The Road to Adaptive Gameplay
Early Insights into the Link between Personality and Experienced Game Entertainment.

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Abstract

Adaptive Gameplay is an upcoming research subject with the goal of making it possible for videogames to automatically adapt themselves to the preferences of the individual player. This research focuses on the possibilities to make these adaptations based on the personality of the player. To make such adaptations, it must be known what people with certain personality traits find entertaining in a videogame. This research is an exploratory research that aims to uncover this link between personality and experienced game entertainment. To do this, an experiment was conducted in which 48 participants had to play through three different types of gameplay areas (fighting, puzzling, and social interaction) and fill out two different types of entertainment measurement instruments, the Self-Assessment Manikin (Lang, 1980) and a grade and ranking score, for each of the areas. Afterwards the participants had to fill out the NEO-FFI personality questionnaire (Costa & McCrae, 1992) to measure the five traits of the Five-Factor Model.

Statistical analysis showed that some significant correlations and several trends could be found between the entertainment scores and personality traits, leading us to conclude that the link between personality and experienced game entertainment indeed exists. However, because the results only showed a few entertainment preferences for people with a certain personality trait, not enough information is available yet to create a reliable form of Adaptive Gameplay based on personality. More research into this link between personality and experienced game entertainment is needed in order to attain enough information to base such a form of Adaptive Gameplay on.

Future research must carefully approach the pitfalls of the research subject. The influence of several control variables like gender and experience with videogames is quite strong and they have to be carefully considered and controlled. Furthermore, the way entertainment is measured is not optimal and should be improved. No standardized measurements for entertainment are available, which makes comparing gameplay experiences a hard task. Addressing the lack of such a measurement is an important subject for future research.
Preface

As I am finishing up the biggest project of my life (for now), I can only think about how great my student-life has been. It has been a long ride that is finally coming to an end with this thesis. I have learned a great deal in my years at Tilburg University, not only about the subjects my professors tried to educate me in, but also about life in general, and maybe most importantly, about myself. I have the feeling that I am ready to go into the wide world and start a career that will bring me to many new and exciting places. And for this, there are several people that I want to thank.

First of all I want to express my gratitude to my supervisors. Pieter Spronck and Giel van Lankveld helped me a great deal these past years to make both my bachelor and my master-thesis possible. They offered me help when it was needed, we had insightful discussions where possible, and they were patient when it was required. When I started my bachelor-thesis they provided me with the only subject that seemed interesting to me and after a successful bachelor-thesis I was glad to be able to perform a follow-up research for my master-thesis. Even though my master-thesis took longer than I expected to finish, I am glad with the result and do not regret a moment of it. For that, both of you have my thanks.

I think that the Tilburg University is a great university with its beautiful campus and wonderful people. As our province of Noord-Brabant is known for, it was always “gezellig” and people here are really sociable. I will miss the casual conversations in the hallways, the celebratory beers in the Esplanade, and laying in the grass with a good book when the weather allowed it. I am glad I studied here and want to thank everybody who made this possible: my classmates, random strangers, participants for my experiments, and even the professors.

Of course, I also want to thank my family. Simply for being the friendly, fun, and supporting family they are. Especially my parents, who have always been very patient with me and my studies, and were the ones who urged me to enroll in the study in which I am now graduating. It is good to know you have a family that cares.

Finally, I want to thank my friends. While they were probably not the best influence to my study, it is them who make studying and living in Tilburg such a great experience. Now that it is time to go out into the “real world”, I hope we can still have the same great times.

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1. Introduction

This chapter provides a motivation for the present research (1.1), the problem statement and research questions (1.2), and an outline of this thesis (1.3).

1.1 – Motivation

The video gaming market has been growing explosively since its introduction in the early 80s and has even surpassed the movie business as being the biggest entertainment business (Chatfield, 2009). With no signs of this growth stopping anytime soon, the budgets for creating videogames will go up and up. There are already games reported with budgets around 100 million dollars (Chatfield, 2009). With the power of computers and consoles being as high as to them almost being able to deliver life-like virtual experiences, software developers cannot merely rely on having “better graphics” to stand out anymore. They will have to come up with new ways to surprise and entertain gamers.

The developers of a game create the game with a specific goal in mind. While for most games this goal is simply to present the players with a pleasurable and enjoyable experience, there are also games which are designed to give players an intellectual challenge or games that try to simulate realistic situations. The one thing that most games have in common is that they are created for the average expected player of the intended audience. The game offers the same gameplay experience for everyone, while it is obvious that not every player is the same. Of course software developers cannot make a separate version for each individual user, but Adaptive Gameplay offers a tool to make videogames dynamic and able to adapt to the individual player.

The presented research is early, explorative research into the subject of Adaptive Gameplay. Adaptive Gameplay is a technology that makes it possible for videogames to adapt their gameplay automatically to suit the player’s preferences. Ideally, this would adapt the videogame to each individual player’s preferences to maximize the entertainment value of the experience. The possibilities for adaptations are endless. It can be anything from a small and simple change, like a change in background music, to a more elaborate change, like changing the entire environment, to suit the player.

In this line of research it is attempted to adapt the gameplay based upon the player’s psychological personality profile. In order to do this a piece of software is needed that can first measure the player’s personality and then changes the gameplay to suit the measured personality’s preferences. This means that Adaptive Gameplay as discussed in this research needs two separate systems. First, a system is needed that measures the personality of the player by monitoring their in-game behavior. The second system needs to adapt the gameplay in a way that should increase the entertainment for the player.

Research on developing the first system has been done in Measuring personality through observations in a virtual environment (Schreurs, 2009). In that research it is concluded that it is possible, up to a certain extent, to measure the trait of extraversion by monitoring in-game behavior. The second system should
then implement gameplay changes that increase the entertainment experienced by the player. While the technology to make changes in gameplay is readily available, it is not yet known what increases the entertainment for players with a certain personality trait and it is there that the goal of the presented research lies. This research aims to discover the link between personality and gaming preferences. If this research yields positive results, the results of Schreurs (2009) and the present research can be combined in order to create a first version of Adaptive Gameplay based on personality profiles (in this case only the trait of extraversion) which can be implemented and tested.

1.2 – Problem statement and research questions

The ultimate goal of this line of research is to examine the full potential of Adaptive Gameplay through personality profiles. With Schreurs (2009) concluding that personality can be measured through in-game behavior, the next step towards Adaptive Gameplay through personality profiles is to find out what a certain measured personality finds most entertaining in a videogame. Therefore the goal of this research is to examine whether there is a link between personality and experienced videogame entertainment. The problem statement reads:

Problem statement: *To what extent can personality predict experienced videogame entertainment?*

Because so far there has only been limited research into the subject of Adaptive Gameplay, a history, review, and assessment into the current state of Adaptive Gameplay should be established first. In order to do that a literature study into the history and future of Adaptive Gameplay will be conducted which will define Adaptive Gameplay and will discuss its usefulness. The first research question therefore reads:

RQ1: *What is the current state of Adaptive Gameplay?*

Three steps will be taken in order to provide an answer to the problem statement. First, a literature study will be conducted in which personality psychology is reviewed and it is discussed how personality might relate to videogame behavior. This should provide reliable background information upon which the experimental setup can be based. To create an experiment based on the expectations of behavior of the entire model of personality is outside the scope of this thesis, so the focus will be set on the trait of extraversion, as found in the Five Factor Model (more on this in Chapter 2). The second research question therefore reads:

RQ2: *To what extent has personality and videogame behavior been researched before?*

Once a solid literature background has been established, it should be possible to create an experimental setup that makes it possible to research the link between personality and the experienced gameplay entertainment. As this research can be seen as a follow-up to the research of Schreurs (2009), the focus in this research lies on the trait of extraversion as well. The third research question therefore reads:
RQ3: *Which experimental setup is suitable for testing the link between personality and experienced videogame entertainment?*

Once an experimental setup is created an experimental study can be conducted to test if the expected link between personality and experienced videogame entertainment actually exists and if the predictions about it are true. With the results of the study it is possible to address the fourth research question:

R4: *What aspects of gaming appeal to people who are high or low on the personality trait of extraversion?*

To gain more insight into the way personality affects gaming entertainment, not only extraversion will be measured, but also the other four traits of the Five Factor Model. Even though the experimental setup is based on expected behavior of introverts and extraverts, it is almost certain that the other traits will influence the entertainment in one way or another as well. So, to get a better idea of what influences the experienced entertainment, the influence of the other personality traits and of certain control variables will be discussed to acquire the best possible insight into influences on entertainment. The fifth research question therefore reads:

RQ5: *What is the link between personality and experienced videogame entertainment?*

1.3 – Outline

This thesis begins with a theoretical framework (Chapter 2) that contains two literature studies to answer the first two research questions. To answer the first research question, the history and the theory behind Adaptive Gameplay is discussed (2.1) and to answer the second research question, literature into personality and gaming is reviewed (2.2). To answer the third research question, an experimental setup for our experimental study is provided (Chapter 3). The experimental study was performed and the acquired results are presented (Chapter 4) and these results are discussed (Chapter 5), providing an answer to the fourth and fifth research question. Finally, conclusions are provided and the problem statement is discussed (Chapter 6).
2. Theoretical framework

This chapter provides the necessary background information to understand Adaptive Gameplay and personality theories. The first section (2.1) describes the history of Adaptive Gameplay and why there is a potential market for it. The second section (2.2) provides a description of the current state of personality psychology, and in specific trait theory and the Five Factor Model. The link between personality and games is also briefly discussed.

2.1 - Adaptive Gameplay

This section gives an overview of the current state of the field of Adaptive Gameplay. First a history of Adaptive Gameplay is provided (2.1.1) which is followed by a definition of how Adaptive Gameplay is regarded in this research (2.1.2). Some important considerations for Adaptive Gameplay (2.1.3) and the differences of Adaptive Gameplay in certain gaming genres (2.1.4) are discussed. Finally, some arguments for the effectiveness of Adaptive Gameplay are given (2.1.5).

2.1.1 – The history of Adaptive Gameplay

The idea of adaptations in a game with the goal of improving the gaming experience is not new. It was actually one of the first options in early gaming to choose a difficulty level that suits the player’s experience, often classified as easy, normal, and hard. As far back as the Atari 2600 it has been possible to change the difficulty on games, with Tempest (Atari, 1981) being noted as the first game ever with a selectable difficulty level. Over the years a wide variety of options has been included in games to provide the player with the possibility to adapt the game to their preferences. A few examples besides difficulty settings are gore settings, music settings, and speed settings. The aforementioned types of changes in games are predetermined and are called Adaptable Gameplay (Gilleade & Dix, 2004).

Adaptable gameplay means that the creators of the game created a few predetermined settings that the player can choose between. However, creators of a game cannot make everything adaptable simply because it is too much work to create a setting for each individual player. They can only create a limited set of predetermined choices and therefore the real preferences of some players will inevitably lie outside the scope of these predetermined adaptations (Gilleade & Dix, 2004). Another downside of adaptable gameplay is that the player has to manually adapt these settings. This can be time-consuming and interruptive to the actual gameplay. These are two problems that can be solved with the implementation of Adaptive Gameplay.

The kinds of adaptations to gameplay researched in this thesis are of a dynamic nature and are called Adaptive Gameplay. The goal of Adaptive Gameplay is to have the game change itself in light of the player’s ongoing interactions with the videogame and thereby making the gaming experience fit the individual user (Gilleade & Dix, 2004). Similarly to adaptable gameplay, this is not a new idea. The early emergence of Adaptive Gameplay focused mainly on helping weak players by providing them certain
help or bonuses. A good example of this can be found in the racing game Mario Kart (Nintendo, 1992) in which the rubber band effect is used. The rubber band effect involves the competitive drivers' vehicles becoming significantly faster when behind the player's vehicle, and significantly slower while in front, as if the two vehicles were connected by a large rubber band (Wikipedia, 2011). The Mario Kart example is an example of one of the simplest kinds of Adaptive Gameplay and more complex systems have been implemented over the years. The game Max Payne (Take 2 interactive, 2001) applied a “auto-dynamic difficulty” approach, which altered the difficulty level by observing the player’s game statistics like average health, shot accuracy, number of times shot, numbers of times killed, etcetera. (Charles et al., 2005).

The goal of this line of research is to take Adaptive Gameplay even further by basing the adaptations on psychological profiles of the player. So far no games exist that employ such a system. The game Silent Hill: Shattered Memories (Konami Digital Entertainment, 2009) claims to make a psychological profile of the player and altering the gaming experience based on it. However, they merely register a few obvious choices the player can make (like caring for his child versus drinking alcohol) and base the ending cinematic on that “profile”. The game only has the ability to discern four different “profiles”, making it a long shot from the desired Adaptive Gameplay this research is referring to.

2.1.2 – Adaptive Gameplay as researched in this thesis

The possibilities of adapting gameplay are wide. Almost every detail of a game can be changed based on a huge amount of information that can be gathered from the player. To create a better notion of the Adaptive Gameplay that is desired in this particular research, a quick insight into the (scarce) literature on the subject is given.

One of the more comprehensive studies on Adaptive Gameplay was performed by Charles et al. (2005). In their research they wanted to adapt the gameplay based on player types. Player types are pre-set models based on the way a player plays the game, instead of their actual personality. Even though this differs from the kind of Adaptive Gameplay intended by the present research, they provide a framework that is useful.

The framework suggested by Charles et al. (2005) can be seen in Figure 1. This framework gives a clear view on how Adaptive Gameplay should work. A solid base in player types, which in our case are psychological profiles, and player preferences are the basics for the system. The game should then monitor the player’s behavior and adapt the game to increase entertainment. The feedback loop in the framework will make control possible and makes sure the system does not stick to the same psychological profile or player preferences for the entire game.
In this research, the “models of player types” part of the framework are psychological profiles and these are researched in Schreurs (2009). Schreurs concluded that it is possible to form a psychological profile of the player by monitoring his performance. The part of the framework in Figure 1 that the present research is focusing on are the player preferences. If this research yields positive results, the player types and their player preferences will be known (for a select group of traits and gameplay elements) and it will be possible to implement an early version of Adaptive Gameplay. Once such an early version of Adaptive Gameplay is created, the last two parts of the framework can be researched as well. Measuring the effectiveness of the adaptation and re-modeling the player types would complete the cycle of the framework and make it possible to thoroughly test this form of Adaptive Gameplay.

Charles et al. (2005) also look at the different kind of adaptations that are possible in a videogame. They name three different areas on which changes can be made, which are changes to:

1. a player’s character
2. non-playable characters (NPCs) in the game
3. the game environment or game state.

Changes in the first two areas, to a player’s character and to the NPCs, are meant to create a greater sense of embodiment and realism. If the interaction between the player’s character and other in-game characters (the NPCs) is realistic and adapts towards the situation, it can make the game more immersive for the player. Making a gaming-experience realistic and immersive is the goal of many games, because becoming part of the virtual world you are playing in can improve the gaming experience (Jennett et al., 2008). The increased realism can also affect the engagement and effectiveness of the communication between the player and the game.

These changes made to the player’s character and the NPCs are changes that affect the emotions experienced by the player and is what Hudlicka (2009) refers to as Affective Gaming. Affective Gaming can be seen as the part of Adaptive Gameplay that focuses on the emotions of the important characters.
in a videogame. Hudlicka (2009) defines it as follows: “Affective Gaming focuses on the sensing and recognition of the players’ emotions and tailoring the game responses to these emotions” (pp. 299). Applying Affective Gaming to a game can certainly increase the way the game is experienced and can probably contribute to increasing entertainment.

Affective Gaming aims at augmenting the emotions experienced in the game and can be used in any situation imaginable where an interaction takes place. These are, however, changes that do not really influence the course or content of the game, but rather the overall feeling that it gives. The Adaptive Gameplay that this research aims for focuses on changing the actual gameplay-content of the game, making it possible to serve the player with situations he prefers playing. This involves changing the third area mentioned by Charles et al. (2005), the game environment or game state.

The fact that the focus in this research lies on the game environment or game state does not mean that we think that changes to the other two areas are less effective. Changing the affective side of a videogame can ensure a more complete, immersive, and engaging gameplay experience and can also be a very important tool for the future of Serious Games (which are games used mainly for educative purposes). Both the Affective Gaming adaptations and the Adaptive Gameplay adaptations discussed here can be researched and applied independently of each other and are completely different kinds of research. Researching Affective Gaming is based around researching the emotions and the way they can be delivered through a virtual game, where the Adaptive Gameplay as discussed in this research focuses on the preferences of people with different personality traits. Research into Affective Gaming is strongly encouraged so that in the future both technologies can be combined in an attempt to make games even more adaptive.

The changes in game environment or game state that Charles et al. (2005) discuss are quite simple and straightforward changes like changes to items that can be picked up or the landscape and the topography of the world changing. However, in this research more elaborate changes are proposed and this can include the implementation, alteration, and removal of entire gameplay elements. A few examples of this are changing locations (a peaceful cove or a busy bar?), changing interactions (long, drawn-out conversations or simple hi-and-bye?), or changing the challenges to overcome (fighting a monster or solving a puzzle?). Because almost every aspect of gameplay can be changed, it is important to thoroughly research what will increase the entertainment for certain players. This is exactly what the present research attempts to do.

Now that an idea of the kinds of adaptations planned on making are clear, we want to examine the added value of Adaptive Gameplay. When mentioning Adaptive Gameplay further in this thesis, the Adaptive Gameplay that is being researched here is meant, meaning an Adaptive Gameplay based on personality profiles that changes the game environment and game state.
2.1.3 – Important considerations for Adaptive Gameplay

The talk about Adaptive Gameplay might seem very interesting and appealing and the idea sounds like a leap forward in gaming. However, is there any actual demand or need for it? Will gamers catch on to the idea? One might say that any adaptation toward an individual’s personality is an improvement or that the fact that some game developers already started with the concept is enough of an argument that it is a desirable new technology. However, do gamers really want a game that adapts? There are several strong arguments to argue against the usefulness of Adaptive Gaming. For example, it is possible that players do not want a difference in game-experience because they want to compare the experiences with their friends or brag about their success (Charles et al., 2005). Some people might want help when they are stuck on a problem while other more challenge-oriented players definitely want to solve it themselves. There are always more arguments as to why Adaptive Gameplay might not be successful, but there are counter-arguments to every new technology and it is impossible to predict if they will prove to be justified unless the technology is actually tested and researched.

Some of the counter-arguments only apply to certain situations. While we have discussed Adaptive Gaming for games in general, the way it can be implemented in certain genres of games is very broad and can affect the game in a different way. For example, in online multiplayer games adaptations of individual characters or their personal spaces can be implemented without much thought, but changes in the general world affect multiple players, meaning it could have a negative impact on some of them. The same goes for any competitive game. Changes that are made in competitive games should not put a certain player at an advantage or disadvantage. However, putting a computer competitor at a disadvantage might be acceptable. The Affective Gaming discussed in Sub-section 2.1.2 can be used in practically any game, because it changes the way emotions are conveyed and therefore can be applied to any conversation. The wide range of possible changes in videogames can make Adaptive Gameplay useful in any gaming genre, but it is important to carefully weigh your options.

The adaptations made by Adaptive Gameplay must ensure that they do not interfere with the goals of the game. A good example of this is the Achievement System that is implemented in many games (Medler, 2009). With these achievements people can show others what they have accomplished. If these are harder or easier to obtain because of Adaptive Gameplay this would give a feeling of unfairness. So adding Adaptive Gameplay in such games is possible, but it should not influence the way people can compare their gaming experience or achievements.

An interesting comparison that can be made is between Adaptive Gameplay and Google. Google provides personalized search results based on the user’s past behavior. While this leads to negative sounds about privacy and a thing called The Filter Bubble (if you get a personalized result, it might occur that you miss some content), Google is still by far the most-used and best-rated search engine. If Adaptive Gameplay is carefully researched and implemented, it might achieve the same success as Google.
2.1.4 – Adaptive Gameplay in Role-Playing Games

In this research the genre of Role-Playing Games (RPGs) will be used. RPGs are chosen because it is the best suitable genre for Adaptive Gameplay. An RPG is a game in which players assume the roles of characters in a fictional setting. This usually involves an adventure in which the player goes on certain quests and gets stronger and more capable along the way. It is like living a virtual adventure, where the fictional character has to overcome obstacles to reach its goal. These obstacles can come in a wide range of situations, from fighting monsters to making money to solving puzzles to cooking dinner, the virtual world tries to be as realistic as possible. Because these games can be so varied, it is a genre in which many changes are possible that could possibly increase the entertainment.

Most RPGs evolve mainly around three gameplay elements: fighting, puzzling, and socializing. The story of an RPG is often something like this: There is a problem somewhere and you have to solve it. To do this you have to go to a town and solve mysteries by talking to the people, fighting evil monsters and bosses, and solving puzzles and riddles along the way. In different games these three different types of gameplay elements occur in different quantities, one game is very intense on fighting, while others are more based on social interactions. However, the balance of gameplay elements cannot always be to the preference of the player, which is where Adaptive Gameplay can be of assistance.

As stated before, barely any research has been done on the subject of Adaptive Gameplay, but there is some literature that can be applied to the subject in order to predict its usefulness. In the next section this will be discussed.

2.1.5 – The “fit” between personality and environment.

So is there reason to believe that adapting the game towards the player’s personality will increase entertainment? While there is almost no research that addresses this directly, there is a body of research about the link between personality and the environment the person is in. The conclusions of those researches might not be aimed at virtual environments specifically, but there is no reason to assume it is not applicable to virtual environments as well.

The link between personality and the environment is called “congruence” or “fit”. The existence of this link has not always been obvious. Traditionally, when studying the causes of human behavior, psychologists focused on one of the two dominant perspectives. As Harms, Roberts and Winter (2006) describe it: “On one hand, social psychologists have emphasized the role of situational demands as a cause of behavior but have ignored the role of individual differences. On the other hand, personality researchers have focused their research on the role of traits, motives, and goals in shaping behavior and have paid little attention to the surrounding context” (pp. 851). More recently however, these two views have been used conjointly to create a better understanding of how situation and personality interact. One of the popular approaches that has risen from this new view is the person-environment fit (P-E fit).
The P-E fit is an approach first researched by organizational psychologists in order to raise worker satisfaction and productivity (Kristof, 1996) and over time has included areas like scholarly achievement (Harms et al., 2006) and stress-management, (Edwards, 1996). The P-E fit studies conclude that a proper fit between personality and environment can raise productivity and/or satisfaction. This means that when applied to a virtual environment the players should benefit from a correct fit and it should raise satisfaction, and therefore raise entertainment.

There is also one research which applies the fit to personality and gaming directly. In their research, Fang and Zhao (2010) refer to this fit as a player-technology fit, which can be seen as a specification of the player-environment fit. They define their fit as “feasible sets of equally effective alternative designs of games. Each design should be internally consistent and matched to a player’s characteristics.” (Fang & Zhao, 2010, p. 344) This means that a higher degree of adherence to an ideal profile increases the gameplay enjoyment (Fang & Xhao, 2010). They describe a test of player-technology fit with three steps: (1) Identifying distinct player characteristic, (2) Specifying ideal gaming technology for each set of player characteristics, and (3) testing player enjoyment resulting from player-technology alignment.

These three points are also parts that can be found in the framework discussed earlier. In the framework (Figure 1), the first point (1) is achieved by monitoring player performance, the second point (2) is performed by the adapt the game to individuals part of the framework, and the third point (3) is found in the measure effectiveness of adaptation part. That these two separate theories show such similarities raises the confidence in the theory.

A way for identifying distinct player characteristics (1) is researched and found in Schreurs (2009), with extraversion being the specific player characteristic in that case. Specifying ideal gaming technology for each set of player characteristics (2) is what the current research aims to figure out. So when the current research yields positive results, further research to test the player enjoyment resulting from player-technology alignment (3) can be conducted and the actual value of Adaptive Gameplay can be measured (for the researched adaptations only, of course).

Fang and Zhao (2010) administered a questionnaire research to verify their first assumptions and they concluded that “an appropriate fit between characteristics of the player and gaming technology could result in greater enjoyment” (pp. 348). Their research focused on personality and preference of gaming genres, so it might not be applicable to actual in-game changes, but nevertheless it gives a good indication that the fit between personality and environment is one that can yield positive results.

If the conclusions of the current research are positive, it will further demonstrate that P-E fit is also applicable to virtual environments. Now that it is established that it is plausible that a fit will have positive effect on entertainment, the next section will go in-depth into personality literature to find out what this fit should look like.
2.2 – Personality and games

Now that a plausible reasoning for the value of Adaptive Gameplay has been given, it is time to take a look at what kind of adaptations could improve entertainment. In order to do this, the second research question has to be answered:

RQ2: To what extent has personality and videogame behavior been researched before?

First a history and description of personality psychology is given (2.2.1) and the most recognized model, the Five Factor Model, is discussed (2.2.2). A closer look at extraversion is taken (2.2.3) and the consequences for translating personality and extraversion into a virtual environment are discussed (2.2.4).

2.2.1 – Personality Psychology

To be able to create a proper player-technology fit that increases videogame entertainment in the future, first we have to look at the possible personalities of the player. How can we make profiles of the players’ psyche? This is a field that has been thoroughly researched.

Countless studies are published each year with the goal of gaining insight into the human mind. Why do people do what they do? Why do people like what they like? Why do people feel how they feel? In trying to explain these questions psychologists tend to create models on which they map human personality. For a more extensive review of personality psychology see Schreurs (2009). As in the research done by Schreurs (2009), the current research makes use of the Trait Theory and the Five Factor Model theory in particular.

2.2.2 – Trait Theory and the Five Factor Model

One of the most well-known and widely accepted approaches to personality is the Trait Theory, in which a trait is describes as enduring patterns of thoughts, feelings, and actions (Costa & McCrae, 2008). There is a nearly unlimited number of potential traits that could be used to describe personality. The statistical technique of factor analysis, however, has demonstrated that particular clusters of traits reliably correlate together (Eysenck, 1991). One of the first researchers to describe a model with a select number of traits was Hans Eysenck. Eysenck (1991) suggested that personality is reducible to three major traits. The research by Eysenck sparked a big interest in trait theory and over the years it has been extensively researched.

After decades of research on personality models, researchers are now approaching a consensus about a general taxonomy of personality traits: the Five Factor Model (FFM) of personality dimensions. The Five Factor domains as labeled by Costa and McCrae (2008) are: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. The labels can be the cause of some confusion, because
all of these domains have been given different labels over time and for some domains there still is no consensus of what they should entail exactly. Especially the domain of Openness has been the subject of discussion. As stated before, in this research we stick to the Five Factors as Costa and McCrae defined them, because their personality instrument is the most widely recognized (Gosling, Rentfrow, & Swann, 2003).

As a result of the acceptance of the Five Factor Model as a structure of personality and its operational implementation in instruments such as the NEO-PI-R, a solid body of knowledge has been accumulated on the stability, heritability, and utility of personality traits (Costa & McCrae, 2008). The Five Factor Model is currently the most widely accepted model of personality structure (Goldberg, 1993).

Each of the five traits is further divided into six facets by Costa and McCrae (1992), but for this thesis only the traits as a whole will be viewed and the facets will not be researched. When the outcome of this research is positive, more and specified research into the facets could be performed. A description of each of the traits as found on Wikipedia (2011) can be found below:

**Openness** is a general appreciation for art, emotion, adventure, unusual ideas, imagination, curiosity, and variety of experience. The trait distinguishes imaginative people from down-to-earth, conventional people. People who are open to experience are intellectually curious, appreciative of art, and sensitive to beauty. They tend to be, compared to closed people, more creative and more aware of their feelings. They are more likely to hold unconventional beliefs.

**Conscientiousness** is a tendency to show self-discipline, act dutifully, and aim for achievement against measures or outside expectations. The trait shows a preference for planned rather than spontaneous behavior. It influences the way in which we control, regulate, and direct our impulses.

**Extraversion** is characterized by positive emotions, outgoingness, and the tendency to seek out stimulation and the company of others. The trait is marked by pronounced engagement with the external world. Extraverts enjoy being with people, and are often perceived as full of energy. They tend to be enthusiastic, action-oriented individuals who are likely to say "Yes!" or "Let's go!" to opportunities for excitement. In groups they like to talk, assert themselves, and draw attention to themselves.

**Agreeableness** is a tendency to be compassionate and cooperative rather than suspicious and antagonistic towards others. The trait reflects individual differences in general concern for social harmony. Agreeable individuals value getting along with others. They are generally considerate, friendly, generous, helpful, and willing to compromise their interests with others. Agreeable people also have an optimistic view of human nature. They believe people are basically honest, decent, and trustworthy.

**Neuroticism** is the tendency to experience negative emotions, such as anger, anxiety, or depression. It is sometimes called emotional instability. Those who score high in neuroticism are emotionally reactive and vulnerable to stress. They are more likely to interpret ordinary situations as threatening, and minor frustrations as hopelessly difficult. Their negative emotional reactions tend to persist for unusually long
periods of time, which means they are often in a bad mood. These problems in emotional regulation can diminish the ability of a person scoring high on neuroticism to think clearly, make decisions, and cope effectively with stress.

Is it possible to predict gaming preferences with these descriptions? The description of extraversion gives an idea about the general behavior of extraverts and this might translate into gaming preferences. They are said to be “action-oriented individuals”, which means they should like fighting and shooting and other kinds of action. They like to talk and seek out the company of others, so social situations should be preferable. For the other traits the same-sort of predictions can be made, but the current research focuses mainly on extraversion and will only try to predict in-game preferences for that trait.

To gain an even more comprehensive view of what extraversion entails its history will be quickly reviewed and even though the facets of extraversion will not be measured in this research, they can still provide some insight into the behavior of extraverts.

### 2.2.3 – Extraversion and behavior

The terms introversion and extraversion were first described by Jung (1923), who used it to describe the inward or outward focus of libido. This means that introverts turn their energy, attention, and orientation towards themselves, while extraverts turn them towards their environment. This definition is still at the basis of extraversion today. Costa and McCrae (2008) state that people high on extraversion are sociable people, that enjoy the company of others, and like cozy situations. They further define extraversion as having six facets. The facets give a good impression of what an extravert generally is like. Scoring high on any of the facets is a marker of extraversion, even though someone high on extraversion does not necessarily have to be high on every facet.

**Warmth:** Warm people find it important to build an emotional bond with others, by showing warmth and affection. Warm people are friendly and show that they genuinely like others.

**Gregariousness:** Gregarious people prefer being in the company of other people. They look up others and like the crowd and activity of groups of people.

**Assertiveness:** Assertive people are dominant, assured, and controlling. They talk without hesitation and often take or get the lead in groups.

**Energy:** Energetic people have a high pace and powerful movement: they have the need to be busy and radiate a feeling of energy. They have a busy, filled, and hasty life.

**Excitement-seeking:** Excitement-seekers have a feel for adventure, stimulation, and action. They like bright colors, noisy environments, and exciting sensations.
**Positive emotion:** People with positive emotion have fun and usually feel happy and joyful. They laugh easily and often and they are cheerful and optimistic.

Especially the Excitement-seeking and Energy facets are interesting for Adaptive Gameplay in this research. Excitement-seeking shows that extraverts like adventurous and extravagant situations and Energy shows that extraverts should be in situations that are fast-paced and intensive. Based on the description of Gregariousness and Assertiveness it can be assumed that extraverts prefer social situations and being in groups more than introverts. The other two facets focus mainly on how the players could interact with others (NPCs) and are more important for the Affective Gaming adaptations mentioned earlier in this research.

The descriptions and definitions given above provide a good impression of the behavior of extraverts and introverts. They are based on long years of research and are known to be accurate predictors of behavior. With this consensus about the Five Factor Model and widely recognized tests like the NEO, researchers had the tools to perform more research into the link between personality and behavior. These lines of research resulted in a large amount of literature about the link between personality and many different kinds of behavior.

Not much of the research done on the connection between extraversion and behavior so far has a direct link to gaming. Even though theoretically any real-life behavior could be implemented in a virtual environment, only some of it will be featured regularly in most videogames. For example, there is research that concludes that extraverts are heavier drinkers than introverts (Martsh & Miller, 1997) and that extraverts drive more dangerously and cause more fatal accidents (LaJunen, 2001). These are not common gameplay elements in most games however, so they are not very useful for predicting gaming preferences.

In order to make better predictions, research that relates to activities that can also be found in gaming environments is needed. Nias (1985) produces an interesting result as he shows that extraversion is associated with watching adventure and crime films. As movies and games are, up to a certain point, comparable media, it could mean extraverts also prefer adventure and crime in games. This is also in accordance with the excitement-seeking facet.

Kirkcaldy and Furnham (1991) researched the link between personality traits (extraversion, neuroticism, and psychoticism) and recreational choice. They conclude that extraversion is clearly related to preferences in sports, wherein extraverts preferred more active (exercisers) versus passive activities (non-exercisers), high versus low group oriented, and competitive versus non-competitive sports. This means that extraverts prefer competitive sports like boxing, karate, or wrestling and introverts prefer board games like backgammon, playing cards, and puzzles. These are helpful results because games can be viewed as recreational choice as well and the mentioned sports or activities can be found in one way or the other in videogames as well.
This is further discussed in Furnham (2004), where he concludes that sensation seeking (which can be viewed as a part of extraversion) is related to choice of leisure activities and that this is not limited to dangerous sports only.

To sum up the researched behavior of extraverts: they like competitive and physically active activities. They prefer stimulating social situations including those which involve assertiveness, intimacy, and competition (Kirkcaldy, 1991). Introverts prefer keeping to themselves, avoid busy social situations, and prefer non-physical and easy-going sports which also involve thought besides action.

2.2.4 – Personality and games

As described in the previous section, there is almost no salient research about personality and games. The reason why there is almost no research into personality and games is not clear, but it might have something to do with the fact that games take place in a virtual world. Players take on a virtual role and can do anything in this virtual world without having the consequences they have to face in the real world. Therefore many people think that the personality someone shows in a game differs from their actual personality. While this could be the case, there is no proof for this. In this research it is assumed that the real-life personality of players is the same as their in-game personality. However, even if this is not the case, it is very interesting to research how the link between real-life and in-game personality functions. This link has only been properly researched in one area, which is with violence in videogames.

When the videogame Mortal Kombat was released in 1993, a massive debate erupted over videogame violence. Since then, most psychological research on videogames has focused only on negative aspects of this relatively new form of entertainment (Griebel, 2006). The reason why only the link between videogames and violence was researched is the assumption of people about the influence these games would have on real-life behavior. People were afraid that children who played violent games would grow up to become more violent themselves. A general conclusion about this has never been reached and debates are still heated about whether violent games should become illegal. Many countries already ban or censor extremely violent videogames, but governments that do ban videogames are criticized for it (Wikipedia, 2011). However, these discussions and selective research subjects do not directly help with getting a better view on personality and games.

There is one important result for this research that that can be obtained from the link between games and violence. Research has shown that there is a link between the trait of aggression and a preference to play violent games and that violent games may increase players' tendencies toward aggression (Przybylski, Ryan, & Rigby, 2009). In this research it is assumed that the Five Factor personality traits carry over into the virtual world and the fact that the trait of aggressions carries over into virtual worlds strengthens that assumption.
3. Experimental setup

This chapter provides an experimental setup for researching the link between personality and gaming entertainment. However, before the experimental setup can be constructed, a closer look is taken at how the link between personality and gaming entertainment is expected to manifest, based on the review of personality in gaming in Chapter 2 (3.1).

An experiment was created in which we tried to correlate the psychological profile of participants, as measured by the NEO-FFI, to their experienced entertainment of gameplay elements in a video game, in order to research if certain gameplay elements were more entertaining to certain specific profiles.

For the experiment participants were selected through the participant pool of Tilburg University (3.2). The experiment was conducted in a computer lab at the Tilburg University. Upon entering the lab, the participants were seated at a desk with a computer on it. They were handed a 10-page booklet with the instructions, an Informed Consent form, and the questionnaires. Version A of the booklet can be found in Appendix A. The booklet is written in Dutch, since all participants had Dutch as their native language. After the participant read the instructions and filled out the Informed Consent form, the videogame was started. The video game that was used was a virtual environment created specifically for this research (3.3). The experienced entertainment was measured with two different instruments (3.4). After each gameplay area the participant had to fill out a picture-oriented questionnaire (3.4.1) and after the videogame was finished they had to grade and rank each gameplay area (3.4.2).

After the videogame, two more questionnaires had to be filled out. A short questionnaire measuring control variables was presented first (3.5), which was followed by the final part of the experiment, the NEO-FFI personality test (3.6). Finally, the results of the experiment were analyzed using a statistics software (3.7).

3.1 – How to test the link between personality and game entertainment

When we combine the behavior of extraverts in real-life (as discussed in Chapter 2) with the assumption that a person’s personality is the same in-game as it is in real-life, it is possible to make predictions about the link between personality and experienced videogame entertainment. In this section, videogame situations and real-life situations are compared to make some actual predictions which can be tested with an experiment. To test these predictions, a virtual environment will be created which contains those situations so they can actually be researched.

As discussed before, a genre to which Adaptive Gameplay is highly compatible are Role-Playing Games. The three types of gameplay elements in RPGs (fighting, puzzling, and socializing) can be viewed in light of the reviewed extravert behavior. Fighting is an active, psychical, adventurous activity, which are typically extravert preferences. So, if a fighting environment would be created, this should appeal more to extraverts than it does to introverts. Puzzling, on the other hand, can be viewed as the opposite of
fighting. It usually involves thinking and introspection without having many outside stimuli, which are generally situations that introverts prefer. Social interactions are harder to describe in terms of extraversion, because they can range from an intimate conversation with a good friend to a discussion in a bar with 20 unknown people. An extravert likes external input and putting energy into conversations, where an introvert can enjoy deep and intellectual conversations with friends.

Because of the explorative nature of this research, no specific hypotheses will be created. The goal simply is to show that the link between personality and experienced game entertainment exists. The hypothesis in this research, which will be tried to be rejected, is: (H1) *There is no link between personality and experienced game entertainment.* In order to test this hypothesis, the three gameplay elements as described in this section will be implemented in a virtual world. As the fighting area has a similarity to activities that would be enjoyed by extraverts, and the puzzle area has similarities to activities that are enjoyed by introverts, these are good situations to test if a link between personality and experienced game entertainment is existent or not.

As stated before, this research is follow-up research onto the work of Schreurs (2009) and therefore extraversion is taken as the trait on which the experiment is based. However, the other four traits are taken in consideration too. To test the hypothesis, an experiment had to be created, which is reflected in research question 3:

RQ3: *Which experimental setup is suitable for testing the link between personality and experienced videogame entertainment?*

To test the hypothesis, a virtual environment has to be created in which a participant gets to play the three different kinds of gameplay elements and then gives entertainment scores for each of them. After that, their personality has to be determined by administering a personality test. Because there are no available virtual games with the gameplay elements in the form and quantity as desired by this research or with the possibility of measuring some of the behavior, a virtual environment was created specifically for this research.

In order to control for an order effect, six different versions of the experiment were created. Each version of the experiment featured a different order of the three gameplay elements. The experimental setup of this experiment is described next in this chapter.

3.2 – Participants

Students were asked to participate in this experiment through the participant pool of Tilburg University (School of Humanities). A total of 54 students signed up for this experiment. A total of 48 participants participated. Four students did not show up, and two were left out of the analysis. One participant was left out because she did not understand the game and needed help during the game. The other participant was left out because she did not finish the game. 32 of the participants were female, and 16
were male. The age ranged from 18 to 24 years, with a mean age of 20.67 years (median = 21). Eight participants were used for every version of the game.

3.3 – Creating the virtual world

The first question that had to be answered is how the virtual world was going to be created. The choice for creating the game fell on the game Neverwinter Nights. The main reason for using this videogame is that it has an easy toolset, namely the Aurora toolset (BioWare Corp, 2006). This toolset can be used for the creation and adaption of videogame modules that run within the videogame Neverwinter Nights and has been used in the previous research (Schreurs, 2009) as well. Neverwinter Nights is a popular RPG which includes all three gameplay elements needed for creating the test environment.

A test-area will be created to have the player get used to the controls, but this is purely for training purposes and will not be scored or monitored. To test the participants a game will be created with three different areas that the player must play through: a fighting area, a puzzle area, and a social interaction area.

The three different gameplay elements should all be representative and general for their sort. To compare the scores on the three elements, each part must focus solely on the gameplay element and keep all peripheral input identical. This means that all settings, lighting, music, and any other input that does not directly affects the gameplay elements should be kept the same in all three areas. The three areas should also take roughly the same time to complete, so that time will not influence the entertainment.

3.3.1 – The storyline

Even though there are four different areas in the game, a story to have them intertwined is still provided. This has to make sure that the experiment reflects a gaming experience as much as possible. Because the experiment is supposed to measure gaming experience, the player has to have the feeling that he or she is really playing a game.

To eliminate the possibility of an order effect, counter-balancing will be applied to the three main areas. This means that there will be six different versions of the experimental setup. This also means that making a story connecting the different areas is not easy, because the story needs to be able to be told in six different orders.

As a solution to this, a story was made up in which the player is an adventurer that is almost member of a guild but has to complete an exam to become a full-fledged member. This exam consists of the three different parts which correspond to the gameplay elements: fighting, puzzling, and social interactions. This way the order in which the areas are presented does not influence the story.
3.3.2 – Creating the fighting area

Fighting in videogames can come in all different shapes and sizes. In the most common form of fighting the player usually has to fight monsters that get stronger as the game progresses. Because this area only involves a fighting sequence, it will consist of a series of enemies that increase in power. It is created in such a way that most people will easily kill the first four enemy spawns and will definitely die on the fifth. After they die they will be revived by a Non-Playable Character (NPC) who tells them that no one could have beaten the last monster. This is done in order to give every player the same feeling of accomplishment, so that their judgments are not based on whether they succeed or not. To give the player the feeling they are really fighting as an adventurer, the character is equipped with a big armor and big sword. This should increase the feeling of immersion of the fight setting.
3.3.3 – Creating the puzzle area

The hard thing about creating a puzzle in a game is deciding on the difficulty of the puzzle. When a player cannot figure out the solution to a puzzle and gets stuck, they will get frustrated and that will drastically decrease the experienced entertainment. The puzzle selected for this experiment had to be a puzzle that was not too hard to solve, but not too easy either. If the puzzle is too easy, then even people who like puzzles might give a low entertainment score because it was too easy to solve. A puzzle was created in which the player had to pull levers that were connected to light beams. Only if the correct levers are switched on will all the lights be turned on, which is required to solve the puzzle. The puzzle also had a failsafe so that people would not get stuck on the puzzle. The failsafe makes the puzzle solve itself after a set timer, so that the player cannot go on indefinitely.

3.3.4 – Creating the social interaction area

For the implementation of a social interaction as a gameplay element, first a look was taken at how it is actually implemented in many current games. Most RPGs contain random chatter with many NPCs, usually as backup stories or simply to make the world more realistic. However, often the player can also receive quests or assignments from an NPC. These quests or assignments can consist of a wide range of objectives and often involve fighting and puzzling. However, sometimes it can simply be to talk with other NPCs in order to acquire information or make a decision. The social interaction constructed for this experiment features a town-leader who cannot decide a winner in a sculpting contest. The player has to help him make the decision and has to go and talk to the three contestants and look at their statues. Each of the three contestants has his own story to tell. One is a poor homeless person who has no money to feed his family and winning the prize would help him greatly. Another is a rich baron who does not need the money and offers to bribe the player with the prize money. The third is a bully who tries to threaten the player into choosing him. This way the player has to decide a social dilemma and has to talk to several people to come up with an answer. It does not matter who the player chooses, the fact that they had to solve a social problem by making a decision by talking to people is what is important.

3.4 – Measuring entertainment

Measuring the entertainment experienced by a form of media might seem easy. People usually have clear opinions about things they experience and they can easily tell you what their favorite movie, music, or videogame is. However, when asked to point out what it is that exactly appeals to them about the experience, most people have problems with it. The reason for this is that entertainment is partially an unconscious process (Schell, 2005). Schell (2005) explains why this is a problem: “Much of what is happening to us when we are being entertained is not noticed by the conscious mind, because of the very fact that we are so caught up in the entertainment experience. Ironically, the act of trying to focus on exactly what causes us to be entertained by a particular experience effectively “takes us out” of the experience, and it ceases to be entertaining” (pp. 2-3). Because of the difficulty of observing our internal
entertainment processes, many people claim entertainment cannot be effectively analyzed (Schell, 2005). Considering the fact that there are no standard measurement instruments for entertainment experienced by some kind of media, this statement seems quite plausible.

The fact that there are no standardized measurement instruments for entertainment makes it hard to compare gaming experiences to one another. As Ijsselsteijn et al. (2008) point out: “One of the main challenges facing the gaming research community is a lack of a coherent and fine-grained set of methods and tools that enable the measurement of entertainment experiences in a sensitive, reliable and valid manner” (pp. 88). Ijsselsteijn et al. (2008) are currently carrying out a project with the goal of “creating a explicitly multi-method, multimeasure approach whereby they anchor and cross-validate various measures (e.g., self-report, psychophysiological, behavioral, neural) via their simultaneous application to a certain standardized set of games, and correlating the results thus obtained” (pp. 88). However, even if this instrument would be available already, it is a much too complicated and extensive instrument that is not suited for use in an experimental setup as used in this research.

For this kind of quantitative research a measurement is needed that can be quickly administered after each separate gameplay area. In this research two different measurement instruments are used. First, the Self-Assessment Manikin (SAM) is used to gauge the player’s emotional response to entertainment. The SAM was chosen because it is a short but validated questionnaire that gives a quick review of how the player was feeling emotionally (on the valence, arousal, and dominance levels) as a response to the gameplay area. The second measurement is a self-report score by means of a grade given for each of the three areas, as well as a ranking order for them. These were chosen because it is assumed that self-reported entertainment scores are still representative for experienced entertainment, even though people find it hard to explain why they prefer a certain situation. Both measurement instruments are explained in the next sections.

3.4.1 - Using the Self-Assessment Manikin

To measure players’ emotional responses a picture-oriented instrument called the Self-Assessment Manikin (SAM) was used (Lang, 1980). SAM has been used to effectively measure emotional responses in a variety of situations, including reactions to videos (which can be compared to videogames), and can be seen as an easy, nonverbal method for quickly assessing people’s reports of emotional responses (Bradley & Lang, 1994). The SAM directly assesses the valence, arousal, and dominance associated with the response to an object or event. Valence can be interpreted as the pleasure the participant feels at the moment, where arousal measures the excitement the participant feels. The dominance dimension of the SAM is used for indexing the interactive relationship that exists between the perceiver and the perceived situation, with high dominance associated with the one having maximum control over the situation, and low dominance associated with the one having minimum control over the situation. In the present experiment a paper-and-pencil version of SAM is used.

This version of the SAM is illustrating its nonverbal, graphic depiction of various figures along each of the three major affective dimensions, which are: valence, arousal, and dominance. SAM ranges from a
smiling, happy figure to a frowning, unhappy figure when representing the valence dimension, and ranges from an excited, wide-eyed figure to relaxed, sleepy figure for the arousal dimension. The dominance dimension represents changes in control with changes in the size of SAM: a large figure indicates maximum control in the situation.

**Valence**

**Arousal**

**Dominance**

Figure 3. The three pictures used in the Self-Assessment Manikin (SAM). The version as used in the experiment can be found in Appendix A.

The pictures can be found in Figure 3. In this version of SAM, the participant can place an ‘x’ over any of the five figures in each scale, or between any two figures, which results in a 9-point rating scale for each dimension.

### 3.4.2 – Using self-reported scores and rankings

Although the SAM is a well-recognized and tested instrument and it should give a good impression of the participants’ emotional reaction to the gameplay elements, it is based on their emotional response. As discussed earlier in this section, entertainment is a tricky thing to measure, so it is not certain that the self-reported emotional responses are only caused by the experienced entertainment. As an extra measure complementary to the emotional responses, a judgment score for each gameplay element has to be given in the form of a grade (a grade from 1-10, standard scoring grades in the Netherlands) and
the participants had to rank the three areas from least entertaining to most entertaining. It is assumed that the grades and the ranks of the areas are a good reflection of the entertainment experienced by the player. However, until more research into the measuring of entertainment is performed and standardized tests for it are created, measuring entertainment will be an uncertain endeavor.

Between the SAM and the grades and ranks, it is expected that a good representation of the player’s experienced entertainment is acquired.

3.5 – Control variables

Ideally personality would be the main predictor for the experienced entertainment in each area. However, it is most likely that the variance of the experienced entertainment is explained by more than just personality. There are some variables of which is expected that they influence the variance as well. Some of these are easily measurable by including a short questionnaire in the experiment, which is exactly what was done.

The control variables that are asked of the participants are gender, age, highest finished education, experience with handling computers, experience with playing videogames, and the difficulty of the controls of the game. These are all asked in a short questionnaire following the videogame. The questionnaire can be found in Appendix A, as part of the information booklet provided to the participants.

Gender, age, and highest finished education are absolute and objective attributes so they can be learned by asking the appropriate question. Experience with handling computers, experience with playing videogames, and the difficulty of the controls of the game are harder to give exact values. For these variables a question was asked with 5 choices from very low to very high (or easy and hard in case of the controls).

Several measures were also made by the videogame itself. With the help of log-files it is possible to measure certain behavior of the participants. In this way the total time spent on the videogame was measured. In the fighting area the number of monsters killed was saved, in the social area the choice for winner of the contest was saved, and in the puzzle area the time spent actually puzzling and the fact if the player solved the puzzle with help of the failsafe or not were saved.

3.6 – Measuring Personality with the NEO-FFI

To measure the participant’s personality the NEO-five factor inventory (NEO-FFI) is used. As mentioned earlier in this thesis the NEO is the most widely recognized personality instrument (Gosling et al., 2003). It has an excellent reputation as a well substantiated, broad, and complete Five Factor questionnaire. The NEO-questionnaires are available in more than 25 languages and is one of the most researched instruments in the world (Hoekstra, Ormel, & De Fruyt, 2007). This is in part thanks to the rising
popularity of the Five Factor Model in general, but also surely to the psychometrical qualities of the NEO and the results of many validity studies (Hoekstra et al., 2007).

The NEO-FFI (Costa & McCrae, 1992; Dutch version Hoekstra et al., 2007) is a 60-item self-report inventory, which is used to measure the model of the participant’s personality. It is a shortened version of the NEO-PI-R (Costa & McCrae, 1992). The NEO-PI-R measures the five traits of personality but also measures six facets of each of those personality traits. The NEO-FFI was chosen over the NEO-PI-R because there was no need to get into the facets for this research and it is much quicker to administer (60 versus 240 items).

Items are scored using a 5-point Likert-scale, ranging from 1 (totally disagree) to 5 (totally agree). The NEO-FFI raw scale scores are transformed into scale scores (with a mean of 5 and a standard deviation of 2) using the norms for the Dutch FFI for people younger than 25 (the participants were all university students below the age of 25). This results in a norm score of 1–9 for every of the five personality traits.

3.7 – Analysis

To analyze the results of personality on entertainment, linear regressions and bivariate correlations were performed using SPSS 19.0. The first step in doing this was entering all the data from the questionnaires and the log-files into SPSS. The scores on the NEO-FFI had to be computed into norm scores. Because some of the items were negatively keyed, those had to be recoded first. After that the raw scores were calculated and the norm scores were then computed according to the guidelines of Hoekstra et al. (2007).

New variables had to be computed for checking the influence of the order-effect. This resulted in three newly computed variables based on the versions of the experiment.

New variables were also computed by subtracting the scores between two different gameplay elements (fight minus puzzle, fight minus social, and puzzle minus social) for the grade scores and the arousal and valance scores of the SAM. This resulted in nine new variables with which it is possible to measure if there is a link between personality and the score-difference on the mentioned measurements.

To check if the entertainment measurements were consistent, the entertainment scores were correlated with each other for each of the gameplay elements.

In order to control for an order effect, the variables for the order of the gameplay elements were correlated to all of the entertainment-scores.

Many different analyses had to be performed to gain information about the link between personality and entertainment. Each of the five traits were correlated with all of the SAM scores (nine variables),
the grades and rankings (six variables), and the score-differences (nine variables). These variables were also all correlated to the control variables, in order to check their influence on the variance.

For every analysis a two-tailed significance was used, because there was no certainty about the way the effects would manifest.
4 – Results

This chapter provides the results of the statistical analysis. First we will look at descriptive statistics of the measured personalities and the acquired scores to get an impression of the average scores (4.1). After that the measurements for entertainment that were used are compared to each other, in order to see if they do in fact measure the same thing or not (4.2). To find out if an order effect was of influence in the experiment, the different orders are correlated with the measurement scores (4.3). Personality and the measurement-scores are correlated and the hypothesis is discussed (4.4). The control variables are used to gather more information about what influences the participants and how this can affect their entertainment (4.5). Finally, a short summary of the results is given (4.6).

4.1 – Descriptive statistics

The mean scores and the standard deviations on the NEO personality traits (Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism) are presented in Table 1. Histograms of the frequency tables for each trait can be found in Appendix B. All of these histograms seem to follow a bell-curve, meaning it is most likely that they represent a normal distribution.

<table>
<thead>
<tr>
<th>Personality Trait</th>
<th>N</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
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<td>4.92</td>
<td>1.74</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>48</td>
<td>4.69</td>
<td>1.55</td>
</tr>
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<td>Extraversion</td>
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<td>Agreeableness</td>
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<td>5.69</td>
<td>1.64</td>
</tr>
<tr>
<td>Neuroticism</td>
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<td>4.40</td>
<td>1.54</td>
</tr>
</tbody>
</table>

The traits are all quite close to 5 (which should be the average score for Dutch people below the age of 25), which means that the participants seem to be a good representation of the population. No remarkable results are found here, which is expected from a well-known and tested instrument as the NEO-FFI.

The mean scores and the standard deviations on the entertainment scores (the SAM-scores and the grade and rank scores) on all of the three areas can be found in Table 2. They are also visually represented in Figure 4 (except for the rank scores). The histograms for the SAM-scores and the grade-scores can be found in Appendix C. As with the trait-scores, the histograms mostly seem to follow a bell-curve, strengthening the assumption that the participant pool was normally distributed.

It is interesting to see that for the grade, valance, and dominance the Social area scores highest and the Fight area scores lowest, while for the arousal this is the opposite. The fact that the Social area scores
highest means that the participants found that area most entertaining. However, this does not matter much for the results of this research, since they are based on the differences between the scores and the changes caused by personality.

Table 2
*Descriptive statistics on the entertainment scores*

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Mean</th>
<th>Measurement</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fight valance</td>
<td>6.23 (1.10)</td>
<td>Puzzle grade</td>
<td>6.33 (1.98)</td>
</tr>
<tr>
<td>Fight arousal</td>
<td>4.67 (1.78)</td>
<td>Puzzle rank</td>
<td>1.92 (0.85)</td>
</tr>
<tr>
<td>Fight dominance</td>
<td>5.29 (1.67)</td>
<td>Social valance</td>
<td>6.83 (1.14)</td>
</tr>
<tr>
<td>Fight grade</td>
<td>5.92 (1.60)</td>
<td>Social arousal</td>
<td>3.92 (1.71)</td>
</tr>
<tr>
<td>Fight rank</td>
<td>2.23 (0.81)</td>
<td>Social dominance</td>
<td>6.40 (1.55)</td>
</tr>
<tr>
<td>Puzzle valance</td>
<td>6.42 (1.46)</td>
<td>Social grade</td>
<td>6.88 (1.47)</td>
</tr>
<tr>
<td>Puzzle arousal</td>
<td>4.08 (1.90)</td>
<td>Social rank</td>
<td>1.85 (0.77)</td>
</tr>
<tr>
<td>Puzzle dominance</td>
<td>5.50 (1.61)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* The standard deviation is shown in brackets.

![Figure 4](image_url)

*Figure 4.* Graph of the mean scores of the SAM-measurements and the grade scores. The whiskers show one standard deviation above and below the mean.

That the arousal is lower than the other measurements is remarkable, because it means that the experiment might have been somewhat boring. The arousal levels are quite low, so it should be possible in future research to increase the external input in order to raise arousal. How a raised arousal influences entertainment cannot be said with certainty, but in the next section some links between arousal and other measures can be found.
4.2 – Internal consistencies of the measurements

As discussed in Chapter 2, measuring entertainment is not easy and no widely accepted instruments exist for it yet. To check if the two instruments used in this research (the SAM and a questionnaire) measure the same thing (which in this research is assumed to be entertainment, although future research might measure entertainment in a different way), the scores on the same gameplay elements were correlated to each other.

The ranking variable is not included in these analyses, because it is a categorical variable that is influenced by all three of the gameplay elements. When you give a rank to a gameplay area, that rank is based on the experience of all three the gameplay areas. When looking for internal consistencies, the compared variables should be measuring the same thing, in this case a form of entertainment. Because the ranking is not simply a measure of how entertaining the single gameplay area was, it is not comparable to the other measurements. Furthermore, a single ranking score does not provide all the information that we want to know about it. For example, if a participant put the fighting area at rank 2, we do not know if they liked the puzzle area or the social area better, which is important information. Because of the influence of the other gameplay areas and the lacking information-level of the variable, the rank is not suitable for testing the internal consistencies.

Because the three scores on the SAM itself are supposed to measure three different emotional responses, these three are not meant to be internally consistent. However, mutual correlations on these three scores can be interesting because it gives us an idea of how the emotional responses affect each other.

The correlations between the grade and scores of the SAM are the most important, because it shows how the grade can be linked to the three kinds of emotional responses. The correlations between the measurements can be found in Table 3, Table 4, and Table 5.

Table 3
Correlations between the SAM-scores and the grade scores on the fighting gameplay area.

<table>
<thead>
<tr>
<th></th>
<th>Fight valance</th>
<th>Fight arousal</th>
<th>Fight dominance</th>
<th>Fight grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fight valance</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fight arousal</td>
<td>.367 (.010)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fight dominance</td>
<td>.320 (.027)</td>
<td>.097 (.513)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Fight grade</td>
<td>.194 (.187)</td>
<td>.402 (.005)</td>
<td>.215 (.143)</td>
<td>1</td>
</tr>
</tbody>
</table>

Note. Significant results ($p < .05$) are bold.

It is interesting to see that the grade given for the fighting area does not correlate with valence (.194, $p = .187$) or dominance (.215, $p = .143$) but only with arousal (.402, $p < .01$). It means that the valance or dominance have no effect on the grade participants give to the fighting area, but that the feeling of
arousal does. One could interpret this as a recommendation for game designers that they should focus on raising the arousal people experience in fighting situations in order to raise the appreciation for the fighting area.

The emotional valance score in fighting has significant positive correlations with the arousal (.367, p = .01) and dominance (.320, p < .05) scores. This means that when a participant has a high score on valance, they have a high score on arousal and dominance as well. This means that when people feel more in control they will have a more positive feeling about the fighting area. The same goes for arousal, when people feel more aroused, they will feel more positive in the fighting area.

However, between the dominance and arousal scores no correlation was found (.097, p = .51). So while dominance and arousal both have an influence on the valance, they do not influence each other.

Table 4
Correlations between the SAM-scores and the grade scores on the puzzle gameplay area.

<table>
<thead>
<tr>
<th></th>
<th>Puzzle valance</th>
<th>Puzzle arousal</th>
<th>Puzzle dominance</th>
<th>Puzzle grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puzzle valance</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Puzzle arousal</td>
<td>.518 (.000)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Puzzle dominance</td>
<td>.354 (.014)</td>
<td>.146 (.322)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Puzzle grade</td>
<td>.529 (.000)</td>
<td>.396 (.005)</td>
<td>.429 (.002)</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note. Significant results (p < .05) are bold.*

The grade for the puzzle area correlates positively with all three SAM-scores. In this case valance (.529, p < .001), arousal (.396, p < .01), and dominance (.429, p < .005) all have an effect on the grade the participants gave to the puzzle area. This means that all three of these emotional feelings have an influence on how the player feels about the puzzle. Where in the fighting area it did not matter if the player felt positive emotion or in control, in the puzzling area a higher feeling of positive emotion or control does increase the grade.

The SAM-scores in the puzzle area correlate in the same way as in the fighting area. The valance positively correlates with arousal (.518, p < .001) and dominance (.354, p < .05). So again, the experienced arousal and control over the situation are of influence on the positivity of the experienced emotion. Again, dominance and arousal do not correlate (.146, p = .322).
Table 5
Correlations between the SAM-scores and the grade scores on the social gameplay area.

<table>
<thead>
<tr>
<th></th>
<th>Social valance</th>
<th>Social arousal</th>
<th>Social dominance</th>
<th>Social grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social valance</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social arousal</td>
<td>.387 (.007)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social dominance</td>
<td>- .058 (.694)</td>
<td>- .147 (.318)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Social grade</td>
<td>.242 (.097)</td>
<td>.326 (.024)</td>
<td>-.015 (.919)</td>
<td>1</td>
</tr>
</tbody>
</table>

Note. Significant results (p < .05) are bold.

As with the fighting area, the grade in the social area is only influenced by arousal (.326, p < .05) and not by valance (.242, p = .097) or dominance (- .015, p = .919). Again, this is interesting because the grade for the social area is only affected by how aroused the player felt and not by how much pleasure or in control they felt. This can be interpreted as a recommendation for any game designer that when creating a social situation the experienced arousal is an important factor.

The SAM scores for the social situation only correlate on valance and arousal (.387, p < .01) and not on valance and dominance (- .058, p = .694) and arousal and dominance (- .147, p = .318). So the positive emotion is only influenced by the experienced arousal.

4.3 – Finding an order-effect

To check for an order effect with the different types of gameplay elements, the experiment was divided into six different versions. To test if these orders had any correlations with the scores the participants gave on the entertainment, three new variables were created that represented the order in which the gameplay elements were experienced. In the variable for fighting, the fighting was done either first (1), second (2), or third (3) and the same goes for the social and puzzle variables.

These new variables are correlated to check if the order has any influence on the scores. These correlations can be found in Table 6. Only the correlations with the matching gameplay element are shown, because the order of a gameplay variable on another than its own order variable cannot be determined and therefore nothing can be said about the effect these correlations have.

Two significant results can be seen in Table 6. Both the Fight dominance (.351, p < .05) and the Fight grade (.323, p < .05) have a positive correlation with the Fight order. This means that when the participants got to play the fighting area later in the experiment, they felt more dominant and gave the fighting area a higher grade. However, this can be explained by the fact that the fighting area requires a higher level of control than the other two areas, meaning that it is possible that people who faced it early were too inexperienced to handle it, feeling less dominant and therefore giving a lower grade. To control for this effect, a longer experiment could be performed. Another option is to expand the fighting done in the training area, so that inexperience cannot be the reason for the low dominance anymore.
Table 6
Correlations between the measurements and the gameplay orders.

<table>
<thead>
<tr>
<th>Fight order</th>
<th>Puzzle order</th>
<th>Social order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fight valance</td>
<td>.071 (.634)</td>
<td></td>
</tr>
<tr>
<td>Fight arousal</td>
<td>.261 (.073)</td>
<td></td>
</tr>
<tr>
<td>Fight dominance</td>
<td>.351 (.014)</td>
<td></td>
</tr>
<tr>
<td>Fight grade</td>
<td>.323 (.025)</td>
<td></td>
</tr>
<tr>
<td>Fight rank</td>
<td>-.224 (.126)</td>
<td></td>
</tr>
<tr>
<td>Puzzle valance</td>
<td></td>
<td>.124 (.401)</td>
</tr>
<tr>
<td>Puzzle arousal</td>
<td>-.068 (.647)</td>
<td></td>
</tr>
<tr>
<td>Puzzle dominance</td>
<td>.064 (.666)</td>
<td></td>
</tr>
<tr>
<td>Puzzle grade</td>
<td>-.013 (.930)</td>
<td></td>
</tr>
<tr>
<td>Puzzle rank</td>
<td>-.030 (.837)</td>
<td>-.250 (.087)</td>
</tr>
<tr>
<td>Social valance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social arousal</td>
<td></td>
<td>.151 (.307)</td>
</tr>
<tr>
<td>Social dominance</td>
<td>-.249 (.088)</td>
<td></td>
</tr>
<tr>
<td>Social grade</td>
<td>.018 (.906)</td>
<td></td>
</tr>
<tr>
<td>Social rank</td>
<td></td>
<td>-.167 (.256)</td>
</tr>
</tbody>
</table>

Note. Significant results (p < .05) are bold.

That the experienced entertainment can be influenced by the order of gameplay elements means that it is important for game designers to find a good balance between different gameplay elements and how to vary them. How the balance and order of these elements should present itself in an actual videogame is therefore an interesting topic for future research.

4.4 – Personality and entertainment scores

To test the hypothesis formed in Chapter 3, the link between personality and the entertainment scores has to be examined. This is done by looking at the correlation between the personality traits and the entertainment scores. The entire correlation matrix can be found in Table 7.

4.4.1 – Extraversion and entertainment

Because this research is tailored mainly towards extraversion, a look at the extraversion column is taken first. There are no significant correlations between extraversion and any of the entertainment measurements. This means that the hypothesis, (H1) There is no link between personality and experienced game entertainment, cannot be rejected yet. Neither the valance, arousal, dominance, grade, or rank score on the fighting area correlated with extraversion.
Table 7
The correlation matrix between the NEO personality scores and the results of the entertainment measurement instruments.

<table>
<thead>
<tr>
<th></th>
<th>Normscore</th>
<th>Normscore</th>
<th>Normscore</th>
<th>Normscore</th>
<th>Normscore</th>
<th>Normscore</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Openness</td>
<td>Conscientiousness</td>
<td>Extraversion</td>
<td>Agreeableness</td>
<td>Neuroticism</td>
<td></td>
</tr>
<tr>
<td>Fight valance</td>
<td>.133 (.367)</td>
<td>.056 (.707)</td>
<td>- .042 (.777)</td>
<td>.076 (.607)</td>
<td>-.105 (.476)</td>
<td></td>
</tr>
<tr>
<td>Fight arousal</td>
<td>-.002 (.988)</td>
<td>-.193 (.188)</td>
<td>-.245 (.093)</td>
<td>-.212 (.149)</td>
<td>.026 (.861)</td>
<td></td>
</tr>
<tr>
<td>Fight dominance</td>
<td>-.042 (.775)</td>
<td>-.144 (.330)</td>
<td>.157 (.286)</td>
<td>.087 (.554)</td>
<td>-.127 (.389)</td>
<td></td>
</tr>
<tr>
<td>Fight grade</td>
<td>.105 (.478)</td>
<td>-.226 (.122)</td>
<td>-.026 (.859)</td>
<td>-.262 (.072)</td>
<td>.187 (.203)</td>
<td></td>
</tr>
<tr>
<td>Fight rank</td>
<td>-.138 (.349)</td>
<td>.178 (.225)</td>
<td>-.096 (.515)</td>
<td>.249 (.088)</td>
<td>-.058 (.698)</td>
<td></td>
</tr>
<tr>
<td>Puzzle valance</td>
<td>.115 (.436)</td>
<td>.229 (.117)</td>
<td>.025 (.865)</td>
<td>.011 (.940)</td>
<td>-.123 (.407)</td>
<td></td>
</tr>
<tr>
<td>Puzzle arousal</td>
<td>.067 (.653)</td>
<td>.045 (.760)</td>
<td>-.218 (.136)</td>
<td>-.039 (.791)</td>
<td>.098 (.507)</td>
<td></td>
</tr>
<tr>
<td>Puzzle dominance</td>
<td>-.205 (.161)</td>
<td>.081 (.583)</td>
<td>.303 (.036)</td>
<td>-.036 (.807)</td>
<td>-.021 (.885)</td>
<td></td>
</tr>
<tr>
<td>Puzzle grade</td>
<td>-.265 (.068)</td>
<td>-.056 (.706)</td>
<td>.029 (.843)</td>
<td>-.119 (.422)</td>
<td>.131 (.376)</td>
<td></td>
</tr>
<tr>
<td>Puzzle rank</td>
<td>.097 (.514)</td>
<td>-.134 (.363)</td>
<td>-.068 (.645)</td>
<td>-.111 (.452)</td>
<td>.058 (.693)</td>
<td></td>
</tr>
<tr>
<td>Social valance</td>
<td>.230 (.116)</td>
<td>.164 (.267)</td>
<td>.051 (.731)</td>
<td>.200 (.173)</td>
<td>.051 (.732)</td>
<td></td>
</tr>
<tr>
<td>Social arousal</td>
<td>.033 (.822)</td>
<td>.070 (.635)</td>
<td>-.061 (.679)</td>
<td>.089 (.547)</td>
<td>.021 (.888)</td>
<td></td>
</tr>
<tr>
<td>Social dominance</td>
<td>-.240 (.101)</td>
<td>-.080 (.588)</td>
<td>-.036 (.806)</td>
<td>-.051 (.733)</td>
<td>-.014 (.927)</td>
<td></td>
</tr>
<tr>
<td>Social grade</td>
<td>.038 (.800)</td>
<td>-.036 (.806)</td>
<td>-.252 (.084)</td>
<td>-.070 (.638)</td>
<td>.239 (.102)</td>
<td></td>
</tr>
<tr>
<td>Social rank</td>
<td>.038 (.796)</td>
<td>-.039 (.792)</td>
<td>.175 (.233)</td>
<td>-.138 (.351)</td>
<td>-.004 (.978)</td>
<td></td>
</tr>
</tbody>
</table>

Note. Significant results (p < .05) are bold, interesting trends are marked grey.

The correlation between Fight arousal and Extraversion does show a negative trend (-.245, p = .093) that indicates that people higher on Extraversion feel less aroused in the fighting area. A possible reason for this could be that extraverts are generally more used to situations that involve a high amount of outside stimuli and therefore find the fighting area less arousing. As discussed in Section 4.2, Fight arousal correlates with Fight grade. In this case the low experienced arousal by extraverts could have influenced their grade. This would mean that in a fighting area with higher arousal, especially extraverts would grade it higher and a different link between fighting and might be found. However, this is speculation and more research is needed to test this.

There is a positive correlation on Extraversion and Puzzle dominance (.303, p < .05), but this in the opposite direction as expected and dominance is not a direct measure of entertainment. The reason for this is unknown, but it might have to do with the fact that extraverts are more dominant in general. As discussed in Section 4.2, the Puzzle dominance correlates with the valance and the grade. This means that increasing the dominance for introverts might be an effective way to increase the entertainment.

No significant correlation was found between any of the entertainment measurements for the social area and Extraversion, which means that in this experiment there is no difference between introverts and extraverts when it comes to the experienced entertainment of the social area. However, although it was not a significant result, a trend was found between the Social grade and Extraversion (-.252, p
.084). This shows that extraverts tend to rate the social area lower than introverts. This makes it hard to conclude anything about the behavior of extraverts and introverts in in-game social situations.

4.4.2 – Entertainment and the other personality traits

If we look at the other personality traits in Table 7 and their links to the measurement-scores, it is disappointing to see that there are no significant correlations. This means that the hypothesis (H1) is still not rejected. However, several trends can be found that are interesting to take a look at.

*Openness:*

People high on Openness tended to score higher on the Social valance (.230, p = .116). In the Social area the players have to talk with people they have never met before and they get to look at art (statues). Both talking with strangers and an appreciation for art are markers of Openness, so the trend found here is not surprising.

What is more surprising, is that people with high Openness showed a trend to score lower on Social dominance (-.240, p = .101). This could mean that people low on Openness feel more dominant in this area because they are controlling what happens, whereas people high on Openness do not focus on being in control as much because they are more interested in the conversations and art.

That people high on Openness tend to score higher on valance but lower on dominance means that they do not have to feel dominant in order to enjoy themselves better. This is not surprising because a feeling of low dominance arises from unknown and new places, but such places appeal more to people high on Openness than people low on the trait.

Openness also showed a correlation trend with the grade for the Puzzle area (-.265, p = .068). Following the descriptions of Openness, this is again a surprising find. The puzzle requires the player to use their imagination and it should work on their curiosity. An explanation for this could be that the puzzle was too long or boring for people high on Openness, or that they already experienced such kind of puzzles before. However, for now it seems as if people higher on Openness do not prefer puzzles more than people low on Openness.

*Conscientiousness:*

Conscientiousness only shows a trend towards the Puzzle valance (.229, p = .117). Because the puzzle is an organized situation with a certain correct solution, this should appeal better to conscientious people, explaining the positive correlation. This could be an indication that conscientious people have a liking for puzzling.
**Agreeableness:**

The trait Agreeableness shows two trends, one with the Fight grade (-.262, \( p = .072 \)) and one with the Fight rank (.249, \( p = .088 \)). That people high on Agreeableness graded the fighting lower and ranked it worse is not surprising, considering the fact that Agreeable people value getting along with others instead of being antagonistic. As the description of Agreeableness states, agreeable people are friendly and helpful, which clearly does not go together with fighting. This means that Agreeableness could be an important factor when further researching fighting and violence in gaming.

**Neuroticism:**

There was a slight trend between Neuroticism and the Social grade (.239, \( p = .102 \)). This could be explained by the fact that neurotic people might feel in control of the situation because they can decide what happens in the given situation. Therefore there is less reason to be anxious or stressed, making them feel more at ease and enjoying the situation better. Although it is only a weak trend, it might be a pointer that real-life Neuroticism carries over into in-game situations.

**4.4.3 – Difference scores**

In Table 8 the correlations between the personality traits and the difference-scores can be found. This was done for the scores on the grades, the valance, and the arousal. Dominance is not included because it is not a direct measurement of entertainment and ranking is not included because the variable itself already indicates difference to the other areas, meaning that calculating difference scores for the ranking is redundant.

Because there were three different areas, there are also three difference-scores for each measurement. For “Fight – Puzzle”, the scores on the puzzle area were subtracted from the scores on fighting, giving a new value that represents the difference between the two scores. The same goes for “Fight – Social” and “Puzzle – Social”.

Two effects can be found on the trait of Openness. There is a positive significant correlation between the Fight – Puzzle grades and Openness (.286, \( p < .05 \)) and a negative trend between the Puzzle – Social grades and Openness (-.261, \( p = .073 \)). In Sub-section 4.4.2 a trend was already found between Openness and the Puzzle grade, but not between Openness and the other two grades. Now it seems that a significant difference can be found between the Fight and Puzzle grades and another trend is found between the Puzzle and Social grades. Therefore, when people score higher on Openness, the appeal of the Fighting and Social area compared to the Puzzle will go up.
Table 8
The correlation matrix for the difference-scores and the personality traits.

<table>
<thead>
<tr>
<th></th>
<th>Normscore Openness</th>
<th>Normscore Conscientiousness</th>
<th>Normscore Extraversion</th>
<th>Normscore Agreeableness</th>
<th>Normscore Neuroticism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fight - Puzzle</td>
<td>.286 (.049)</td>
<td>-.104 (.481)</td>
<td>-.041 (.780)</td>
<td>-.077 (.605)</td>
<td>.017 (.910)</td>
</tr>
<tr>
<td>Fight - Social</td>
<td>.052 (.726)</td>
<td>-.142 (.334)</td>
<td>.152 (.303)</td>
<td>-.146 (.324)</td>
<td>-.024 (.870)</td>
</tr>
<tr>
<td>Puzzle - Social</td>
<td>-.261 (.073)</td>
<td>-.026 (.863)</td>
<td>.194 (.187)</td>
<td>-.059 (.688)</td>
<td>-.042 (.777)</td>
</tr>
<tr>
<td>Valance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fight - Puzzle</td>
<td>-.015 (.921)</td>
<td>-.188 (.202)</td>
<td>-.057 (.701)</td>
<td>.046 (.755)</td>
<td>.043 (.770)</td>
</tr>
<tr>
<td>Fight - Social</td>
<td>-.096 (.515)</td>
<td>-.104 (.481)</td>
<td>-.087 (.558)</td>
<td>-.120 (.417)</td>
<td>-.144 (.328)</td>
</tr>
<tr>
<td>Puzzle - Social</td>
<td>-.070 (.634)</td>
<td>.111 (.453)</td>
<td>-.016 (.915)</td>
<td>-.158 (.283)</td>
<td>-.177 (.229)</td>
</tr>
<tr>
<td>Arousal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fight - Puzzle</td>
<td>.080 (.589)</td>
<td>-.263 (.071)</td>
<td>.013 (.931)</td>
<td>-.185 (.209)</td>
<td>-.085 (.565)</td>
</tr>
<tr>
<td>Fight - Social</td>
<td>-.036 (.810)</td>
<td>-.270 (.063)</td>
<td>-.192 (.190)</td>
<td>-.308 (.033)</td>
<td>.006 (.968)</td>
</tr>
<tr>
<td>Puzzle - Social</td>
<td>.042 (.779)</td>
<td>-.021 (.889)</td>
<td>-.186 (.206)</td>
<td>-.136 (.356)</td>
<td>.090 (.544)</td>
</tr>
</tbody>
</table>

Note. Significant results ($p < .05$) are bold and trends are shown in grey.

There is a negative trend between Conscientiousness and the Fight – Puzzle arousal (-.263, $p = .071$), and between Conscientiousness and Fight – Social arousal (-.270, $p = .063$). This means that when Conscientiousness goes up, the arousal of the fighting area is lower compared to the Puzzle and Social area. This can be an important find, because as seen earlier in Section 4.2 arousal is of influence on the grade of any area. People who are higher on Conscientiousness are not as aroused by the fighting area compared to the puzzle and social area, so for those people arousal in the fighting area could be increased to possibly gain a better grade.

There is a negative significant correlation between Agreeableness and Fight – Social arousal (-.308, $p < .05$). This means that when a person is high on Agreeableness, their arousal in social situations as compared to fighting goes up. As arousal influences both the grade for Fight and Social areas (see Section 4.2), Agreeableness is certainly a trait to consider when creating fighting and social situations.

Two significant results are found here that indicate that personality does have an influence on how entertainment is experienced. Therefore the hypothesis (H1) There is no link between personality and experienced game entertainment, can now be rejected. This means that the goal of this research, to demonstrate the existence of the link between personality and experienced game entertainment, is reached.
4.5 – Control variables

Now that the link between personality and experienced entertainment is tested, it is time to take a look at the influence that the control variables have on that entertainment as well. To check for this influence, the control variables are correlated to each other and to all entertainment measures. The correlation matrix can be found in Table 9. Age, education, and total time are not included in this table, because they had no significant influence on any of the other variables.

The control variables measured by the log-files are not included either, because they did not yield interesting results. One of the reasons for this is that most participants completed the game in a similar fashion, meaning that there was not enough variation in the variables to produce statistically satisfying results.

Table 9
The correlation matrix of the control variables and entertainment measures.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Experience with computers</th>
<th>Experience with games</th>
<th>Difficulty of controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experience with computers</td>
<td>-0.457 (.001)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Experience with games</td>
<td>-0.698 (.000)</td>
<td>0.510 (.000)</td>
<td>1</td>
</tr>
<tr>
<td>Difficulty of controls</td>
<td>-0.165 (.262)</td>
<td>0.153 (.299)</td>
<td>0.123 (.403)</td>
</tr>
<tr>
<td>Fight valance</td>
<td>0.027 (.855)</td>
<td>0.098 (.508)</td>
<td>0.194 (.187)</td>
</tr>
<tr>
<td>Fight arousal</td>
<td>-0.109 (.462)</td>
<td>-0.082 (.581)</td>
<td>0.120 (.416)</td>
</tr>
<tr>
<td>Fight dominance</td>
<td>-0.485 (.000)</td>
<td>0.163 (.268)</td>
<td>0.365 (.011)</td>
</tr>
<tr>
<td>Fight grade</td>
<td>-0.177 (.228)</td>
<td>-0.019 (.898)</td>
<td>0.284 (.050)</td>
</tr>
<tr>
<td>Fight rank</td>
<td>0.370 (.010)</td>
<td>-0.317 (.028)</td>
<td>-0.415 (.003)</td>
</tr>
<tr>
<td>Puzzle valance</td>
<td>0.112 (.447)</td>
<td>-0.012 (.933)</td>
<td>-0.005 (.971)</td>
</tr>
<tr>
<td>Puzzle arousal</td>
<td>0.125 (.396)</td>
<td>-0.099 (.504)</td>
<td>0.059 (.692)</td>
</tr>
<tr>
<td>Puzzle dominance</td>
<td>-0.083 (.574)</td>
<td>0.113 (.446)</td>
<td>0.111 (.452)</td>
</tr>
<tr>
<td>Puzzle grade</td>
<td>0.166 (.259)</td>
<td>-0.147 (.318)</td>
<td>-0.146 (.320)</td>
</tr>
<tr>
<td>Puzzle rank</td>
<td>-0.229 (.118)</td>
<td>0.050 (.735)</td>
<td>0.158 (.285)</td>
</tr>
<tr>
<td>Social valance</td>
<td>0.013 (.930)</td>
<td>0.011 (.943)</td>
<td>0.119 (.421)</td>
</tr>
<tr>
<td>Social arousal</td>
<td>0.070 (.638)</td>
<td>-0.145 (.326)</td>
<td>-0.241 (.099)</td>
</tr>
<tr>
<td>Social dominance</td>
<td>-0.307 (.034)</td>
<td>0.311 (.032)</td>
<td>0.341 (.018)</td>
</tr>
<tr>
<td>Social grade</td>
<td>0.000 (.100)</td>
<td>-0.262 (.072)</td>
<td>-0.037 (.803)</td>
</tr>
<tr>
<td>Social rank</td>
<td>-0.135 (.360)</td>
<td>0.276 (.057)</td>
<td>0.260 (.074)</td>
</tr>
</tbody>
</table>

Note. Significant results (p ≤ .05) are bold.

One of the most salient variables when it comes to computers and gaming is gender. It is often stereotypically assumed that men are better with technology and are more avid gamers. This is clearly found in this research as well, there is a significant correlation between gender and computer
experience (-.457, \( p < .005 \)) and gaming experience (-.698, \( p < .001 \)). There is, unsurprisingly, also a very strong correlation between computer experience and gaming experience (.510, \( p < .001 \)). This means that these three variables have a huge influence on each other and it can be concluded that males have more computer experience and more game experience. This could possibly be an effect of the subjectivity of the control questions as well, since it might be the case that women are simply more conservative when judging their own experiences. However, because of the strength of the correlations this is unlikely.

The fact that gender, computer experience, and game experience are closely related is also reflected in the correlations found for the three variables. All three of them have a significant correlation on the Fight rank and on Social dominance. That gender (.370, \( p < .05 \)), computer experience (-.317, \( p < .05 \)), and gaming experience (-.415, \( p < .005 \)) all correlate with Fight rank means that men and people with high computer or game experience ranked the fighting area better. Gender (-.307, \( p < .05 \)), experience with computers (.311, \( p < .05 \)), and experience with games (.341, \( p < .05 \)) all also correlate significantly with the Social dominance. This means that men and people with high computer or game experience feel more dominant in the social area. That such similarities are found strengthens the idea that gender, computer experience, and game experience are closely related. However, some differences can also be found, meaning that the variables certainly do no measure the exact same thing.

For example, Fight dominance was significant on gender (-.485, \( p < .001 \)) and gaming experience (.365, \( p < .05 \)), but not on computer experience (.163, \( p = .268 \)). This is probably a result of the fact that women do not feel dominant in the fight area, but generally still had a pretty high experience with computers. In the high gaming experience people, men are overly represented. The conclusion for this is that men and experienced gamers feel more dominant when engaged in fighting in a videogame. There is one more significant correlation on these three variables and that is between gaming experience and Fight grade (.284, \( p = .05 \)). That this is only found for gaming experience is surprising, because the variables are so much alike and all three did have a correlation on the Fight rank. It seems that only people with high gaming experience significantly grade the fighting area higher.

The fact that these three control variable have such significant effects shows that gender and experience are important influences on gaming and they should definitely be taken into account with any further research in gaming.

Finally, there is the difficulty of controls that correlates significantly with both the Social valance (-.333, \( p < .05 \)) and Social arousal (-.395, \( p < .01 \)). These are curious findings because the Social valance and Social arousal go up when the reported difficulty of controls goes down. A possible explanation for this can be that the social area was the easiest to navigate and control. Therefore people who had problems with controls found the social area the easiest to play and therefore felt more positive emotion and arousal. Of course, it can also be the other way around, that people who had no problems with the control found the social are too easy and simple so they felt less positive and aroused by it.
4.6 – Summary of the results

The hypothesis is rejected in the light of the acquired results and the existence of the link between personality and experienced game entertainment is shown. However, only two significant results were found on a large amount of data, which means that even though the link exists, it is not shown to be very strong or stable yet. A reason for this might be the strong influence of the control variables, which had more significant results and seem to have a stronger link with experienced game entertainment. The find of some significant results and several trends on the link between personality and experienced game entertainment in this early, contemporary, and explorative research inspire confidence for the future of the research subject.
5 – Discussion

The subject of the present research is a very contemporary one on which almost no prior research has been performed. The goal of this research was to try to demonstrate the existence of a stable link between personality and gaming entertainment, but due to the shortage of background knowledge, some difficult choices and assumptions had to be made in the process of creating the experimental setup. Because of the uncertain grounds of this research, this research had a second goal as well. As this research is new in its subject, it is exploratory in nature and therefore learning anything that might prove useful for future research on the subject is just as important a goal.

The first goal was reached: the existence of the link between personality and gaming entertainment was found. However, it must also be concluded that only a few significant effects could be found and that the influence of personality was not as big as was expected. It was found that the influence of personality was smaller than that of some other variables, such as computer or gaming experience. Adaptive Gameplay is still a useful tool for future games, but it should not only be based on personality.

The second goal was also reached. Future research can definitely learn from the design imperfections that caused this research to have inconclusive results. The present research had to make choices and assumptions on certain points, and whether the right or wrong assumptions were made there, more information regarding those subjects is now available.

This research linked personality to experienced game entertainment through the use of certain gameplay elements. However, personality can also be useful in many other ways. When the player’s personality is measured in a videogame, this information can be used for various purposes. Simply measuring personality could be one of them. As explained in Schreurs (2009), measuring personality through observations of behavior (in this case videogame behavior) has its advantages over measuring through introspection (as is the case with questionnaires). Personality can also be used for other purposes like marketing or improving customer care. Also, this research only focused on three gameplay elements and only on the variable entertainment, whereas the influence of personality could also be tested with other gameplay elements or other variables, like realism or immersion. An example of this would be the Affective Gaming discussed in Chapter 2. It is clear that the present research only scratched the surface of the possibilities of research into personality and gaming.

This chapter first discusses how Adaptive Gameplay should be researched further (5.1). The limitations of the current research are discussed (5.2) and recommendations for further research subjects that can support Adaptive Gameplay are provided (5.3).

5.1 – Specifying the line of research

This research is a link in the chain of research into Adaptive Gameplay. In Adaptive Gameplay the goal is to adjust gameplay toward the player, in this research based on his personality. Therefore the goal of
this research was to find out if a certain personality trait could be associated with the experienced entertainment of certain gameplay elements. It would be a useful result if, for example, extraverts prefer fighting and introverts prefer puzzling in videogames. However, such results were not explicitly found in this research. That these results are not found does not mean Adaptive Gameplay cannot be achieved; it just means that the focus has to be readjusted. Whereas this research instantly tried to find major variations in the experienced entertainment of videogames, the focus has to be put on more specific adaptations.

In this research three gameplay elements were researched based on common elements featured in Role-Playing Games, namely fighting, puzzling, and social interactions. For each of the gameplay elements a playable area was created that should have reflected a simple and common implementation of that element. In retrospect however, this might have been an unfortunate choice. Not much is known about each gameplay element and thus creating a single gameplay area to represent the entire element is very tricky. The problem is that there is so much variation possible within a single gameplay element that choosing just one standard situation as a reflection of the entire element will probably not serve as a proper representation. More information is needed about each gameplay element itself in order to investigate the differences they can contain. This would also make it possible to research adaptations within a single gameplay element. To do this, the content of a gameplay element has to be altered. This could be done, for example, by changing the difficulty level or the intensity level of the gameplay element, making it more suitable for a certain player.

Not only the specific gameplay elements have to be researched, but also the order and quantity in which people play them. This research already showed that an order effect was applicable to the fighting area. That the order already mattered with only three short areas (about 5 minutes per area) means that it can have a serious impact in larger retail games, which can last for dozens of hours. Besides just the order, the quantity of the gameplay elements has to be researched as well. In this experiment there was only one area for each gameplay element, which means that the area is new and interesting for the player. Even if they would not generally like one of the areas, it is possible that they still did not mind it because it was such a short experience. Videogames however, are a continuous link of gameplay elements and if one of these bores the player, it can ruin the gameplay experience. Therefore some research into the effect of repetition and order are important future research subjects. If it is known how long a player wants to play a gameplay element and how these elements should be varied, it is possible to avoid boredom and annoyance, which would improve the gaming experience. It is all about finding a gameplay balance that suits the player.

In summarizing the section above, Adaptive Gameplay (as discussed in this thesis) should not aim at replacing entire gameplay elements with others, but at fine-tuning the gameplay elements themselves and finding a balance for the duration and the variation in which they are presented.
5.2 – Limitations of the presented research

Several choices had to be made in the process of this research. After performing the experiment and gathering the results, some of these choices can be questioned and recommendations for how these choices could be made in the future can be given. In this section the most important limitations are discussed.

In retrospect the most problematic limitations were the measurement instruments that were used. Where the NEO-FFI did not cause any problems, the entertainment measurements and the measurements for the control variables had some limitations.

- The Self-Assessment Manikin is used to measure emotional response to a certain stimulus and is a well-known research instrument. However, even though it used a 9-point scale, the resolution of the answers turned out to be quite small. Most participants answered only within a small portion of this scale. When people felt a certain degree of arousal or pleasure the gameplay areas could influence this, but mostly these were only variations of 1 point.

- The other instrument used for measuring entertainment was a grade and a ranking for the gameplay areas. Giving grades is a popular way to measure a certain experience, but it is a self-reported score and as discussed in the Section 3.4, people often cannot explain their experienced entertainment. The problem with the ranking score is the fact that it provides a categorical variable that is dependent of all three gameplay elements. On top of that, it also has a quite small resolution. This makes it a variable that is not ideal for use in statistical analysis. These variables were useful in discussing how the participants experienced the gameplay areas, but are not suitable for extensive research into entertainment.

- Another limitation is the subjectivity of the measurements of some of the control variables. The experience with computers, experience with games, and the difficulty of controls are all asked with a 5-point scale ranging from “very little/easy” to “very much/hard”. This resulted in a subjective representation of the participants and made the variables not optimal for statistical analyses. For example, 40 of the 48 participants answered either 3 (normal) or 4 (easy) on the difficulty of controls question. Looking for a more objective way to measure these control variables and with a better resolution will be a sensible thing to do for future research.

The last limitation that is important to point out is the composition of the target audience. As discussed in Section 4.5, experience with gaming is a variable that has a strong influence on how games are experienced. However, in this research, only 9 of the 48 participants reported to have an above average gaming experience. Because of the strong influence on the variance of certain entertainment measures, experience with gaming might have overshadowed the effects of personality. It would be a wise idea for future research to keep experience with games controlled. For example, it is possible to perform research on novice gamers only, because prior research has shown that changes in gameplay are more effective when applied to novice gamers (Joosten, 2010). Research on experienced gamers on the other
hand is also possible, but experience has a big influence on in-game behavior. The target audience and population has to be carefully considered.

5.3 – The future of Adaptive Gameplay

What are the most interesting subjects for future work in gaming research? The presented research raised more questions than it has answered and there are many possibilities. Besides the research subjects about Adaptive Gameplay that are proposed earlier in this chapter, there is also the Affective Gaming discussed in Sub-section 2.1.2 that is an interesting research subject. However, while these are both promising subjects, there are some more basic problems that have to be addresses as well. This section discusses the need for more basic knowledge about gamers, how entertainment works, and how new technologies can influence the future of gaming research.

5.3.1 – Background research

It is our opinion that there are two important subjects that need further studying in order to help improve studies into Adaptive Gameplay. Firstly, more general knowledge about gamers would help with making decisions and assumptions about their preferences and experiences. Especially information about gamers and personality, like Fang and Zhao (2010) collected in their study, could help improve the knowledge about how Adaptive Gameplay should be implemented. They used simple questionnaires to map the gaming preferences of people with a certain personality trait. If more of such questionnaire research could be performed, decisions about the preferences of people high or low on a certain trait would not only be based on personality literature anymore, but on a solid base of research.

Secondly, the lack of a standardized measurement for entertainment should be addressed. The lack of such an instrument makes it very difficult to assess the functionality of adaptations. Therefore more research into how entertainment can be measured is important. However, it is not only important to know how to measure it, but also what is being measured. That this is a significant and complicated matter can be seen in Section 4.2. Even between the gameplay elements there are different variables that influence the entertainment. Discovering how players actually experience entertainment in a videogame is a challenging, but an important line of research that should be performed.

5.3.2 – Future possibilities

At the start of the research it was believed, and it still is, that personality can have an important role in the way adaptations are performed in videogames. Some important topics for future research are already discussed in this chapter, like research into the content, duration, and variation of the gameplay elements or research aimed at improving the measurement instruments used in this line of research. However, with the possibilities that future technology holds, it is wise to look at some other factors as well. There are several factors of which we think that will have an important role in the future of
Adaptive Gameplay. When future research is conducted into Adaptive Gameplay, these points certainly have to be taken into consideration:

- One of the problems of Adaptive Gameplay is the question as to when the gameplay should be changed. As discussed earlier in this chapter, more research about the variation and duration of gameplay elements is recommended so that a better idea is acquired of when they should be changed. However, this is not an exact science and it can be different for every individual player. That is where more information about the state of the player could help out. Gathering external, real-time information can be done in various ways. Two of the easier and already quite popular gadgets for consoles are remote motion controllers (for example the controllers of Nintendo’s Wii) and cameras that are aimed at the player and can track his movements (Microsoft’s Xbox’s Kinect system). This could be used to register body language and see when a player becomes bored or agitated, a clear sign for changing gameplay elements. Even more complex measurements might be used in the future as well. Think for example of psychophysiological measurements as blood pressure meters, skin-monitors, muscle activity, and eye-tracking, or even neural measurements, which can give detailed information about the player’s bodily reactions.

- An important revolution that is taking place in the gaming scene is the rise of large online communities. These are large online networks on which gamers must log on in order to play their videogames. One of the leading examples is Valve’s Steam network, which has over 30 million (Valve Software Corporation, 2010) accounts. Everything the player does in this community and while playing the games can be saved online, which means that over time a large information database about each player will be available. This would be a great development for Adaptive Gameplay because it could mean that every player’s personality is readily available and only the adaptations themselves have to be implemented.
6 – Conclusions

In this chapter the conclusions of the research are presented. All of the research questions are answered (6.1) and the problem statement is discussed (6.2).

6.1 – Research questions

The goal of this research was to examine the link between personality and experienced game entertainment. In order to achieve this goal, five research questions were composed and answered.

The first research question is: “What is the current state of Adaptive Gameplay?” To answer this research question, a short history of Adaptive Gameplay was given and literature on the subject was discussed in Chapter 2. It is concluded that Adaptive Gameplay is a contemporary research subject that has the potential to become a successful new technology in the gaming industry. However, while there is theoretical support for the use of Adaptive Gameplay, more research and actual testing into the proposed theories and frameworks of Adaptive Gameplay is needed in order verify its effectiveness.

The second research question is: “To what extent has personality and videogame behavior been researched before?” In answering this question, literature into personality was discussed and its relation to gaming was described in Chapter 2. It is concluded that there is almost no salient research into the link between personality and videogames. This means that any predictions about this link have to be made based on literature about the separate subjects. Personality as found in the Five-Factor Model is discussed and it is assumed that the behavior of people in real-life is transferred to their behavior in games. This means that the real-life behavior expected of people with a certain trait, as described in Chapter 2, can be expected in videogames as well.

The third research question is: “Which experimental setup is suitable for testing the link between personality and experienced videogame entertainment?” To test the link between personality and videogame entertainment an experiment was created. In Chapter 3 the experimental setup is presented. A videogame was created with three gameplay elements, based on common gameplay elements found in the Roleplaying Game genre: Fighting, Puzzling, and Social Interaction. It was expected that the experienced entertainment of these gameplay elements would have a link with the Five-Factor personality traits. To test this, the participants had to fill out questionnaires to measure entertainment (the Self-Assessment Manikin and grade and ranking scores) and a personality questionnaire (the NEO-FFI). A questionnaire with control variables was also administered, to check for the influence of these other factors. When the experiment is performed and the results are statistically analysed, it is possible to conclude more about the link between personality and experienced videogame entertainment.

The fourth research question is: “What aspects of gaming appeal to people who are high or low on the personality trait of extraversion?” The results of the experiment can be found in Chapter 4, and these
results do not indicate any significant effects for the entertainment measures on the trait of extraversion. Some trends were found that could indicate that extraversion has an effect on how people experience entertainment, but no conclusive results could be found. This means that it is not yet possible to create an early version of Adaptive Gameplay based on the results of Schreurs (2009) and the present research.

The fifth research question is: “What is the link between personality and experienced game entertainment?” To answer this question, the results of the experiment are discussed in Chapters 4 and 5. Correlating the entertainment scores to personality provided several significant results and several interesting trends. The two most important results of the experiment are found with the difference-scores. There was a positive significant correlation between Openness and the grade difference between the Fight and Puzzle area (.286, p < .05), meaning that people higher on Openness gave the Fight area a higher grade than the Puzzle area. A negative significant correlation was found between Agreeableness and the arousal difference between the Fight and Social area (-.308, p < .05), meaning that people higher on Agreeableness were more aroused by the Social area than by the Fight area. These results show that personality traits can influence how players experience certain gameplay elements. However, the influence of personality was not as big as was expected and some of the control variables were more influential than personality. More research is needed to map out how the link between personality and experienced game entertainment works, in which the influence of other variables must be carefully taken into account.

6.2 – The problem statement

With the research questions answered it is possible to discuss the problem statement. The problem statement is: “To what extent can personality predict experienced videogame entertainment?” With the currently performed research it is not possible to give a satisfying answer to this. The acquired results show that the link between personality and gaming does exist, but the results were not conclusive and convincing enough to conclude anything about the extent of the link. This explorative research has brought to light several possible pitfalls and limitations for the research into Adaptive Gameplay and these should be carefully addressed. More research is needed into the link between personality and gaming in order to get a better understanding of how Adaptive Gameplay could enhance the gaming experience.
Literature


Wikipedia (2011). Big Five personality traits, from
Appendix A – The information booklet provided to the participants

Bedankt voor uw deelname aan dit experiment. Ik voer dit onderzoek uit in het kader van mijn afstudeerthesis voor de masteropleiding Communicatie- en Informatiewetenschappen op de Universiteit van Tilburg.

Voor mijn masterthesis doe ik onderzoek naar de speelbaarheid van computerspellen en mogelijke manieren waarop de spelervaring verbeterd kan worden.

Onderzoek naar computerspel-ervaringen:

Dit experiment bestaat uit drie delen.

Als eerste zult u een computerspel gaan spelen dat bestaat uit vier losse gebieden. Het eerste gebied is een oefengebied en de andere drie gebieden zijn onderdeel van het experiment. Na elk van de drie experimentgebieden dient u een korte vragenlijst met drie meerkeuzevragen in te vullen. Een korte uitleg over het computerspel en de besturing zal gegeven worden op de volgende pagina en in het oefengebied zal de besturing getest worden.

Na het computerspel krijgt u een vragenlijst met een aantal korte vragen over het computerspel en algemene informatie over uzelf.

Tot slot krijgt u nog een laatste vragenlijst met 60 simpele meerkeuzevragen die beantwoord dienen te worden met een score van 1 tot en met 5, waarbij 1 helemaal oneens is en 5 helemaal eens.

Het onderzoek duurt in totaal ongeveer 45 tot 60 minuten.

Informed consent:

De data verkregen uit de vragenlijsten en het computerspel zullen gebruikt worden voor het schrijven van mijn masterthesis en wellicht een wetenschappelijk artikel. Alle gegevens worden anoniem verwerkt.

Deelname aan dit onderzoek is vrijwillig en kan geweigerd worden. Tevens is het op elk moment tijdens het onderzoek toegestaan om zonder opgaaf van reden met het onderzoek te stoppen.

Als u nog vragen heeft kunt u deze stellen aan de experimentleider.

Alvast bedankt voor uw medewerking.

Versie 1
Toestemmingsverklaringformulier (informed consent)

Titel onderzoek: Onderzoek naar computerspel-ervaringen
Verantwoordelijke onderzoeker: S.M. Schreurs

In te vullen door de deelnemer

Ik verklaar op een voor mij duidelijke wijze te zijn ingelicht over de aard, methode, doel en [indien aanwezig] de risico’s en belasting van het onderzoek. Ik weet dat de gegevens en resultaten van het onderzoek alleen anoniem en vertrouwelijk aan derden bekend gemaakt zullen worden. Mijn vragen zijn naar tevredenheid beantwoord.

Ik stem geheel vrijwillig in met deelname aan dit onderzoek. Ik behoud me daarbij het recht voor om op elk moment zonder opgaaf van redenen mijn deelname aan dit onderzoek te beëindigen.

Naam deelnemer: …………………………………………………………………………..

Datum: …………… Handtekening deelnemer: ………………………………………..

In te vullen door de uitvoerende onderzoeker

Ik heb een mondelinge en schriftelijke toelichting gegeven op het onderzoek. Ik zal resterende vragen over het onderzoek naar vermogen beantwoorden. De deelnemer zal van een eventuele voortijdige beëindiging van deelname aan dit onderzoek geen nadelige gevolgen ondervinden.

Naam onderzoeker:
……………………………………………………………………………………………………

Datum: …………… Handtekening onderzoeker: ………………………………………..
Deel 1 – Computerspel

U zult nu een kort computerspel gaan spelen dat zoals de meeste spellen gemaakt is om de speler te vermaken. Het spel zal beginnen in een korte testruimte, zodat u de besturing van het personage en de camera onder de knie kan krijgen. Vervolgens begint het experiment, dat uit drie losse delen bestaat. Wanneer u een deel voltooid heeft zal dit in het spel duidelijk gemaakt worden en dient u een van de drie korte vragenlijsten verder in dit boekje in te vullen. Het totale computerspel (inclusief het invullen van de drie korte vragenlijsten) zal ongeveer 25-30 minuten duren.

Instructies:

Aangezien dit onderzoek slechts gebruik maakt van een klein deel van de mogelijkheden van het spel, hoeven niet alle functies uitgelegd te worden. De benodigde functies staan hieronder beschreven en worden in de testruimte ook nog eens uitgelegd. U kunt deze pagina voor u houden, zodat wanneer u iets vergeten bent u hier terug kan kijken. Als iets onduidelijk is aarzel niet om de experimentleider om ophedering te vragen.

De besturing:

Rondlopen:

Om rond te lopen moet u met de linker muisknop ergens op het scherm klikken. Het personage loopt dan naar de plek waar geklikt is.

Interactie met voorwerpen (computerspelers, deuren, vijanden, etc):

Om een interactie te starten moet u met de linker muisknop op een voorwerp of persoon klikken. Wanneer u bijvoorbeeld op een deur of een kist klikt zal u deze proberen open te maken. Wanneer u op een computerspeler klikt zal u proberen hier een conversatie mee te starten, of indien hij vijandig is zal u hem aanvallen.

Keuzes maken in een gesprek:

Wanneer u een gesprek heeft met een computerspeler zal linksboven in het scherm een kader worden geopend. Bovenaan het scherm ziet u wat de computerspeler tegen u zegt. Onderin staan de reacties die u daarop kan geven. In de meeste gevallen kunt u maar 1 reactie kiezen, maar er zijn gesprekken waarin u meerdere reacties kunt kiezen. U kiest een reactie door hier met de linkermuisknop op te klikken.

De camerahoek veranderen:

Het kan voorkomen dat u een deel van een ruimte niet goed kunt zien doordat de camera niet goed staat. U kunt de camera dan draaien door de muiscursor naar de zijkant van het scherm te brengen. U kunt ook de pijltjes toetsen op het toetsenbord gebruiken om de camera te draaien en de camera in en uit te zoomen. Met het muiswiel kunt u ook inzoomen en uitzoomen.

Annuleren:

Tot slot kunt u altijd op escape drukken als er een ongewenst menu is geopend, dit menu wordt dan gesloten en de normale interface wordt weer hersteld.

Vraag de experimentleider om het computerspel te starten als je klaar bent om te beginnen.
Korte vragenlijst 1-A:

Zet een kruisje bij de score (1-9) die je gevoel op dit moment het beste weergeeft.

1. Hoe voel je jezelf op dit moment?

2. Hoe erg opgewonden voel je jezelf op dit moment?

3. Wat is je controle over de situatie op dit moment?
Korte vragenlijst 1-B:

Zet een kruisje bij de score (1-9) die je gevoel op dit moment het beste weergeeft.

1. Hoe voel je jezelf op dit moment?

2. Hoe erg opgewonden voel je jezelf op dit moment?

3. Wat is je controle over de situatie op dit moment?
Korte vragenlijst 1-C:

Zet een kruisje bij de score (1-9) die je gevoel op dit moment het beste weergeeft.

1. Hoe voel je jezelf op dit moment?

2. Hoe erg opgewonden voel je jezelf op dit moment?

3. Wat is je controle over de situatie op dit moment?

U heeft het computerspel-gedeelte van het onderzoek af. Ga op de volgende pagina verder met de deel 2 van het onderzoek.
Deel 2-A – Beoordeling computerspel

Geef een rapportcijfer (van 1 tot en met 10) voor hoe leuk u ieder deel van het computerspel vond:

Deel 1 (Puzzel): 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10
Deel 2 (Probleem oplossen): 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10
Deel 3 (Vechten): 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

Zet de delen van het computerspel in volgorde van leukst (1) naar minst leuk (3):

1. ......................................................
2. ......................................................
3. ......................................................

In het puzzelgedeelte, heeft u de puzzel bewust opgelost of was dit meer gebaseerd op geluk?

........................................................................................................

Deel 2-B - Persoonlijke informatie

Mijn leeftijd is: .......... jaar

Ik ben een: man / vrouw

De hoogste opleiding die ik heb afgerond is:

0 Lager onderwijs
0 Voorbereidend beroepsonderwijs (VBO, LTS, LHNO)
0 Algemeen vormend onderwijs (MAVO, HAVO, MULO)
0 Voorbereidend wetenschappelijk onderwijs (VWO, Gymnasium, Atheneum, HBS)
0 Middelbaar beroepsonderwijs (MBO, MTS, MEAO e.d.)
0 Hoger beroepsonderwijs (HEAO, HBO e.d.)
0 Universiteit (WO)

De ervaring die ik heb met computers zou ik beschrijven als:

0 Zeer weinig
0 Weinig
0 Normaal of gemiddeld
0 Veel
0 Zeer veel

De ervaring die ik heb met het spelen van computergames zou ik beschrijven als:

0 Zeer weinig
0 Weinig
0 Normaal of gemiddeld
0 Veel
0 Zeer veel

Ik vond de besturing van het spel:

0 Zeer lastig
0 Lastig
0 Normaal
0 Makkelijk
0 Zeer makkelijk
Deel 3 - Persoonlijkheidsvragenlijst

Dit deel bestaat uit een vragenlijst met 60 uitspraken. Lees eerst de instructies goed door en ga vervolgens naar de volgende pagina om aan de vragenlijst te beginnen.

Instructies:

Deze vragenlijst bevat 60 uitspraken. Lees elke uitspraak zorgvuldig en zet een cirkel rond het cijfer dat uw mening het beste weergeeft. Let erop dat u geen regels overslaat.

De scores betekenen het volgende:
1 = Helemaal oneens, 2 = Oneens, 3 = Neutraal, 4 = Eens, 5 = Helemaal eens

Zet dus een cirkel om het nummer dat u mening het beste weergeeft. Omcirkel slechts één mogelijkheid bij elke uitspraak.

Als u een antwoord wilt veranderen maak dan uw eerste keuze ongeldig door hier een kruis door te zetten en omcirkel alsnog het goede antwoord.

Voorbeeld:

Als u het bijvoorbeeld helemaal oneens bent met de uitspraak:

“Ik zou wel een miljoen willen winnen”

Dan vult u dat als volgt in:

1. Ik zou wel een miljoen willen winnen. 1 2 3 4 5

Wanneer u eerst aangeeft neutraal te zijn in de stelling, maar vervolgens toch van mening verandert en vindt dat u er helemaal mee oneens bent, vult u het als volgt in:

1. Ik zou wel een miljoen willen winnen. 1 2 4 5

Ga naar de volgende pagina om aan de persoonlijkheidsvragenlijst te beginnen.
Vragenlijst:

1. Ik ben geen tobber.  
2. Ik houd er van veel mensen om me heen te hebben.  
3. Ik houd er niet van mijn tijd te verdoen met dagdromen.  
4. Ik probeer hoffelijk te zijn tegen iedereen die ik ontmoet.  
5. Ik houd mijn spullen netjes en schoon.  
6. Ik voel me vaak alsof ik barst van energie.  
7. Ik merk zelden de stemmingen of gevoelens op, die verschillende omgevingen oproepen.  
8. Als ik eenmaal de goede manier om iets te doen gevonden heb, dan blijf ik daar bij.  
9. Ik lach gemakkelijk.  
10. Ik verkeer vaak in meningsverschillen met mijn familie en collega's.  
11. Ik werk hard om mijn doelen te bereiken.  
12. De meeste mensen die ik ken mogen mij graag.  
13. Ik ben geïntrigeerd door de patronen die ik vind in de kunst en de natuur.  
15. Ik ben de mindere van anderen.  
16. Ik denk dat de meeste mensen je zullen gebruiken als je ze de kans geeft.  
17. Ik vind het echt leuk om met mensen te praten.  
18. Ik geef er meestal de voorkeur aan om dingen alleen te doen.  
19. Ik geef er meestal de voorkeur aan om dingen alleen te doen.  
20. Ik ben explosioneel van energie.  
21. Ik vind dat leerlingen alleen maar in verwarring worden gebracht door ze te laten luisteren naar sprekers met afwijkende ideeën.  
22. Soms voel ik me volkomen waardeloos.  
23. Ik ben geïntrigeerd door de patronen die ik vind in de kunst en de natuur.  
24. Ik werk liever met anderen samen dan met ze te wedijveren.  
25. Ik houd er niet van mijn tijd te verdoen met dagdromen.  
26. Ik probeer alle aan mij opgedragen taken gewetensvol uit te voeren.  
27. Ik ben vaak cynisch en sceptisch over de bedoelingen van anderen.  
28. Ik lach gemakkelijk.  
29. Ik heef duidelijke doelen voor ogen en werk daar op een systematische manier na toe.  
30. Ik ben geïntrigeerd door de patronen die ik vind in de kunst en de natuur.  
31. Ik denk dat de meeste mensen je zullen gebruiken als je ze de kans geeft.  
32. Ik probeer vaak nieuwe en buitenlandse gerechten.  
33. Ik voel me vaak alsof ik barst van energie.  
34. Ik verkeer in meningsverschillen met mijn familie en collega's.  
35. Ik houd van veel mensen om me heen te hebben.

Ga verder op de volgende pagina.
36. Ik word vaak kwaad om de manier waarop mensen me behandelen. 1 – 2 – 3 – 4 – 5
37. Ik ben een vrolijk en levendig iemand. 1 – 2 – 3 – 4 – 5
38. Ik vind dat we beslissingen in morele zaken van onze religieuze leiders mogen verwachten. 1 – 2 – 3 – 4 – 5
39. Sommige mensen vinden me koel en berekenend. 1 – 2 – 3 – 4 – 5
40. Als ik iets beloof, kan men er op rekenen dat ik die belofte ook nakom. 1 – 2 – 3 – 4 – 5
41. Wanneer dingen mis gaan raak ik maar al te vaak ontmoedigd en heb ik zin om het op te geven. 1 – 2 – 3 – 4 – 5
42. Ik ben geen vrolijke optimist. 1 – 2 – 3 – 4 – 5
43. Wanneer ik een gedicht lees of naar een kunstwerk kijk, voel ik soms een koude rilling of een golf van opwinding. 1 – 2 – 3 – 4 – 5
44. Ik ben zakelijk en onsentimenteel in mijn opvattingen. 1 – 2 – 3 – 4 – 5
45. Soms ben ik niet zo betrouwbaar als ik zou moeten zijn. 1 – 2 – 3 – 4 – 5
46. Ik ben zelden verdrietig of depressief. 1 – 2 – 3 – 4 – 5
47. Ik heb een jachtig leven. 1 – 2 – 3 – 4 – 5
48. Ik ben niet erg geïnteresseerd in het speculeren over het wezen van het universum van de mens. 1 – 2 – 3 – 4 – 5
49. Over het algemeen probeer ik attent en zorgzaam te zijn. 1 – 2 – 3 – 4 – 5
50. Ik ben een productief mens die een klus altijd voor elkaar krijgt. 1 – 2 – 3 – 4 – 5
51. Ik voel me vaak hulpeloos en wil dan graag dat iemand anders mijn problemen oplost. 1 – 2 – 3 – 4 – 5
52. Ik ben een heel actief persoon. 1 – 2 – 3 – 4 – 5
53. Ik heb een breed scala aan intellectuele interesses. 1 – 2 – 3 – 4 – 5
54. Als ik mensen niet mag, laat ik dat ook merken. 1 – 2 – 3 – 4 – 5
55. Het lijkt mij maar niet te lukken om de dingen goed op orde te hebben. 1 – 2 – 3 – 4 – 5
56. Soms schaam ik mij zo dat ik wel door de grond wil zakken. 1 – 2 – 3 – 4 – 5
57. Ik ga liever mijn eigen gang dan dat ik de leiding geef aan anderen. 1 – 2 – 3 – 4 – 5
58. Ik heb vaak plezier in het spelen met theorieën of abstracte ideeën. 1 – 2 – 3 – 4 – 5
59. Als het nodig is ben ik bereid om mensen te manipuleren om te krijgen wat ik wil. 1 – 2 – 3 – 4 – 5
60. Ik streef er naar uit te blinken in alles wat ik doe. 1 – 2 – 3 – 4 – 5

U bent nu klaar met het onderzoek, lever dit boekje in bij de experimentleider.

Hartelijk bedankt voor uw medewerking!
Appendix B - Histograms for the NEO-FFI trait scores

Normscore Openness

Mean = 4.62
S.D. Dev = 1.72
N = 69

Normscore Conscientiousness

Mean = 6.09
S.D. Dev = 1.046
N = 69

Normscore Extraversion

Mean = 6.69
S.D. Dev = 1.35
N = 69

Normscore Agreeableness

Mean = 6.69
S.D. Dev = 1.639
N = 69

Normscore Neuroticism

Mean = 4.4
S.D. Dev = 1.54
N = 69
Appendix C - Histograms for the grade scores and the SAM scores