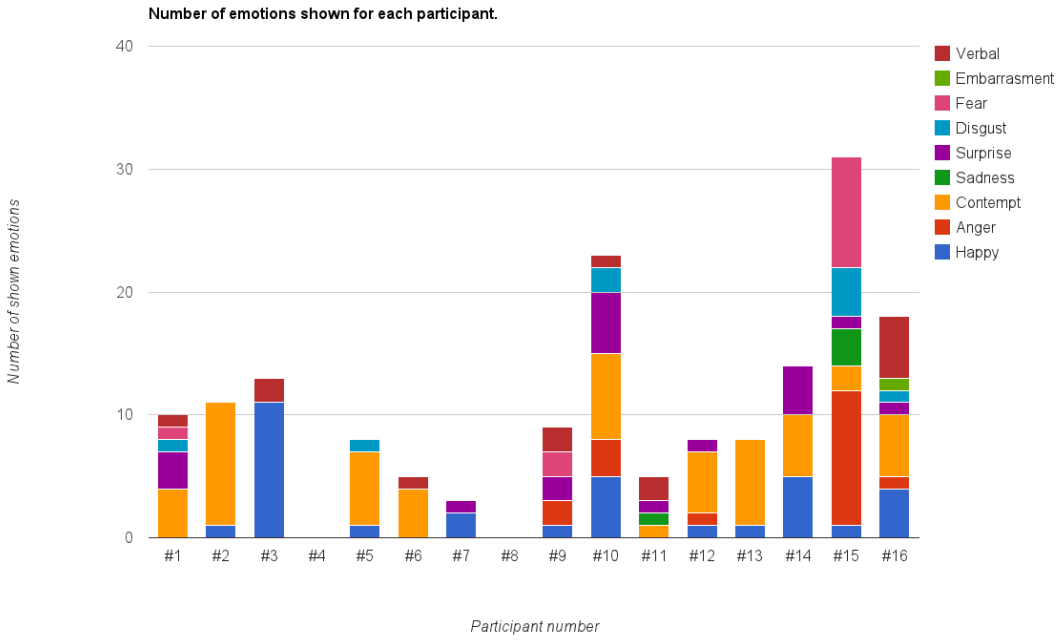

Figure 15. A stacked bar graph showing the total and individual amount of emotions shown by all participants.

The data from the post-session questionnaires was collected and gathered into an Excel spreadsheet, in order to organize the data and analyse the result. Each questionnaire was calculated a score based on the answers and from that a level of immersion was measured for each participant. The participants measured immersion was then compared to the answer given to question number 28 on the post-session questionnaire. According to Jennett et al. (2008) the simple question of "How immersed did you feel" should be a reasonable indicator of the participants immersion, question 28 on our questionnaire would as such then be expected to be correlated with the total score. Pearson's correlation coefficient was calculated to check for correlation between the two scores.

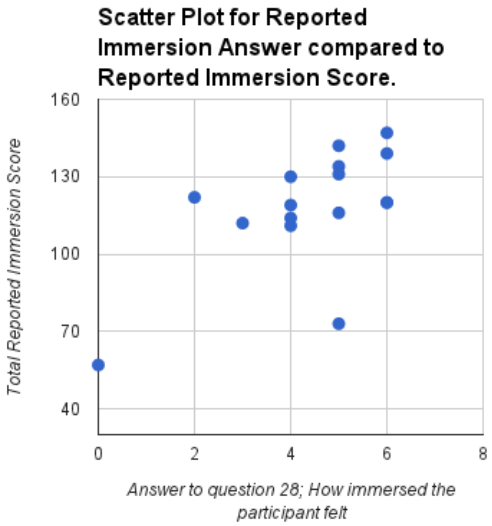

Figure 16. A scatterplot of the answers to question 28 on the post session questionnaire compared to the total score.

There was a positive correlation between the two variable, answer to question 28 and the immersion score from the questionnaire (r = 0.62, n = 16). A scatter plot summarizes the results (Figure 16)

Figure 17 shows the immersion scores from the post-session questionnaire divided into their respective conditions. No statistical significant difference was found between the conditions.

	Condition 1	Condition 2	Condition 3
	134	142	114
	119	122	111
	73	116	131
	112	130	139
	57	120	120
	147		
Mean	107	126	123
Median	115.5	122	120
Standard Deviation	35.0827593	10.2956301	11.7686023

Figure 17. A table showing the total reported immersion scores from the post questionnaire divided into the respective conditions, as well as mean, median and standard deviation values for each condition.

5. Discussion

5.1. Immersion Interviews

Translation.

The questions used in the semi-structured interviews were Danish translations of the questions used in Brown and Cairns (2004). As such the meaning and tone of the some of the questions might have been changed in the process. In cases where words could be translated in multiple ways the one judged by the group to be closest to the intended meaning was chosen. An English to Danish dictionary was used for the majority of the translating work, however in the case of the words engaged, engrossed, and immersed, Henrik Schønau Fog (Assistant Professor at Aalborg University Copenhagen) who has done work with immersion was consulted in order to capture the meaning of the words correctly in Danish. Based on his feedback we decided to use "engageret" for engaged, "opslugt" for engrossed, and "omsluttet" for immersed. Because of the format of the semi structured interviews we were also able to clarify the meaning of the term, e.g. by providing the English words to the participant.

It is likely that a different translation could yield slightly different results, but since the interviews were semi-structured and the data analysed qualitatively the data should still be valid.

Expectations.

Once the analysis of the data is done it will be interesting to see how our results compare to that of Brown and Cairns (2004) as well as Ermi and Mäyrä (2011). It would be expected that the results are somewhat close to the findings of Brown and Cairns (2004) since the interview scheduled used was a translation of the one used in their study and the guidelines used for the analysis is the same. However, since the data is qualitative some deviation would be expected both because of individual differences between the participants but also a different age group and location. This notion is somewhat confirmed by the fact that Ermi and Mäyrä (2011) who also conducted interviews and analysed the data through grounded theory has a different opinion of what immersion is and what the concept consists of. Since the main differences between the two studies is the age group and the location, Ermi and Mäyrä (2011) interviewed children together with their parents, as well as supposedly Ermi and Mäyrä (2011) using a different interview

schedule we expect our results to be closer to the findings of Brown and Cairns (2004) since our participants have a similar age, and the methods and interview schedule used in the data collection is also similar.

Results.

The interview was based on a semi-structured interview, some answers are longer and more elaborate than others and some participants are not asked all the questions chronologically because they might have answered that question in an earlier question. When comparing the answers to each other it would however have been most preferable if every participant was asked the same question at the same time in order to get the best overview of the spreadsheet, and therefore the use of a semi-structured interview might have been substituted with a structured interview. A semi-structured interview is however better to get more elaborate answers from the participants, and in order to build a theory based on grounded theory, this was the most effective procedure.

Qualitative or Quantitative.

We chose to do an interview in line with the study made by Brown and Cairns (2004), in order to validate if the Danish gamers had the same opinion and view as the English speaking participants that Brown and Cairns interviewed in their study. Using Grounded Theory for this study was determined to be the best approach to validate their results. Grounded Theory is however based on the researches own criteria of what categories and phenomenon to use for the analysis. The questions, if developed by ourselves, could have been influenced by our goal and because we were the ones to interview the participants as well, we could have made them bias because of the experimenters effect (Field & Hole, 2003).

Grounded Theory might not have been the quickest solution in order to validate the theory by Brown and Cairns. According to Field and Hole (2003) qualitative studies tend to be more open-ended than quantitative studies. If we had constructed a questionnaire based on their theory or hypothesis, the results might have been able to be replicated that way. However, even in the questionnaire, the participants could have been biased based on the formulation of our questions. When using quantitative studies, the results will be based on a numbers and thus be measured, however in a qualitative study you'll be able to get more insight based on the participants'

answers. So in order to avoid bias and influencing the results the study was conducted using the same questions used by Brown and Cairns in 2004, using grounded theory to analyse and code the data and basing the results on the 6 criteria stated by Strauss and Corbin (1998).

Analysis.

Grounded theory was used by Brown & Cairns (2004) and also by Ermi & Mäyrä (2011), in order to develop their theory. Therefore this analysis method was chosen in line with the theory from Brown and Cairns. The theory could have been confirmed by doing a questionnaire in order to get quantitative data and compare the results based on the theory instead. However, we thought that the best way to get the same type of data on a different set of people would be to take inspiration from their test and build our own theory based on these data, then comparing them to each other to see if we came up with the same base structure. When coding the results, the first two stages would be in focus, in line with Brown and Cairns (2004), who according to their paper, mainly used these two steps to build their theory. In this report, the results will be based on all stages of the coding in order to get the best analysis and to apply all methods described by Strauss and Corbin (1998) to avoid as much bias as possible from our side. Doing this could cause us to get different results than those found by Brown and Cairns (2004).

5.2. Game Choice

When first planning the experiment to measure immersion, the intended game was "The Elder Scrolls V: Skyrim", mostly based on its review ratings (metascore) where it was reviewed to be one of the highest scoring games as of yet to be released, therefore naturally this game went to the top of our preference list of games to pick from. However, when testing the game with the setup several issues came to light during the test which indicated that this should not be the game used for this experiment. The effects in the game was perfect for the ambient lighting system, working well with the intended setup, however it was too straining on the PC's CPU to cooperated with the ambient lighting system, it used all of the capacity available for the PC, thereby slowing down the gameplay and causing a decrease in performance, stability and visual effects. Furthermore after internal testing of the gameplay, it became clear that the games introduction would take too long because there were many customization options. The build of the participant's character would take a considerable amount of the time set for the experience,

and this stage of the game would have a great influence on the game experience to just skip and tell the participant that this stage they should just skip ahead and take the default character. The reasoning behind this was that the character creation process is 4-5 minutes into the game, whereas these minutes would be used to immerse the participant in the games story, thereby interrupting and possibly breaking the participants' immersion, which should be avoided. (Brown and Cairns 2004) (Bjørner, T., personal communication, May 28, 2014) (Ermi and Mäyrä, 2011)

Other games then came up for discussion, firstly was the "Team Fortress 2", a mass multiplayer first person shooter game. This game was completely in the other direction when looking at the genre and gameplay. The reason this game was considered was in order to try and fulfil the social immersion aspect from our grounded theory. Based on this it was important that the participants had a social interaction during the game, however this opened up the experiments "environment" for many variables. "Multiplayer" meant that the game would be a public game, which could be controlled if it was possible to predetermine the other players and have these playing together and against each of our participants, but this was not possible for this experiment. So the participants had to play with and against different people each time, furthermore it might not have been on the same server or map either. Based on these criteria the variables could give a noticeable influence on the participants immersion, and this is not bringing in the possibility of being kicked, harassed, out matched or server issues which would cause our participant to experience less immersion then intended, therefor this game was also cast aside. (Field & Hole, 2003)

Amnesia: The Dark Descent, a horror first person puzzle game, was also a game that was discussed but was also dismissed. The games effects would have worked in cooperation with the ambient lighting system due to its creative use of the lighting in the game, but previous experimentation with this game came up during the discussion, and reminded us about the horrors this game brought, not from the game, but from the participants confusion during the first 30 minutes of the game. The participants would wander around endlessly in multiple areas confused about what to do next, breaking their immersion and transforming fun to frustration within minutes. Based on a statement from one of our participants from grounded theory, the horror genre might not be in our best interests either.

Finally a game was chosen, Batman Arkham Asylum Game of the Year Edition. This game was picked because it had a quick start up, but was still able to bring the participants into the story of the game. The story of the game is considered to be important and in focus for our participants' immersion and game experience, this is based on the grounded theory. The game has no customization to the appearance of Batman, however it does have a level system which supports customization and the RPG elements, which our grounded theory supports to be improving immersion. The game itself is using lighting in such a way that the ambient lighting system could cooperate instantly and without any decrease in performance. The game is compatible with mouse and keyboard, and the Xbox controller, in which case the game is playable by each preference group of participant, whether they prefer a PC or a console setup, thereby minimizing the controls negative influence on the participants' immersion.

Batman Arkham Asylum is however a single player game with no co-op mode available. This means that the game has no social interaction aspect to the game which according to our grounded theory is something the participants found to be a part of their gameplay experience and immersion.

Batman Arkham Asylum is not the perfect game to fit the grounded theory, but it is the game that fits the most of the factors without opening the game environment to uncontrollable variables.

Skyrim, "build your character", customization, slow, CPU heavy, lowered graphics and effects.

Team Fortress 2, multiplayer, customization, uncontrolled environment,

Amnesia, too dark, bad experiences, horror, good light effects, torch, instant play.

Batman Arkham Asylum, instant play, good light effects, RPG element,

5.3. Windowed mode only

When the Lightpack is screen grabbing, it is only grabbing the actual screen, aka the desktop. This is an issue because games are usually played in fullscreen, which it does not grab and thereby does not process. This is something that could limit the use of the Lightpack in a gaming perspective, and something that is not mentioned in the manual or information when buying the product. So in order to get the Lightpack to screen-grab the game it has to run in windowed mode, giving the game borders and a frame, which is somewhat annoying to look at, which could then be a variable in measuring the participants immersion. This issue can be solved with an external program that removes the borders and the window, making the game appear fullscreen without actually being fullscreen. For this experiment the program called Borderless Gaming 6.5 has been used to do so, and thereby enabling the Lightpack to screen-grab the game and be used optimal.

However, during the last three participants the program encountered some technical problems and could no longer assist the ambient lighting system in grabbing the screen when the game was in fullscreen, but instead grabbed the desktop. To solve this problem, the game was run in window mode in order for the ambient lighting system to react to the game.

5.4. The human eye

When working with light, it is imperative to understand how the human eye perceive light and in what context the human eye react to different stimuli. The human eye is receiving all light in its field of view, light hits the eyes receptor cells, and they convert the light into a neural signal, which is then transferred by the optical nerve to the visual cortex. This centre in the brain is divided into two channels, the ‘magno’ and ‘parvo’. Each of these channels responds differently to visual stimuli, thereby giving them different reaction times and sensitivities. (Bartels, 2011)

	Magno	Parvo
Speed	Fast	Slow
Spatial Resolution	Low	High
Contrast Sensitivity	High	Low
Colour Sensitivity	No	Yes

Figure 18. Properties of Magno- and Parvo-channel (Bartels, 2011)

For this study these factors are of interest in relation to the effects of the ambient lighting system SYSTEM. The reaction time is of relevance because this will determine the grab delay and what effect it is going to have on the participants, if it is too fast or too slow and in what degree the human eye can perceive it.

Spatial resolution is of importance when determining the setup of the ambient lighting system and what light should be used and how the light will be perceived. Contrast sensitivity is interesting because of its influence on the reaction time and how the brain is reacting to this kind of stimuli, and in relation to colour sensitivity, which colours to use and how the brain is perceiving the colours in the Magno-channel or the peripheral, based on the distance and size of the screen.

5.5. Choice of Participants

When choosing the participants for this experiment, it was an increasing concern about what people to choose. Initially the choice was simple; Gamers. But what is a Gamer? This is a question that we have not been able to define. There are several opinions on what a gamer is. The

English Dictionary defines a gamer as: A person who plays a game or games, typically a participant in a computer or role-playing game. If this is the case, gamers a people that play computer games or a person playing e.g. Pen and Paper games such as Dungeons and Dragons. However this does not seem to be the case when people are asked what is a gamer. Several gaming magazines such as IGN, Eurogamer and The Escapist - Extra Credits (Extra Credits, 2012) has discussed this topic with different perspectives and terms such as “Casual gamers”, “Hardcore gamers” and “Pro gamers”. The PBS Game/Show (2014) discussed this specific topic with the statement that the term “Gamer” is weird because we does not apply it to people that see a lot of movies and call them “Moviers” or cinephiles (people going to cinemas a lot). The term “Gamer” is being used to define a sense of community, defined by however is in the different groups (PBS Game/Show, 2014). In a video from Razer (2014), a company that makes equipment for professional gamers, they state that: Gaming doesn’t define who we are, it is who we are that defines gaming. Which is a much more open statement that gives the choice to the individual person to define who they are. Therefore, the target group as a gamer was discarded, because there was not a clear definition of who they were or how to find them. Instead the participants was chosen from their willingness to participate. They were asked and recruited through a social media (Facebook) and without any criteria other than their statement “I play videogames” and their willingness to play.

5.6. Recording equipment

The recordings for the Effect of Ambient Lighting Systems Experiment has come to debate whether or not to have recorded at a higher resolution than it was. The laptop that was running the Vidblaster program was hooked up to two webcams, synchronizing them in the program and compressing them into one video file. This was a process that used a lot of CPU power and coursed the laptop to experience difficulties recording at higher resolutions. A stronger laptop might have been a solution to this problem and could have increased the quality of the recordings to give a clearer vision of the participants’ faces. This could also have increased the visual quality when the participants were in the dark. Another solution could also have been to record using to separate videos instead of using a program to compress the videos into one frame. By doing so it would have increased the visibility of each recording and given a much clearer visual. However, this would have increased difficulty the setup for analysing the data afterwards,

because then it would have been needed to use two programs to display the videos and having to synchronize them before each analysis. Cutting them together afterwards would take time and allow for human error, which is something we have had experience with during a previous project, which was not successful, and therefore we decided not to use that method again.

The gameplay was recording from the second camera recording the screen and the ambient lighting system, however the gameplay itself could have been recorded in order to get a more precise insight into the gameplay, the participants movements and use of controls, however it would have as above increased the time used to prepare the analysis, also the small representation of the gameplay was enough to recognize were in the game the participant was and what they were about to encounter, due to internal testing and personal experience with the game, the sections of the game that the participants were playing through was well known. A problem that could have occurred if the gameplay was to be recorded would have been the strain on the PC. The PC would then have had to play the game, control the ambient lighting system and record the gameplay which as tested during choice of game only using the ambient lighting system and the game, put much pressure on the PC's CPU.

So in this case, we used our equipment to their limit, in order to get the best results without decreasing game or analysis performance.

5.7. Immersion - Gameplay Experience

As presented in this report there are several opinions about the term immersion. In this section the terms will be taken up for discussion in relation the each other and the relation to the findings from the grounded theory produced in this report.

According to Ijsselsteijn et al. (2007) the Gameplay experience is not just one experience, but many, Qin et al (2009) state that these experiences are flow, immersion, cognitive absorption and presence. Flow is according to Jennett et al. (2008) like immersion and that flow overlaps with immersion, which is in line with Csikszentmihalyi (1990), and Sweetser and Wyeth (2005). According to these authors Flow is an optimal state that is reflected upon the correlation of skill and challenge. So in order to achieve a high level of flow, the game has to challenge the player in such a way that it matches his/her skill level. These statement correlates with the statements from

the questionnaires related to Immersion. The participants states that the game has to be challenging but not to a level of impossible to complete. Related to the answers from the questionnaire, the elements of which Sweetser and Wyeth (2005) base their model of gameflow, are in line with these. They state that you need to concentrate about the game, it has to be challenging, you should be able to increase your skills and use this progression along the way, clear goals - but also new goals, feedback, immersion and social interaction. These terms have all been discovered during the analysis and related to the terms of "Enjoyment" and "Social Interactive Experience". Sweetser and Wyeth (2005) state that not all elements of their model would fit to all games genres, in their case real time strategy games, but not all elements are needed in order to estimate the level of gameflow. By dividing the "Social Interactive Experience" into a category for itself, this might increase the theory build from the grounded theory. Sweetser and Wyeth state that single player games might not fit the model, however there are other social interactions to be made other than talking in-game. From the questionnaires it became clear that some of our participants used social media, forums and achievements in order to connect and compete with other players, even when not playing.

Presence is a topic that has been discussed and defined just as frequent as immersion and some argue that these two terms are very close and are sometimes used as synonyms. (Ermi and Mäyrä, 2011) Slater (1999) discuss in an article the instance of this happening, when talking about immersion, as mentioned earlier in the report he is using the terms "System immersion" and "Immersive response" in relation to his definition of presence. .

According to Qin et al. (2009) immersion shares qualities with both presence and flow. Steuer (1992) states that presence is divided into two states: natural perception and telepresence. Slater (1999) states that presence is a psychological sense of being in a virtual environment. This is in line with a Lombard and Ditton (1997) when they state that the three types are "You are there", "It is here" and "We are together". This suggest that presence in a game sense is the perception of being in the game environment. This is in line with Slater's first two aspects of presence, however the final statement from Lombard and Ditton (1997) differs. This final statement is supporting the gameflow model by Sweetser and Wyeth (2005) when they bring in the element of "Social interaction" into the gameflow model. The grounded theory brings about presence in relation to category of "Escaping into the game", in line with the statements of "You are there".

The category is related to the topic of "Absorption", being absorbed by the game, not only through the senses but also cognitively, losing yourself in the narrative. This topic was related back to the first statements from the participants when they stated that they were present in the game, being the avatar and being drawn into the story. The statement from Ermi and Mäyrä (2011) that presence depends on a metaphor of transportation (telepresence), and therefore prefer to use the term immersion when talking about digital games is something to consider, because according to Slater (1999) immersion is not feeling, it is something the system delivers.

It can be argued that Slater's (1999) statement about difference in terminology can be said about presence as well as immersion. If the two terms "System immersion" and "Immersive response" is related to the other authors and the terms presence and immersion is set aside, these terms would fit a lot better and could be used to collect the difference in terminology under more collaborate terms, e.g. Ermi and Mäyrä would place their immersion as an "Immersive response" and their definition of presence under "System immersion". If presence was to be looked at in this perspective the grounded theory developed in this report would be able to describe the "Immersive response" as the Gameplay experience and "System immersion" as the Absorption.

Brown and Cairns (2004) state that immersion is a linear path with certain barriers to overcome in order to become immersed. These three stages are: Engagement, engrossment and total immersion. In the grounded theory produced in this report a topic was named engagement, these two topic relate to each other. Brown and Cairns state that the engagement stage requires the user to invest time, effort and attention in order to learn the game and its controls. This is in line with the grounded theory "Engagement". As mentioned earlier in the report T. Bjørner (personal communication, May 28, 2014) does not agree with model developed by Brown and Cairns because it is mission a description that shows what happens when the involvement is completely lost and how to recover the different levels again. This is something to take into consideration when using this model. According to this statement the model from Brown and Cairns is a linear path to immersion, Brown and Cairns (2004) do state that total immersion is unlikely to happen, but what is it does happen, but is lost, how does this affect the player and is it possible to regain this state of mind or is it lost? Brown and Cairns only describe a degree of involvement rising, but throughout a game there can be many factors having an influence on immersion, therefore

immersion should not be linear, but changing all the time. As stated by Jennett et al. (2004), that players are able to be in a state of presence without being immersed.

This relates to the grounded theory and can be argued that a player does not need to fulfil every aspect of the model in order to be immersed.

When looking at the different definition and models for immersion it is difficult to say who is wrong and who is right, because each model has something that can be related to the feeling of being immersed. Ermi and Mäyrä (2011) cover a lot of ground with the use of presence, cognitive absorption and flow, better than Brown and Cairns (2004), however Brown and Cairns (2004) involves some elements that Ermi and Mäyrä does not, such as loss of time and basic engagement. In the end it could all just be the use of different terminology (Slater, 1999).

5.8. Immersion Questionnaire

When looking back at the participants it might have been an idea to do a genre based division of the participant. The results from the questionnaire at the moment is heavily favouring MMORPG players, whereas FPS players might not fit the results. By dividing the participants into different groups, we might have been able to see tendencies between the different groups and thereby be able to develop a broader theory that would fit more genres than now. If that was not the case, then several theories could have been developed to fit each genre and thereby set in stone that different games needs different approaches, based on the fact that people are not created to enjoy the same things.

When taking the participants from this session into consideration, most of the participants enjoyed the same genre of game, but even so, this opened up for even more individual differences in preferences, e.g. PvE, PvP or Role-play. This makes it difficult to conclude any generalisations based on this spread of participants, because the focus for our participants was on MMORPG. This theory could however be used in future studies to go deeper into the MMORPG genre and the different types of play it contains in order to find the tendencies and differences between these.

A question to take into consideration is whether or not the theory model and questionnaire is wrong for other types of games or it would fit? Should we have performed the experiment on World of Warcraft instead, based on the theory model being developed mainly around this game? This would have made sense and could have given some results that could have fit perfectly into the theory model, however, by using a different game with aspects related to the answers from the questionnaires, the model is still relevant and can be used to give a general idea. Even if the test was made with World of Warcraft, it would have opened the test up for a lot of variables, such as outside interference due to the fact that it is a MMO and then it should have been fitted to the preference of the participant, if they had a preference of game type.

5.9. Results

When looking for facial expressions the detection level of the observer is critical. During several hours of analysis some facial expression may not be detected even though more than one observer is analysing the video. Facial expressions when analysed without a program is analysed by using the criteria and guidelines presented by, in our case, Matsumoto et al. (2008). A program for facial recognition could have been used in order to help the observers in case they should have missed something. The facial recognition system might also have captured or recognized the some emotions that the observers could not see or discarded as irrelevant. However, due to the low resolution of the recordings the program might have encountered some problems recognising any facial expressions at all, and the light changes due to the monitor and ambient lighting system could have interfered or coursed problems. .

6. Conclusion

The goal of the project was to determine the definition of immersion and examine how it can be measured. In order to do this the terms Immersion, Flow and Presence were examined to establish the main differences and similarities between them. The terms are very closely connected and therefore often confused or discussed as mentioned by Ermi and Mäyrä (2011) and Slater (1999) as well as others. Inspired by Brown and Cairns (2004) a grounded theory approach was taken to examine Immersion: Ten gamers were interviewed by using a semi-structured interview based on the questions used by Brown and Cairns (2004). The interviews were then transcribed and analysed by using grounded theory (Strauss et al., 1998). The analysis resulted in a model for Immersion that consists of enjoyment, engagement, absorption and a social interactive experience. The results from the interviews were used to develop an Immersion questionnaire that was used in a later experiment. The goal of the experiment was to examine if playing games with the addition of an ambient lighting system would affect the immersion of the player. In order to do this an experiment with 16 participants divided randomly over three conditions, one with an ambient lighting system, one with a delayed ambient lighting system and one with passive white ambient light. The participants played the game Batman: Arkham Asylum for 30 minutes while being video recorded from the front and back. The video data was analysed through interaction analysis (Jordan & Henderson, 1995) with focus on the emotions shown by the participants. The results revealed no statistically significant difference between the conditions in neither emotions shown nor self-reported immersion.

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8. Appendices

8.1. Semi-structured interview ”template”

Immmersion Interview

(Start med navn, dato og favorit spil)

1: Hvorfor har du valgt X som dit favorit spil? Kan du nævne et spil du ikke kan lide og i forhold til det sige hvad der er godt ved dit favorit spil? Hvad er det ved spillet der appellerer til dig? Når du tænker på spilletsegenskab, er så grafikken, modstanderens AI, lyden eller noget andet der appellerer til dig? Er der en historie i spillet?

2: Føler du dig nogensinde “til stede” i spillet? Hvordan vil du beskrive den følelse? Hvilke aspekter af spillet støtter den følelse?

3: Har spillet en slutning? Hvordan ved du at du har nået slutningen? Vil du fortsætte med at spille efter slutningen? Eller spille igen? Hvorfor/hvorfor ikke? Hvis der ikke er en slutning hvad motiverer dig så til at blive ved med at spille? Betyder det noget for dig hvis du ikke afslutter spillet?

4: Hvor længe spiller du? Hvad får dig til at blive ved med at spille så længe? Hvad er det ved spillet der får dig til at føle du ikke kan stoppe? Afhænger det af spillet?

5: Er der bestemte tidspunkter du spiller? Hvad er der ved de tidspunkter der gør dem gode? Afhænger det af spillet? Betyder det noget?

6: Vi har snakket om nogle bestemte egenskaber ved dit favorit spil, hvad med spil som en helhed, hvorfor spiller du dem? Er der en bestemt form for nydelse? Sammenlignet med andre? Er der en fælles funktion/egenskab/særpræg for alle computerspil du spiller?

7: Er det andet, udover at spille computerspil du nyder af lignende grunde? Nogle har nævnt at læse og spille rollespils spil som eksempel. Hvad er lighederne og forskellene mellem denne oplevelse og spil oplevelsen?

8: Er der andre spil du også nyder? Nyder du dem af de samme grunde? Hvad med andre spil i andre genrer, f.eks. strategy, første person skydespil, multiplayer online games eller nyder du dem ikke overhovedet? Hvad med den sociale oplevelse af at spille?

9: Har du oplevet at der er spil du ikke nyder? Kan du komme i tanke om hvorfor du ikke lide dem? Er der noget de spil du kan lide har, som de spil ikke har? Eller noget disse spil har som dit favorit spil ikke har der får dig til ikke at kunne lide dem? Kan du måske sammenligne egenskaber i spil du kan lide, hvad kan du ikke lide og hvorfor ikke?

10: Føler du dig nogensinde rigtigt opslugt i et spil? Hvordan vil du beskrive den følelse? Er det en behagelig fornemmelse? Bliver du opslugt i dit favorit spil? Hvad med spil du ikke kan lide? Er der spil hvor du ikke bliver opslugt men nyder alligevel?

11: Hvad er din opfattelse af tid imens du spiller? Føler du at du har mistet fornemmelse af tid? Eller føler du en forbedret fornemmelse af tid? Kan du give eksempler på sådanne oplevelser? Er det en behagelig fornemmelse eller ej?

12: Nogle spil anmeldelser har nævnt udtrykket omsluttet via sanserne (på engelsk: Immersion) som en følelse oplevet mens man spiller et godt spil. kan du relatere til den følelse? Hvordan vil du beskrive den? Ville du bruge det til at beskrive en egenskab af dit favorit spil?

8.2. Immersion Experiment Consent Form

Samtykkeerklæring

Jeg giver hermed min tilladelse til at jeg vil blive videooptaget under dette forløb. Jeg forstår, at jeg kan tilbagekalde min deltagelse på ethvert tidspunkt i løbet af undersøgelsen. Jeg forstår at materialet kun vil blive brugt i studiemæssig sammenhæng (projektrapport og tilhørende fremlæggelse).Det materiale der er optaget vil forblive anonymt.

Jeg forstår og accepterer disse betingelser.

Dato:

Navn:

Underskrift: _____

Deltager nummer:

8.3. Immersion Experiment Post Questionnaire

Post-session questionnaire

I hvilket omfang mistede du fornemmelsen af tid imens du spillede?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvilken grad følte du dig opmærksom på hvad der skete omkring dig?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvor høj grad følte du en fornemmelse af frihed i spillet?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvilken grad føler du at computer spil lader dig være en "anden"?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvor høj grad finder du computer spil afslappende?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
Hvor meget ønskede du at "vinde" spillet?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvor høj grad oplevede du en følelse af succes når du løste en opgave i spillet?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvilken grad var du nysgerrig efter at finde nye ting i spillet?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvor høj grad følte du at der altid var nye mål i spillet?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvilken grad følte du at spillet var underholdende?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvor høj grad ønskede du at gennemføre spillet?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvilket omfag følte du at spillet fangede dig?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvor høj grad følte du at spillets controls var lette at lære og bruge?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvilken grad føler du at du glemte hverdagens bekymringer?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad

I hvor høj grad spiller du når du kan i din fritid?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvor høj grad føler du dig del af et hold når du spiller med andre?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvor høj grad ønsker du at være bedre end andre når du spiller?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvor høj grad bruger du spil som en måde at være sammen med andre?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvor høj grad har du en fornemmelse af et fælles mål når du spiller med andre?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvor høj grad følte du at spillets genre passer til dig?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvor høj grad følte du at du havde inflydelse på din karakter?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvilket omfang fandt du spillets gameplay appellerende?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvilken grad fandt du spillets historie interessant?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvilket omfang kunne du lide spillets lyde og/eller musik?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvor høj grad kunne du lide spillets grafik?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvor høj grad følte du at du kunne påvirke spillet?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvilken grad følte du at du kunne springe direkte ind i spillet?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad
I hvor høj grad følte du dig immersed (omsluttet/indlevet) i spillet?	I meget høj grad	☐	☐	☐	☐	☐	☐	☐	I meget ringe grad

Navn:

Participant nummer:

Alder:

Condition:

8.4. Immersion Experiment Controls Sheet

8.5. Immersion Experiment Emotions Count for each Participant

Results from Interaction analysis of Immersion experiment. The tables show the count for the emotions showed for each participant followed by a note about tendencies.

Participant 1	
Verbal Emotions	1
Nonverbal Emotions	8
Contempt	4
Surprise	3
Fear	1
Disgust	1

The participant was observed looking at the keyboard and the note for help. The participant had a tendency to bite his lip during specific sections of the game.

Participant 2	
Verbal Emotions	0
Nonverbal Emotions	11
Contempt	10
Happy	1

The participant was observed to skip the cut scenes throughout the game. The participants had a tendency to bring the right hand to the face when idle in the game or conversations with the

NPC's were walking to the player. Throughout the session the participant looked at the keyboard.

Participant 3	
Verbal Emotions	2
Nonverbal Emotions	9
Happy	11

The participant's verbal emotions was in this case related to laughter and no words. The participant was observed to look at the keyboard several times throughout the session. The participant received several SMS messages throughout the session without reacting to them.

Participant 4	
Verbal Emotions	0
Nonverbal Emotions	0

This participant's video file was corrupt after 14 minutes of play. The participant had a tendency to put his hand to his face.

Participant 5	
Verbal Emotions	0
Nonverbal Emotions	8
Contempt	6
Happy	1

Disgust	1

The participant was observed to look away from the screen several times throughout the session. The participant had a tendency to have tongue out of the mouth in specific parts of the game. The participant skipped all the cut scenes.

Participant 6	
Verbal Emotions	1
Nonverbal Emotions	3
Contempt	4

The participant's verbal emotions was in this case related to a sigh and not words. The participant had a tendency to move close to the monitor at specific parts of the game. The participant skipped all the cut scenes.

Participant 7	
Verbal Emotions	0
Nonverbal Emotions	3
Happy	2
Surprise	1

The participants' video file was corrupt after 2 minutes and 30 seconds of play.

Participant 8	
Verbal Emotions	0

Nonverbal Emotions	0

The participants' video file was corrupt after 8 seconds of play.

Participant 9	
Verbal Emotions	2
Nonverbal Emotions	6
Anger	2
Fear	2
Surprise	2
Happy	1

The participant was observed to look at the controls/keyboard and the note for help several times throughout the session.

Participant 10	
Verbal Emotions	1
Nonverbal Emotions	21
Contempt	7
Happy	5
Surprise	5
Anger	3

Disgust	2

The participant was observed to look at the controls and the note for help a few times during the session.

Participant 11	
Verbal Emotions	2
Nonverbal Emotions	2
Sadness	1
Surprise	1
Contempt	1

The participant had a tendency to put the tongue out of the mouth several times during specific section of the game. The participant was observed to look at the controls a few times during the session.

Participant 12	
Verbal Emotions	0
Nonverbal Emotions	8
Contempt	5
Anger	1
Happy	1
Surprise	1

The participant was observed to look at the controls several times throughout the session.

Participant 13	
Verbal Emotions	0
Nonverbal Emotions	8
Contempt	7
Happy	1

The participant skipped the first two cut scenes. The participant was observed to look away from the screen a few times during the session.

Participant 14	
Verbal Emotions	0
Nonverbal Emotions	14
Contempt	5
Happy	5
Surprise	4

The participant was observed to look at the controls a few times during the session. The participant had a tendency to bite his lip during specific sections of the game.

Participant 15	
Verbal Emotions	0

Nonverbal Emotions	29
Angry	11
Disgust	4
Fear	9
Sadness	3
Contempt	2
Surprise	1
Happy	1

The participant showed several emotions during the session, some emotions was determined to be more than one emotion. The participant skips the first cut scene.

Participant 16	
Verbal Emotions	5
Nonverbal Emotions	10
Contempt	5
Happy	4
Anger	1
Disgust	1
Surprise	1

Embarrassment	1

The participant was observed to look at the controls several times during the session. The participant skips the cut scenes.