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Why do I lose time playing?
Game features reported by players as being more satisfying

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Dedication

To my dear family, especially my grandfather, and all my friends who supported me.

Acknowledgements

First of all, dedicate this work to my family that supported me through all the past two years of study. Hope that all the effort and motivation they gave me, I can now demonstrate with this research, to everyone interested in it, a knowledge capable to help game developers design better game experiences to the players around the world. Furthermore, for those who still thinks games as just "kid stuff" or "just for fun", to demonstrate that games may be much more complex than what it seems and they think it to be.

Second, to all my brazilians friends that gave me strength even from far away, because they knew how difficult it was for me to "leave everything and everyone behind", come to a new continent where everything was new with the objective to study games. I will not mention names because, thanks God, I have a lot of them, and would be too many names to put in here.

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Lucas Paulon

Preface

"Finding new ways of working often leads to innovative designs."
—Eric Zimmerman and Kate Salen, *Rules of Play*, 2003

Today I am a Game Designer and all the following years since when I graduated in it were destined to reading and studying about games and its design. More importantly, I always found myself with the phrase "when designing games, know your audience." So, when I first started thinking about what to do when I finally started my thesis, the only certain I had was that I needed something different from that, and also different from what everyone in my class were working with: "games for education", "gamification applied in..." or "games for... something." And it is perfecly fine since it is a master degree in Design and Development of Digital Games. However, I wanted to go deeper.

Over the years, I did online courses, read a lot of blogs, articles, sites, books, and stuff of every possible area of knowledge related to games. Then, someday in this reading journey, I found myself curious with psychology. Even though I never actually studied it, I knew this area of knowledge had a branch that studied human perception (cognition) and thereby came up the thought that psychology was the correct path to start thinking in a "new way" about what to do and develop an idea to transform it into my research.

Even though some of them are not always included, games integrate a lot of areas of knowledge: target audience, marketing, programming, art (2D or/and 3D), animation, narrative, user experience, interface design, level design, game design, testing, producing, sound, platforms of distribution, money (a lot of it most of the time) and many more. But, remember the phrase cited in the beginning: "Know your audience."

So, if games have all this knowledge in it, all this areas that somehow have a little information that makes players able to play the game if designed correcly, studying game design started to seem not enough to create good games. The need to start looking for answers in my audience, study the "players framework", their brain, people behavior and similar topics started to be my point of interest and main goal.

I really believe games are extremely powerful tools which we can deliver our players a lot of things beyong the core of it: fun. Therefore, to be able to deliver players the best designed experience possible, teach them about the game world we designed, first is actually needed to start knowing players themselves: How to motivate humans? Do they look to satisfy a spcial need? How people actually "work"? Are there any tricks? Is it magic? How do I really "know my audience"? Understanding this, it may be possible to create better game designed experiences to match the profile of a target audience.

At this point, it started my adventure and quest to research about psychology, people and integrate it with games. Below, you will find my attempt to integrate everything I researched,

over the last year, about this topic and try to provide a different perspective about how to think about game design.

Hope to motivate you to read till the end and that this little piece of knowledge may help you, even for a little bit, to design better game experiences for people or, as we know them, our players: the audience that must be known.

Resumo

Este trabalho teve como objetivo tentar encontrar elementos da psicologia cognitiva e os associar com design de jogos. Para isso foi demonstrado o que são jogos, seu game design para criação de uma boa experiência de jogo aos jogadores, demonstração de elementos de persuasão e então como as recompensas fornecidas aos jogadores podem mantê-los interessados no jogo e influenciar seu comportamento.

Por fim, foi criada uma tabela com elementos que foram discutidos e identificados como importantes para possibilitar uma boa experiência de jogo. Além disso, dados coletados de um questionário online, realizado com jogadores e obtidas 182 respostas, foram analisados afim de testar algumas hipóteses e concluímos que dificuldade do desafio, escolhas e jogar com amigos são fatores importantes.

Palavras-chave

Psicologia cognitiva; design de jogos; sistemas de recompensa; comportamento do jogador; satisfação dos jogadores

Abstract

This dissertation had the objetive to relate elements from cognitive psychology with game design. For this purpose, it was discussed some features that constitutes a game, game design in order to create a good playing experience for players, presented persuasion strategies and thus how rewards given to players may keep them interested in the game and influence their behavior.

To conclude, a list has been created with elements that were discussed and identified as being relevant in creating a good game experience. Besides, data collected from an online form done with players, with a total of 182 answers, was analysed for the sake of testing some hypotheses and concluding that challenge difficulty, player choices and playing with friends are important features.

Keywords

Cognitive psychology; Game design; Reward system; Player behavior; Player satisfaction

Index

Folha em branco

1 What is a game after all?

"Innovation in the field—game design—can grow only from a deep understanding of these basic concepts."

—Salen and Zimmerman, *Rules of Play*, 2003

Introduction

Now you must be asking yourself about what are these basic concepts mentioned. If you thought that, great! That is exactly what will be discussed in this first chapter because it is important to at least have some basic concepts about the core of it, what constitutes a game and a bit of its potential before moving on to understand how games may engage players. Although, keep in mind this topic could have a whole research just about it and it is definitely not the purpose of this study. It will be briefly presented in order to understand that all games "share the same fundamental principles, articulated in radically different ways.". (Salen & Zimmerman, 2003, Chapter 1, p.5). And that is important to the final point when discussing about rewards: if the concept is understood for one game, it may be applied for all kinds of games.

1.1 Play concept

There are various authors (David Parlett, Clark C. Abt, Johann Huizinga, Roger Caillois, Bernard Suits, Chris Crawford, Greg Costikyan, Elliot Avedon and Brian Sutton-Smith) that have tried to conceive a definition of games and its fundamentals principles, a fact we can observe in the book Rules of Play, where Salen and Zimmerman summarized and compared some definitions (Salen & Zimmerman, 2003). Then, they themselves came up with their primary definition of what games are: an artificial system, governed by rules where players face conflicts and resulting in a quantifiable outcome (Salen & Zimmerman, 2003).

Besides this first definition, it is relevant to cite a popular referenced and quoted author in this topic, Johan Huizinga who, in his book, Homo Ludens, talked about the concept of play and defined it as a voluntary activity or occupation executed within certain field limits, which he referenced as magic circle, with time and place. Also, this field relates to rules freely accepted, binding and accompanied by a feeling of tension, joy and someway different from ordinary life (Huizinga, 1949). It seems a little philosophical to talk about games this way and, actually, it is, as Huizinga was not a game designer. But it is necessary to demonstrate his perspective and definition of play because it is related to the core of games.

1.2 Games' principles

As for a game designer definition, if you want to categorize it, more modern than Huizinga's (1949), Rogers (2014) defined games as an activity that has rules, which requires at least one player, has a win and lose condition and needs a clear objective. Games then set up a framework with which players think (Squire, 2012).

We may then come up that games have rules, takes place in somewhere different from ordinary life, an activity done by a player with a defined goal and accompanied with an emotion like joy, for example. However, it seems that this is not sufficient to define the whole of what a game is and is capable of. Gee (2012) affirmed that although games have content, they are not about it, and yet, are about the player doing something, making decisions, solving problems and interacting, with the purpose meant to engage players into the game experience (Gee & Hayes, 2012). Even more than that, games are systems made up of interconnected parts, a combination of all discussed so far, with narrative content, signs and symbols, and the platform through which they are delivered, whether it may be a deck of cards or a next-generation console (Macklin & Sharp, 2012).

But we can still add some elements to our list of items of what defines a game. Authors like Eric Zimmerman and Kate Salen (2003, Chapter 1, p. 5) demonstrated essential principles of game design that will define how games work and what they are:

> "Understanding design, systems, and interactivity, as well as player choice, action, and outcome. They include a study of rule-making and rule-breaking, complexity and emergence, game experience, game representation, and social game interaction. They include the powerful connection between the rules of a game and the play that the rules engender, the pleasures games invoke, the meanings they construct, the ideologies they embody, and the stories they tell."

1.3 Into the New World games create

It is possible to summarize that all this fundamentals or game *framework,* as Squire (2012) stated and already mentioned, creates a new complex game world, with the potential not only to represent reality, but also to model it through simulations with a set of potential events (Frasca, 2001) offering worlds where participants are important and in which what you know is directly related to what you are able to do and, ultimately, who you become (Barab, Gresalfi, Pettyjohn & Solomou, 2012).

Videogames, which is a game played on a video screen (Rogers, 2014), give the players a new world to seek, participate in, being able to interact with the world and, perhaps, about language, learning and being capable of learning about the real world while thinking about

this game world which players create an empathy for (Gee, 2014). Games are complex and, because of that, it becomes:

> “an interesting medium because there are definite paralinguistic activities involved, and meaning is conveyed through gesture, space, color, sound, activity and agency. And all these can combine into engaging aesthetic experiences.” (Davidson & Lemarchand, 2012, p. 104).

1.4 Potential of games

Although it will not cover the whole potential of games, some other factors that games have potential beyond entertainment, are aspects that are worth mentioning. Besides being a complex new world system for players, Bogost (2010) said that videogames are computational artifacts that have cultural meaning, they are popular and particularly relevant medium for computational persuasion and expression. Moreover, he suggested that through procedural rhetorics, videogames have unique persuasive powers, most notably the so-called Serious Games, which have sought to create videogames to support existing social and cultural positions. Besides, he argued that it becomes instrumental tools for institutional goals and tha videogames can also disrupt and change fundamental attitudes and beliefs about the world, leading to potentially significant long-term social change.

It is also possible to discuss about specific researches associated with Massive Multiplayer Online Games (MMOGs) as it seems important to demonstrate some games characteristics and how people relates with it. As Dickey (2005) talked about MMOs design and referenced that games are becoming increasingly social environments. MMOGs are not merely designed objects; they are emergent cultures, which are created, maintained, and kept fresh through the colaboration of those who are actually interested playing them (Steinkuehler, 2008). Still, Gortari (2007) can complement this idea saying that online videogames effectively attract gamers of varying personality profiles (target audience) since games cater distinct activities like socializing, battling, role playing, exploring, customizing, building and virtual property consumption. Still, she continued her idea that this flexibility often powerfully fulfills the psychological needs of the gamer in areas like: group identification, ownership, companionship, personal catharsis, relaxation, self-expression, and disinhibition.

After all thesse concepts that were shown, we can notice that all games have some basic principles incorporated that defines them and are developed based on each of the specific game purposes, making them a powerful complex system. Inside of it, there is a lot of actions going on, where everything relates to each other, and the resulting system may include persuasion, may be used for cultural purposes, social change, socializing, learning, and purposes beyond only fun that games are generally related to. An interesting concept that

may be useful here to relate to this resulting game system is the one about mental models, defined by Susan Carey (1986, as cited in Weinschenk, 2011, p. 73):

> “A mental model represents a person's thought process for how something works (i.e., a person's understanding of the surrounding world). Mental models are based on incomplete facts, past experiences, and even intuitive perceptions. They help shape actions and behavior, influence what people pay attention to in complicated situations, and define how people approach and solve problems.”.

James Gee (2014) idea may complement Weinschenk (2011) concept by using the term mod, where humans design a world in their heads, based on past experiences, and play themselves and/or other people. While playing and using this mod, they build their own simulations/role playing sessions in their heads of what might happen in the game world if they take certain actions, make certain decisions, or engage in certain strategies. He continued saying that players are modding the game in their minds, in order to build a model of the game and game world in their heads and so testing it out before they act.

Now, just like in the beginning, you must be asking another question in your mind, however something more like: “Ok, games have all this principles, may be used for other purposes beyond entertainment, but how is it created to mean something to the player? How to make the player engage and interact with it in a way it makes sense?” That is all related to game design, which is our next topic of discussion and defined by Salen and Zimmerman (2003) as the process by which game designers create a game, to be encountered by a player and where meaningful play emerges.

2 Welcome to Game Design

"Start with a "fun" idea. As you develop the game, if you find something in the game that is not fun (or un-fun), remove it. After you have removed all the un-fun, all that should be left is the fun."
— Scott Rogers, *Level Up!,* 2014

Introduction

When talking about game design, it is a very broadly field and the purpose here will be to explain its elements based on creating a good game experience for players. The focus will be destined on presenting some game design elements that are crucial to create a good experience where players engage in it through being able to learn and interact. Also, the relation of player action and its outcome will be presented. This will be important to comprehend as we transit to Cognition (next chapter) and begin to understand human behavior and then finally focus on rewards.

2.1 Introducing Game Design

Now that we possibly have an idea on what is a game, it would be possible to start this part of the dissertation talking about what is needed to produce a game: programmers, artists, designers, producers, testers, composers, sound designers, writers, product managers, creative managers, art directors, technical directors, marketing team, and also that games are divided into game genres (Rogers, 2014). However, all these people involved produce game content, dividing them into a category and, as showed previously by Gee (2012), games are not about their content only. So, how exactly do we create the experience showed by Gee or the meaningful play by Salen and Zimmerman (2003)?

The important thing to know about game design is that, as Rosewater (2016) affirmed, designing games is all about making players enjoy the experience and making the best game possible for them. To begin with, to produce game design it seems like it needs a game designer and, Macklin and Sharp (2012), said that they can be though as orchestrating the structures that players inhabit, enliven and interpret through play. The game designer needs to answer "what can the game do?", to understand and harness the technology into a designed system that results in meaningful play by using the materials that constitute a game (Salen & Zimmerman, 2003). Through this creation, Macklin and Sharp (2012) also affirmed that players are compelled to learn how a game works, how it rewards them as they learn and this process of discovery and mastery produces a game's meaning, all for the sake of pleasure, discovery, competition, and other reasons that are often into the notion of fun.

Another author that discuss game designer and player relationship is Squire (2011) that proposed game designers need to have an answer for what goals the game will offer players, if they are going to be attained quickly, if they are clear, if players will feel compelled to continue playing, if the environment constantly advertise new and seductive things to do, always keeping an eye for checking if the game designed is producing an emotionally satisfying experience to players. As for the player side, they need to learn to read these processes as a critic, that is, playing a videogame or using a procedural system with eye toward identifying and interpreting the rules of it (Bogost, 2010). Michele Dickey (2005) also argued that depending on the genre and individual game, players may be required to analyze, synthesize, and use critical thinking, among other skills, in order to play and execute moves. She continued saying that game designers may create scenarios and events that subtly invoke these skills and that game design is at the forefront of cultivating innovative techniques for interactive design. This is because, games value different forms of thinking and suggest different modes of interpretation (Squire, 2012).

This will result in players developing a literacy of games as they learn through the playing of a variety of games, because a good game (a well designed one) can teach players how to play it through the very act of playing it as stated by Davidson and Lemarchand (2012).

2.2 The context of Game Design

When talking about what are games, Gortari (2007) said that online videogames effectively attract gamers of varying personality profiles since the games cater distinct activities. But this is not specific to online games, it is about all kinds of games and the activities it envolve. Rosewater (2016) warned that this aspect of games are important to always remember when designing games' components for the audience it is intended for, since when aiming to please everyone, often, he spoke, no one is pleased, because, if the game is played by one or more players, not all of them want the same thing from it. So, understanding what different kinds of things your players want is key to understand what kind of different players you have or want your game to have. He then concluded that if other players do not like your game or a specific feature, it does not matter, because it is not designed for them, but the game designer must know for whom they are designed for. It seems obvious that different types of players like different types of games (Gee & Hayes, 2012).

The process of designing games, as mentioned by Bogost (2010), can also be something which the cultural value of videogames goes beyond even the longitudinal experience of an individual. Besides, even over the course of many lives, generations, eras of human experience and videogames designed by a person. He also claimed that games make claims about who we are, how our world functions and when they are played today, it may have meaning now, but they also will defer that meaning for future players who will experience these artifacts in different contexts.

2.3 Matching the Designer Concept with the Player's Concept

Beyond the target audience of your game, remember when it was presented and talked about the concept of mental models by Weinschenk (2011)? She also affirmed that people create mental models often before even using the software or device, that it comes from their prior experience with similar, or not, softwares or devices, assumptions they have, things they have heard others say and also from their direct experience with the product or device. People refer to mental models to predict what the system, software, or product is going to do, or what they should do with it. Eysenck and Keane (2010) calls this process by reproductive thinking, which involves the re-use of previous experiences.

Mark Rosewater (2016) noticed that this resonance, that people have preloaded in them, is important and the game designer can build upon and use these emotional preexisting responses to their advantage. This way, creating a rich emotional game experience. Besides that, he complemented this resonance idea saying that it has another important feature that is teaching a game mechanics, something he calls piggybacking: use of preexisting knowledge to front-load game information to make learning easier. His example comes from the game Plantz vs Zombies (PopCap Games, 2009): you don not have to teach the player that the plants will not move in the game, since when a plant is planted, it already means that it is fixed.

According to Weinschenk (2011, p. 74), here is why you should care about matching your game concept with the players mental concept of it: “if there is a mismatch between the person's mental model and the product's conceptual model, then the product will be hard to learn, hard to use, or not accepted.”. So, make sure if you are designing, for example, a pirate game, and you decide to add some robot aliens inside of it, make sure to have a coherent and clear explanation to support that, otherwise, as robot aliens and pirates often do not belong to the same context or universe, the game will feel strange to players. Don not confuse interesting (intellectual stimulation) with fun (emotional stimulation), because people tend to act less based on facts and more on emotions and when you speak to the player on an emotional level you are more likely to create player satisfaction (Rosewater, 2016). So, Rosewater (2016) suggested, as a good practice, make sure everything in the game makes sense and contributes to the emotional output.

Consequently, games must be cleverly designed and, in order to check if everything designed and implemented inside the game matches players' desires and expectations about it, games involve hours of play-testing, sculpting the player's experience and making it feels like a warm hug (Squire, 2011), also, in order to know what to insert in your game you have to understand what comes out (Rosewater, 2016). Sometimes for these tests, soon after the

game concept is ready and to confirm it is fun and the core mechanics works, game designers may use, as defined by Gee (2008), models, that are just depictions of a real thing (like planes or cars) or a system (like atomic structure, weather patterns, social systems) that are simpler than the real thing and used for imaginative thought, learning, and action, when the real thing is too large, too complex, too expensive, or too dangerous to deal with directly.

After a bunch of tests, if for some reason we find out something does not contribute to the overall experience, or it is not working the way it was designed for, or it is just not fun, remove it, because we need to focus on what emotion our game is trying to evoke, what we want our audience to experience (Rosewater, 2016). Then, we can move on to actually developing the game and keep iterating it with players.

2.4 Learning the Game World

It is possible to already know that games offer people experiences in a virtual world and they use learning, problem-solving, mastery for engagement and pleasure, that game design uses learning theory and game designers have discovered important principles of it without needing to become academic learning theorists (Gee, 2008). This learning features are key aspect of good game design and games designed around problems people could not learn to solve and did not enjoy solving simply would not sell (Gee & Hayes, 2012). Games are carefully crafted learning experiences and not only open environments, being more polished in game experiences than in content, always refreshing themselves and offering new lessons the more players play (Squire, 2011).

To better understand how game worlds are created and how the player learns along their journey through achieving game goals, we will use Gee's (2014) concepts that game designers design a world that is, like all worlds for us humans, readable like a text and players must read this world in order to win the game or else, if they cannot read it well, they cannot play the game. Game designers take the syntax and semantics of the real world (or some other visual world) and make on top of it another syntax and semantics for the game, which is based on actions and affordances— we will discuss this later— for actions to solve specific sorts of problems. Furthermore, there is a guidance inside the game that teaches players how to achieve their goals and it comes from the game design itself, from the Non Player Characters (NPCs), that is, any character that has from a basic to a complex artificial intelligence inside the game, the environment from information given “just in time” and “on demand”, from other players in and out of the game, and finally from the resources of communities of practice built up around the game (Gee, 2008).

For the purpose of learning, players may act in the game world and it respond and generate responses that guide further player action, generating a conversation between the player and the game world (Gee, 2014). And from this relationship between player action and the

system outcome, that is exactly when meaningful play emerges which is the goal of successful game design (Salen & Zimmerman, 2003).

2.5 Living into the designed experience

At this point, we already know from Salen and Zimmerman (2003) that meaningful play is important and it must be discernable, which means players must perceive the system responses after their actions. Also, it must be integrated into the larger context of the game, not only having immediate significance but also affecting the play experience at a later point in the game. Now using Gee and Hayes' (2012) concept, players have to keep acting in the game and understanding if their actions are working through comparing with the game responses, checking if their actions results brings them closer to their goal and, if not, how they can act in a way that they proceed towards success.

This way, Bogost (2010) said that in a procedural representation like a videogame, there is a possibility space which refers to the myriad configurations the player might construct to see the ways the processes inscribed in the system, game world, work. This is really what we do when we play videogames: we explore the possibility space its rules afford by manipulating the game's constrols.

However, the question here is: How exactly players act inside this game world we've been talking so much about? And the answer is through something called avatar.

2.5.1 Avatar

An avatar is an identity that a player inhabits when playing games (Gee, 2014) and there is something magical about this transformation, that let us enter the world of the game and uses this new identity to perform actions inside the game (Schell, 2014). Schell (2014) continued his explanation about the relationship between player and avatar by saying that sometimes it will make players feel distinctly apart from the avatar, but other times when the player’s mental state is completely projected into the avatar, this relation will be to the point that the player gasps if the avatar is injured or threatened. This should not be completely surprising. After all, we have the ability to project ourselves into just about anything we control.

An interesting study similar to this concept is from Iacoboni and Mazziotta (2007) about humans' mirror neurons, that is critically involved in imitative learning through neural interactions and may provide a simulation-based form of empathy. We humans take on different identities in different contexts of our lives, as one and the same person can talk and act, at different times and places, as an executive, a husband, a biker, a hip-hop fan, a gamer, and an African-American of a certain sort (Gee, 2014).

Gee (2014) explained it is through controlling the avatar that the player aligns with the game

world, using it to perform physical actions in the game and so avatars determine what the player can and cannot do as they can differ from other avatars, be it inside the same game or a different one. Besides, it's the avatar that determines the affordances for actions in the game, the abilities the player must have or gain, using its tool-kit for accomplishing goals and solving problems in the game.

Although, not all games have a clear avatar like Mario (Nintendo, 1993), Sonic (Sega, 1991), Pac-man (Namco, 1980), Kratos (SCE Sony Santa Monica, 2005), Gee (2014) explained that this kind of game, known as “god games”, the avatar still exists as a minimal form, letting players to perform actions like to get miners to mine, soldiers to train and fight, to build armies and cities, to create religions, and so forth. This way, "god games" use this type of avatar because in such games players need to consider a whole world or system in "big picture" terms and make decisions about different parts of the world or system based on that big picture. For instance, in a game like Tetris, players as a puzzle-solving god, just manipulate falling blocks and with this minimal ability they must use it to their best effect.

2.5.2 Acting in the Game World

Our designed world invites players to have the opportunity to act in it using the avatar. Rosewater (2016) warned to give players a diversity of choices, details, resources, paths, customization and letting things to be discovered. If players find things or game designers design features to allow players to feel that what they choose inside the game is theirs, they will be more invested in playing. As he continued, players want something from the game that feels like an extension of themselves, something in the details that they will fall in love with —that they feel strongly attracted to it and wants to come back to the game— as they explore their choices. And this is extremely important: players have to have a personal connection with the game. This way, the argument of Rosewater's is that it is not the players job to find the fun in your game, it's yours as game designer. When players sit down to a game there is an implied promise from the game designer they will do whatever the game instructs them to do to achieve the desired goal, even if it is not fun, but, if they didn't have fun when your game ends, they will blame the game, he concludes.

To complement Rosewater idea of players feeling that something is theirs, Susan Weinschenk (2012) said that people like autonomy, to feel that they are doing things on their own, with minimal help from others, doing it the way they want to and when they want to do them.

The way players are able to act inside the game may emerge meaning, that is, understanding what does it punish, reward, its strategies and styles (Johnson, 2012) and being able to achieve the desired goals designed by the game designer, is the subject of discussion we will be talking about now and was already mentioned, which is via affordances.

2.5.2.1 Affordances

For all these players's actions to happen, it is important that they are able to read the

environment (Gee, 2014), and the game designer must make sure that the objects in the environment are easy to see, easy to find, and have clear affordances (Weinschenk, 2011). Further than that, we need to really see the shapes, colors, proportions, shadows, reflections, textures and its relationship to its environment and the people who use it, to see its function and meaning as we view the game artwork (Schell, 2014). Without this, players don not understand the world they are in and are not able to play the game.

In Gee (2014), he used the concept defined by Gibson (1979) that an affordance is what things are good for, based on what someone can do with them. Moreover, in Gee (2008b) an affordance is a feature of the world (real or virtual) that will allow for a certain action to be taken, but only if it is matched by an ability in an actor who has the wherewithal to carry out such an action. For example, in the massive multiplayer game World of Warcraft (Blizzard Entertainment, 2004) stags can be killed and skinned (for making leather), but only by characters (avatars) that have learned the skinning skill. So a stag is an affordance for skinning for such a player, but not for one who has no such skill. Gee (2008b) continued saying that players then must think in terms of "What are the features of this world that can enable the actions I am capable of carrying out and that I want to carry out in order to achieve my goals?", this way the are able to perform actions that will lead to a successfully accomplishment of their goals.

2.5.2.2 Goals

Players inhabit an avatar and look for affordances in the game. But why is that? Because good games let players match skills to the environment to create affordances for accomplishing goals and not only that, but also, when we are goal-driven with an eye for surprise, we look for new, innovative, or hidden affordances or effective abilities (Gee, 2014). This is important because as players discover the world, it is possible to design in a way to let them also make up their own goals, based on their own desires, styles, and backgrounds, producing a highly motivating state (Gee, 2005), which will make players have a personal connection with the game (Rosewater, 2016).

So, players must see important details and patterns that will allow them to act successfully, looking past irrelevant details to see where the affordances will lead to problem solving and completing goals in the game world (Gee, 2014). And since designers do a lot of work to make goals compelling to players and seducing them into pursuing them, a suggestion would be to make goals as doable in a short amount of time and providing overlapping goals, so players always have something to choose to do and in a short period of time inside the game (Squire, 2011).

Consequently, a good game can and should teach players what they need to know and do in order to succeed, and the very act of playing the game should enable players to master the game-playing units of the gaming situation so that they can master the rising challenges and

complete the experience successfully (Davidson & Lemarchand, 2012).

After all, players must be able to progress in the game because people like to feel they are making progress as they are learning and mastering new knowledge and skills (Weinschenk, 2011). She continued saying that mastery is a powerful motivator as even small signs of progress can have a large effect in motivating people to move forward to the next step, which relates to the short-term goals stated by Squire.

In his book, Gee (2014, p. 30) considered something he named going mindfully meta:

> "(a) thinking about something as a system; (b) seeking to understand in a conscious, over what how the system works; (c) learning to articulate one's understanding in an appropriate and useful form of language; and (d) sharing knowledge with others so claims can be revised by others and knowledge can accumulate and spread. [...] I call this "going mindfully meta" because it crucially involves overtly thinking about—bringing to conscious awareness—things we often do only unconsciously, know tacitly, take for granted, or engage with on automatic pilot."

He continued by saying that gamers see the game world in terms of what game designers (or people related with games) call game mechanics: what you can do with features in a game. So gamers see the game world in terms of verbs (actions): crates are good for breaking, ledges are good for jumping, shadows are good for hiding, and so forth.
Gee (2014) completed his idea by explaining that games speak to players in terms of affordances for action and players speak back to games in actions. In doing so, they carry on a conversation with the game about how to accomplish successful actions and accomplish the game goals.

2.5.3 Flow

While players act in the game world, what we can find in Davidson and Lemarchand (2012) is that in a well-designed game, the experience is kept pleasurably frustrating: it is not too easy, nor is it too hard. Ideally, you get increasing challenges followed by a reward and possibly increased abilities that make it a little less challenging for a bit, but it soon ramps up again. To support their thought, Davidson and Lemarchand (2012) refered to various authors. The first one is Crawford (1984, as cited in Davidson & Lemarchand, 2012, p. 101) that said that this pleasurably frustrating experience is a smooth learning curve in which a player is enabled to advance successfully through the game. The second one is Costikyan (2001, as cited in Davidson & Lemarchand, 2012, p. 101) who noted that "play is how we learn" and move from one stage to the next in game. The third one— probably the most common one cited in game theories about this inside game progress of players— is Csikszentmihalyi's (1991, as cited in Davidson & Lemarchand, 2012, p. 101) notion of flow, in which a person achieves an optimal experience with a high degree of focus and enjoyment, is an apt method for

discussing this process as well. And the last author, Gee (2004, as cited in Davidson & Lemarchand, 2012, p. 101) noted that well-designed games teach us how to play them through rhytmic, repeating structures that enable a player to master how to play the game. Also, he continued saying that in terms of unit operations, the units are being justaposed well so that meaning and mastery build as you play, and he believes that this creates an aesthetic experience unique to games.

Another author that discussed flow, especially the work of Mihaly Csikszentmihalyi (n.d), is Daniel Kahneman (2012), who said that he (Csikszentmihalyi) have done more than anyone else to study this state of effortless attending. By the later one words, people who have experienced flow describe it as a state of effortless concentration so deep that they lose their sense of time, of themselves and of their problems.

Flow is important to keep players engaged and creating a place where players may test their hypotheses progressively, figuring out how to play and the rules of the game (Gee, 2014). In doing so, they master the game as they progress. Another research that may help support flow theory, comes from Eysenck and Keane (2010) that explained deliberate practice which has four aspects: first, the task is at an appropriate level of difficulty (not too easy or hard, as the flow state just discussed); second, the learners (in this case, the players) are given informative feedback their performance; third, the learners have adequate chances to repeat the task; and finally, the learners have the opportunity to correct their errors.

Flow then creates an harmony between players and the game while they interact with it. As Gortari (2007, p.7) affirmed:

> "As an engaging and pervasive activity, gaming stimulates the flow of mental state because it: Demands concentration or varying levels of attention depending on the degree of interaction, manipulation of virtual objects and reception of different stimulus; Is intrinsically rewarding, allowing users to complete tasks, accomplish goals, follow rules and experience seemingly real success, failure and control; Offers a pre-established balance between ability level and challenge; Triggers the subjective distortion of time and trance states; Enables users to lose feelings of self-consciousness via avatar manipulation and self representation where "every movement of the gamer is a game action" (Turkle, 1984, as cited in Gortari, 2007).

2.5.4 Learning

Besides the flow players reach when playing, Gee (2005) believes that what makes games so deeply motivating to trigger learning is how they are designed, and designers of many good games have hit on profoundly good methods of getting people to learn and to enjoy learning. Furthermore, making games deeply enough so that players exercises their learning muscles, though often without knowing it and without having to pay overt attention to the matter.

James Mazur (2012) complements Gee's argument when explaining operant conditioning, that might be described as "learning by doing": an animal performs some response and experiences the consequences, and the future likelihood of that response is changed. This is something players do, especially when they start playing the game, while trying to master the game and understand how its internal processes function. And, by “learning by doing”, Bogost (2010) cited another work that also focus on it: situated learning theory, which is the work of social constructionism which includes approaches like the Soviet activity theory that descended from Lev Semenovich Vygotsky (n.d) own contributions.

In order to achieve this flow and learning, it is also important to complement this idea and specify one important thing: Games play a mentorship role differently in different types of games, for the reason that different types of players find different types of games to better fit with their preferred ways of learning, but nearly all games demand persistence past failure and proactive learning (Gee, 2014). Then, Gee (2014) completes this thought by claiming that games place cognitive skills inside emotionally driven, highly motivating experiences where players care.

Another author that discussed learning is Ian Bogost (2010), who cited the work of Edward Thorndike (n.d) and B.F. Skinner (n.d), saying that learning is about reinforcement. Thus, organisms respond to positive and negative incentives and when they find themselves in similar situations with similar incentives, they will respond in similar ways. Transfer of learning takes place via repetition and reinforcement, which is something that can be related to the argument of Eysenck and Keane (2010) when flow was presented.

Bogost (2010) also used the work of Jean Piaget (n.d), to say that the understanding of learning became more connected to theories of mind, correcting the immoderate scientism of behaviorism. Also, the cognitive structure of the individual, constrained by a particular stage of development, undergirds the learner' ability to actively construct new ideas based on his or her experiences and past knowledge. Constructivist learning, then, assumes that the learner constructs knowledge individually, that learning is inseparable from the learner's interaction with the environment. As already shown, especially while discussing flow, players seek to interact in the environment, receive a response from it and by doing it, learning what choices are better suited to achieve a determined goal.

2.5.4.1 Learning Principles

Although we are not far from finishing the overall discussion about game design and get to the final stage players face after completing goals, which is the focus of the this research, it will be introduced and discussed psychological concepts into the knowledge developed about learning we have been discussing until now.

It has been cited already about some features games may perform to create a good experience along our journey so far, but it will be used a summarized version of Gee (2005b) literature to present some of the learning principles incorporated in games:

- **Identity**: It has been presented when talking about avatars, which is when players inherit a strongly formed and appealing character;
- **Interaction**: Games do talk back. In fact, nothing happens until a player acts and makes decisions. Then the game reacts back, giving the player feedback and new problems;
- **Production**: Players may be producers, not just consumers; they may be "writers" not just "readers". Even at the simplest level, players may co-design games by the actions they take and the decisions they make. For example, in a massive-multi-player game like World of Warcraft (Blizzard Entertainment, 2004) thousands of people create different virtual careers through their own unique choices in a world they share with many others;
- **Risk Taking**: Players are thereby encouraged to take risks, explore, and try new things. In fact, in a game, failure is a good thing. Facing a boss (usually, a very difficult and special opponent used in a final stage, or level, of games), the player uses initial failures as ways to find the boss's pattern and to gain feedback about the progress being made;
- **Customization**: Players can usually, in one way or another, customize a game to fit with their learning and playing styles, which is something Rosewater (2016) also discussed so players feel related to the game. Also, games often have different difficulty levels and many good games allow players to solve problems in different ways;
- **Agency**: Thanks to all the preceding principles, players feel a real sense of agency and control. They have a real sense of ownership over what they are doing, as Weinschenk (2011) warned that people like to feel in control of their actions;
- **Well-Ordered Problems**: In good video games, the problems players face are ordered so that the earlier ones are well built to lead players to form hypotheses that work well for later, harder problems. It matters how the problem space is organized— that is why games have "levels". This is related to the concept of flow we've discussed. For this, Gee (2005b) also used the concept of Davidson and Lemarchand (2012) previously demonstrated about the experience being pleasantly frustrating, that is, it feels "doable", but challenging, producing a highly motivating state for learners (players);
- **Challenge and Consolidation**: Good games offer players a set of challenging problems and then let them solve these problems until they have virtually routinized or automatized their solutions. Then the game throws a new class of problem at the players (sometimes this is called a "boss"), requiring them to rethink their now taken-for-granted mastery, learn something new, and integrate this new learning with

their old mastery. In turn, this new mastery is consolidated through repetition (with variation), only to be challenged again;

- **Just in Time and On Demand**: People are quite poor at dealing with lots and lots of words out of context. Games almost always give information either "just in time"— that is, right when players need and can use it— or "on demand", that is, when the player feels a need for it, wants it, is ready for it, and can make good use of it;
- **Situated meanings**: As Gee said, recent research suggests that people only really know what words mean and learn new ones when they can hook them to the sorts of experiences they refer to. Games always situate the meanings of words in terms of the actions, images, and dialogues they relate to, and show how they vary across them, which we can relate to the concept of affordances presented;
- **System Thinking**: Games encourage players to think about relationships, not isolated events, facts, and skills. This way, games make players think how their actions contribute or have an impact in the overall world they are in;
- **Explore, Think Laterally, Rethink Goals**: Games encourage players to explore thoroughly before moving on too fast, to think laterally and not just linearly, and to use them to reconceive one's goals from time to time;
- **Smart Tools and Distributed Knowledge**: Related to the topic discussed about actions the virtual characters, avatars, lets players do inside the game, here Gee (2005b) only emphasized avatars as "smart tools": they have skills and knowledge of their own which they lend to the player;
- **Cross-Functional Teams**: Games like World of WarCraft (Blizzard Entertainment, 2004), often are played in teams (parties) in which each player has a different set of skills (say a Mage, a Warrior, or Druid). Players must each master their own specialty (function), since a Mage plays quite differently than a Warrior, but understand enough of each other's specializations to integrate and coordinate with them (cross-functional understanding). Furthermore, in such teams, people are affiliated by their commitment to a common endeavor, not primarily by their race, class, ethnicity, or gender;
- **Performance Before Competence**: Players can perform before they are competent, supported by the design of the game, the "smart tools" the game offers, and often, too, the support of other, more advanced players.

2.5.4.2 A brief explanation of Learning and why it is important to relate it with Games

As we approach our psychological concepts to relate with games, it is time to incorporate a little bit of it as a transition to the next chapter. And to do that: What is learning? And what is its relationship with games?

To help find these answers, Mazur (2012) defines that, although even specialists have difficulty defining the term learning precisely, as learning is a very broad field, most would

agree that it is a process of change that occurs as a result of an individual's experience. Not only the process of learning is studied, but also, the product of it—the long-term changes in an individual's behavior that result from a learning experience. Then, as he continued his argument, many researchers from both the behavioral and cognitive traditions have adopted the idea that learning involves the formation of associations and, there is now abundant evidence, that learning experiences can lead to the growth of new synaptic connections between neurons in the brain.

One principle of Mazur's (2012) work can be introduced into the discussion and, as defined by him, one of the oldest ones of associative learning: the principle of frequency. It states that the more frequently two stimuli are paired, the more strongly will an individual associate the two, and to sum to this idea, are the ones of affordances players look for inside the game as proposed by Weinschenk (2011) and Gee (2005).

Another concept to associate with the presented one is from Mazur (2012, p. 103) that used a formulated principle of learning, the Law of Effect (or the principle of positive reinforcement), from Thorndike (1898):

> “Of several responses made to the same situation, those which are accompanied or closely followed by satisfaction to the animal will, other things being equal, be more firmly connected with the situation, so that, when it recurs, they will be more likely to recur; those which are accompained or closely followed by discomfort to the animal will, other things being equal, have their connections with that situation weakened, so that, when it recurs, they will be less likely to occur. The greater the satisfaction or discomfort, the greater the strengthening or weakening of the bond. […] By a satisfying state of affairs is meant one which the animal does nothing to avoid, often doing such things as attain and preserve it. By a discomforting or annoying state of affairs is meant one which the animal commonly avoids and abandons.”

Though the relation between player action and emotions will be presented soon after this section, the principle of Law of Effect is absolutely important when we relate to the discussion of players acting in the game world. Remember Rosewater (2016) words: designing games is all about making players enjoy the experience and making the best game possible for them. So, game designers must pay close attention to the results presented to players for their actions to correctly guide them through their designed game experience that they want players to interact and be engaged.

Another author to complement this topic is Skinner (n.d, as cited in Mazur, 2012) and according to him, when comparing his pigeons experiments with cats' behaviors experiments of Guthrie and Horton (1946), the distinctive behaviors developed in them were because the distinctive styles that happened when they moved the pole while in the experiment: Whatever behavior happened to be occuring when the reinforcer was delivered was

strengthened. If the first reinforcer occurred immediately after a pigeon had tossed its head upward, this behavior of head tossing would be more likely to occur in the future.

Finally, to reinforce the power of reinforcement, Mazur (2012) claimed that learning theorists, especially those who specialize in operant conditioning, have generally believed that reinforcement exerts a simple but powerful influence on behaviors: Behaviors that are reinforced will increase in frequency, and those that are not will decrease and eventually disappear. As long as a behavior such as pressing a lever, stepping on a platform, or pulling a chain occurs once in a while, it is possible to patiently wait for the desired behavior to occur, follow it with a reinforcer, and expect the frequency of that behavior to increase (Mazur, 2012). Mazur named this the stop-action principle that can be used to increase the frequency of any behavior that is part of the subject's repertoire.

That is to say, in a simpler way, that players look for patterns (affordances) in the game world. So they act in it as they form relations. They get a response (feedback) from it. Then, they produce (learn) a relation between the action and its outcome. If the resulting action produces a satisfying outcome, players are more probably to do it again. If not, they may learn about their mistake and choose a different action that will result in a favorable outcome. Thus, players will progress through this learning process throughout the game to achieve their objectives. And it is really something game designers must pay attention to the details of the information given, so the game may evoke the correct emotion desired by them, resulting in an enjoyable experience for players, as showed so far which is the main function of game designing.

To finish and complement this topic, Ansari, Montoya, & Netzer (2012) showed that several types of learning rules have been explored, including belief (players form their beliefs based on the opponent’s prior decisions and determine the best response based on the expected payoff), reinforcement (strategies that paid off in the past get reinforced), and imitation learning (implies that players may learn by imitating the action of others).

2.6 Information, Emotion and Feedback

In Susan's work (Weinschenk, 2011) we encounter the concept of progressive disclosure, which, by the way, is related to Gee (2005) discourse of providing only the information people need at the moment and thus, by giving them a little information at a time. This way, avoiding overwhelming people (players, in this case), and also address the needs of different people— some may want a high-level overview, whereas others are looking for all the detail.

The ability to control and focus attention while providing information is critical, warns Weinschenk (2011). As she affirmed, people only let in information that fits with the goal, as research shows that they need to feel that they have a good chance of completing the goal to get into, and hold onto, the flow state. She also said that if people think they have a good

chance of failing at the goal, then the flow state will not be induced. This is important for the game designer to manage the information given to the player, inside the game world, to guide them through their actions without letting them get confused and lost between a lot of information happening inside the game in a given moment.

Other relevant aspect to consider, as noticed by Gee (2008), is that human emotion plays a variety of important roles in thinking and learning. First, because the more an emotional information charge on us, or we feel something is at stake or matters, we store it more deeply and better integrate with our prior knowledge when processing information. Second, he said that emotions can often help us focus our attention on what is important. Third, emotions assist us in evaluating information and action. When we act in the world, we get feedback from the world, and something happens. But we have to know how to evaluate or assess the meaning to make usefulness of this result. While this most certainly involves rational judgments based on norms, it also involves weighted choices of what to do next in terms of how we feel, what we care among those choices. If a person has no such emotional weighting, he or she can be paralyzed in choosing among equally good possibilities and left unable to act or decide (Gee, 2008).

However, Gee (2008) warned that while emotions can facilitate thinking and learning, they can also frustrate thinking and learning like high stress, too much frustration, powerful anger, or intense fear can overwhelm our thinking and shut down our learning. In good games, Gee (2008) continued, players feel that their actions and decisions co-create the world they are in and shape the experiences they are having as their choices and what they do matters. This will produce the feeling that the game is an extension of themselves and people feel attracted to it (Rosewater, 2016).

For instance, Gee (2008) showed that one way in which they have done this is to focus on “distributed cognition” or “distributed knowledge.” (already discussed in Gee (2005) learning principles). These terms are meant to describe the ways in which people can act smarter when they combine or integrate their own individual knowledge with knowledge that is built into tools, technologies, environments, or other people. One of the fascinating things about modern video gaming is that game designers have discovered that people find great pleasure, excitement, and fun in organizing themselves into cross-functional teams. Though such teams have given rise to high stress and a lot of tensions in workplaces, millions play on such teams for pleasure in games like World of Warcraft (Blizzard Entertainment, 2004).

Thus, it may be noticed that the information and emotion related to it while players experience the game is something game designers must not take for granted and must be very careful while designing what information are being given to players. Thorndike's (1898) Law of Effect cited by Mazur (2012) is crucial for this matter. In order to do that, game designers use something already discussed but was not the focus of the discussion, which is giving

players feedback. Even more than that, Weinschenk (2011) declared that to stay in the flow state, people (players) need a constant stream of information (constant feedback) coming in that gives you feedback as to the achievement of the goal. Thus, she suggested to make sure to build in lots of feedback messages as people perform the tasks. Take care not to overload players, though.

To conclude this chapter, after all that has been presented, it is time to introduce the part of the game this work is destined for. Although it has already been mentioned earlier, after showing the feedbacks presented to players, it's about time to present it formally: the reward system of a game and its influence in players game experience and behavior. This is nothing more than the results presented to players after completing their tasks or achieving something important. But first, it must be presented a discussion about human cognition, persuasion and how people may perceive stimulus which are things very important to understand or, at least, comprehend that there are things that may drive human behavior. Then, a whole section will be dedicated just to analyse rewards. For now, before the next part, a quote from Bogost about how games may influence people's lives:

> “The humanities attempt to get to the bottom of human experience in specific situations, to expose their structures. Procedural media like videogames get to the heart of things by mounting arguments inherent in them. When we create videogames, we are making claims about these processes, which ones we celebrate, which ones we ignore, which ones we want to question. When we play these games, we interrogate those claims, we consider them, incorporate them into our lives, and carry them forward into our future experience. When we read books, watch cinema, view art, attend theater, listen to music, pore over comics—and indeed when we play videogames—these media influence and change us. They contribute to the type of person each of us becomes, each text, each film, each song, each game making a mark, a unique inspiration or aversion. Humanistic approaches to cultural artifacts could be seen to trace the procedural construction of human subjectivity—the interlocking logics, histories, and cultural influences recent and past that drive our perspectives on new challenges. As the name suggests, the humanities help us understand what it means to be human, no matter the contingencies of profession, economics, or current affairs.” (Bogost, 2010, p. 339)

3 Cognition

"The world makes much less sense than you think. The coherence comes mostly from the way your mind works."

—Daniel Kahneman, *Thinking, Fast and Slow*, 2012, p. 58

"Ask yourself if you are really having fun, because there is a chance that there are psychological effects that lead you to play when you are not actually having it."

—Johnny Soraker, *The ethics of exploiting psychological research in videogames*, 2013

Introduction

It is finally time to introduce, once and for all, the psychology concepts into this study— it was already introduced a bit of it before, as when presented with the learning aspects in the previous chapter. More specifically, cognitive psychology will be the theme that will be related to all the game process that has been discussed so far. This chapter will try to relate everything discussed so far and relate it to the concepts that will now be discussed. And finally, as the final part of it, will end up discussing about rewards, which is the focus and final process of our discussion: players enter the game, learn it, identify goals, make actions, receive feedbacks till they finish their goal and receive a reward for it.

3.1 Defining Cognition and Cognitive Psychology

Looking for the meaning of cognition in the Oxford dictionary ("Cognition", 2016) it is possible to find it to be: "The mental action or process of acquiring knowledge and understanding through thought, experience, and the senses." and a complement that states that it is "a perception, sensation, idea, or intuition resulting from the process of cognition.". Does something come to mind when presented with this definition? Is it possible to relate with something? No? Then let the mind works a little more as the concept is explained.

In his study and previously presented, Mazur (2012) presented about the growth of new synaptic connections between neurons in the brain as a result of learning experiences. Now, to add to his statement, he also claimed that this neurons compose the nervous systems of all creatures and whose major function is to transmit information. This information may be sensed by humans in consciousness and, when arguing about what is consciousness, Colman (2001, as cited in Eysenck & Keane, 2010, p. 160) defined it as "the normal mental condition of the waking state of humans, characterised by the experience of perceptions, thoughts, feelings, awareness of external world, and often in humans… self awareness.". Eysenck and Keane (2010, p. 607) also quoted authors like Tononi and Koch (2008), who said that "the most important property of consciousness is that it is extraordinarily informative. This is

because, whenever you experience a particular conscious state, it rules out a huge number of alternative experiences.”.

Another concept to mention is cognitive psychology, defined by Eysenck and Keane (2010, p.1) as “ concerned with the internal processes involved in making sense of the environment, and so deciding what action might be appropriate to take”. They also say that these processes include attention, perception, learning, memory, language, problem solving, reasoning, thinking and, to conclude, they define cognitive psychology as involving the attempt to understand human cognition by observing the behavior of people performing various cognitive tasks.

It was already presented the mod concept argued by James Gee (2014), however, his concept may also be able to associate with characteristics of sensing the environment and deciding what action might be taken. He then quoted Hood (2012) and Kahneman (2011), to say that the human power to simulate and role play in their heads are the basis of consciousness.

Another argument by Gee (2014), is how humans can process the world: aesthetically and goal-driven. The first, related to humans revealing in details without pushing themselves to accomplish any very specific goal beyond enjoyment or appreciation. As for the second, humans look just for what they need to accomplish a specific goal, looking past any details that are irrelevant to their goal.

3.2 Human Attention

By now, it may be possible that it already came to mind what this all was supposed to be related with: games. Yes, games! The thing that has been shown until now. Remember the concepts of Weinschenk (2011) and Rosewater (2016) that people already have experiences and ideas when they meet with your product (games, in this case). Besides, others authors' concepts presented can be related to this topic when discussed about learning and the processes players pass through when living in the game that was designed for them. It is all about information, knowledge, perception, ideas, sensations, awareness of the world (be it the real one, Earth, humans live or the one humans become avatars to live in, games), and this is exactly what cognition is about as it was presented just now. So both, games and cognitive psychology, are related and as the journey of this research goes deeper into psychology, the possible ways to relate with games will be associated.

First of all, Eysenck and Keane's (2010) research demonstrated that the process of humans perceptions occurs first by reception (absorption of physical energy by the receptors, then transduction (the energy recepted is converted into an electrochemical pattern in the neurons), and finally, coding (a direct one-to-one correspondence between aspects of the physical stimulus and aspects of the resultant nervous system activity). By this means, it is how humans process information. It is important to notice, though, that people do not always

process all information presented, and it's something relevant to pay attention when game designers are thinking about their in game feedback that will be showed to players. As Eysenck & Keane (2010, p. 149) argued:

> "Our belief that we have a clear-detailed representation of the visual environment is approximately correct, but we are mistaken in assuming that our attention will automatically be drawn to important events. It has also been found that changes not detected at the conscious level can nevertheless influence cognitive processing and behavior."

There are studies about this influence beyond humans' consciousness level and will be briefly covered soon in a specific section just to show that unconscious things may influence human behavior. By the way, continuing what Eysenck and Keane (2010) presented, they also said that what we attend to in the real world is largely determined by our current goals and emotional states— they warn though, that in most research, what people attend to is determined by the experimenter's instructions rather than their own motivational or emotional states, which is something that will be discussed later when faced with authority.

Previously, it was discussed the concept presented by Weinschenk (2011) about how people have focused attention in things related to their goals. This may seem good, but it also may have problems. As she affirmed, it is possible that people can easily miss changes that occur in the environment or system their paying attention to if they do not expect changes to appear. To define this phenomenon, she quotes Chabris and Simons (2010), calling it inattention blindness or change blindness. To integrate more ideas into hers, Eysenck and Keane (2010) argued it occurs by the failure to detect that an object has moved, changed, or disappeared. As they also presented, inattentional blindness happens when the presence of an unexpected object in a visual display is not consciously detected. A famous example of it that can be checkd out, is the demonstration in the book The Invisible Gorilla, by Christopher Chabris and Daniel Simons (2010, as cited in Kahneman, 2012). He described the experiment as follows:

> "They constructed a short film of two teams passing basketballs, one team wearing white shirts, the other wearing black. The viewers of the film are instructed to count the number of passes made by the white team, ignoring the black players. This task is difficult and completely absorbing. Halfway through the video, a woman wearing a gorilla suit appears, crosses the court, thumps her chest, and moves on. The gorilla is in view for 9 seconds. Many thousands of people have seen the video, and about half of them do not notice anything unusual. It is counting task – and especially the instruction to ignore one of the teams – that causes the blindness." (Kahneman, 2012, p. 23)

This is extremely relevant and important to relate with games. Why? Because games, as noticed through facts presented so far, show players a lot of information, be it one or more at

once, to try to guide and show them feedback about what is going on. And it is exactly when change blindness becomes important because, as Eysenck and Keane (2010) showed, whereas most studies of perception consider visual processes applied to single stimuli, those on change blindness are concerned with dynamic processes in visual perception over time applied to two or more stimuli.

To complement it, Weinschenk (2011) said that for people to pay attention to something, you must be able to sense and perceive it (ex: sight, sound, smell, touch, taste), and it is not as simple as it sounds, because your senses may perceive a stimulus, but that does not mean that you are paying attention to it. She continued by claiming that people are unconsciously aware that they have limited resources, and the brain therefore decides what it really needs to pay attention to and what it can ignore.

To try to solve these matters, Weinschenk (2011) explained loads, which are three kinds of different demands that it is possible to make on a person, and the best example of purposely increasing loads is gaming. Basically, loads' demands are: cognitive (which includes memory), visual, and motor. She gave for instance, that to grab someone's attention you might add visual information (pictures or anything that moves like animations, video or blinking) or use color, size, sound (loud noises) and thereby increase the visual load of the product.

Another phenomenon that may happen with human perception and worth mentioning is masking, that happens when an initial visual stimulus is followed shortly afterwards by a second visual stimulus, which this later one often prevents conscious perception of the first (Eysenck & Keane, 2010). This way, game designers can not create the world they intent to by simply throwing a lot of information for players believing every piece of it will be assimilated. There must be this kind of concern with the phenomena presented so the information can be correctly assimilated and interpreted for those who are playing the game.

Finally, in the attempt to engage players in world they are in, where lots of information are being given to them, Gortari (2007, p.5) study may help understand what can be done:

> “The most popular and sophisticated online communities expose the user to rapid and frequent reception of sensory stimuli through multiple channels: synchronous gamer initiated interactions, vivid real-time three-dimensional feedback of subjective actions, availability of flexible virtual object management, social interaction, an opportunity for projection of fantasy, and the exercise of the imagination within malleable fictional and pervasive environments. All of these contribute to a highly engaging gaming environment.”

3.2.1 Problem solving, transfer and expertise

James Gee (2014) study demonstrates that games are related to problem solving, achieving goals and making use of previous knowledge of players. The player discovers or forms goals

within the simulation and in order to reach them, by recognizing problems and solving them from within the simulated world. This essentially means that the player must figure out the rule system (patterns) that constitutes the simulation (the rules that the simulation follows thanks to how it is designed). He concludes by arguing that players must discover what is possible and impossible (and in what ways) within the simulation in order to solve problems and carry out goals, and thus achieving them constitutes the win state for the player.

About this, Mayer (1990, as cited in Eysenck & Keane, 2010) defined problem solving as the cognitive process of direct transforming a given situation into a goal oriented one when no obvious solution is available to the problem solver. Besides, by the own authors words, there is also something known as transfer, which is concerned with the beneficial (or adverse) effects of previous learning and problem solving on some current activity or problem, as we are constantly making use of past experiences and knowledge to assist us in our current task. This way, by solving things inside the game and acquiring knowledge of how the world works, players achieve expertise, defined by the authors as problems requiring considerable knowledge and a key reason why experts perform tasks at a much higher level than novices: their ability to transfer or make use of their stock of relevant knowledge acquired previously.

By this means, this areas all involve problems requiring individuals to generate their own options, and then to use their ability and knowledge to select the best choice from the options (Eysenck & Keane, 2010). This generates the feeling that players may act by their own ideas or strategies generated, feeling connected with the game (Rosewater, 2016) and that their choices matter (Gee, 2008).

When confronted with a problem to solve inside the game, players may solve it by different methods using the choices available by the game. In their study, Eysenck and Keane (2010) presented these problems by showing that there are well-defined problems which all aspects of the problem are clearly specified (initial state or situation, the range of possible moves or strategies, and the goal or solution). Also, knowledge-rich problems are ones that can only be solved by individuals possessing a considerable amount of specific knowledge (experienced players). To finish their argument, they presented the contrast of the previous one, or knowledge-lean problems, which do not require the possession of such amount of knowledge, because most of the necessary information is given in the problem statement.

3.2.2 Influencing thoughts: priming and inner desire

In his research, Daniel Kahneman (2012) began by arguing that you cannot trace how you came to the belief that there is a lamp on the desk in front of you—among other examples using voice and threat detection—before you became consciously aware of it. He claimed that the mental work that produces impressions, intuitions, and many decisions goes on in silence in our mind. Although it will not be covered a deeper knowledge on this field, it is relevant to demonstrate some examples and notice that it exists and may influence human behavior.

Kahneman (2012) said that this notion that we have limited access to the workings of our minds, things that drive us that we are not aware of, is difficult to accept because, naturally, it is alien to our experience, but it is true the fact that we all know far less about ourselves than we feel we do. He also says that besides stimuli to which people pay no attention at all, and even by stimuli of which they are completely unaware, common gestures can also unconsciously influence our thoughts and feelings. Furthermore, the main moral of priming research is that our thoughts and our behavior are influenced, much more than we know or want, by the environment of the moment.

About priming, Kahneman (2012) explained that people cannot know this from conscious experience, of course, but must accept the alien idea that their actions and emotions can be primed by events of which they are not even aware, as priming is not restricted to concepts and words. For instance, he used the example that:

> "If you have recently seen or heard the word EAT, you are temporarily more likely to complete the word frament SO_P as SOUP than as SOAP. The opposite would happen, of course, if you had just seen WASH. We call this a priming effect and say that the idea of EAT primes the idea of SOUP, and that WASH primes SOAP." (Kahneman, 2012, p.52)

This all may seem even more alien to relate with games, however, notice that when game designers give players choices, ideas, to form affordances and relationships inside the game, then receiving feedback about it, it is a lot of information given and knowing that previous ones may influence future thoughts, even if people are not consciouss of it, it is something worth being aware of. This is especially important because Kahneman (2012) said that an idea that has been activated does not merely evoke another: It activates many ideas, which in turn activate even more. However, he warned, only a few of the activated ideas will register in consciousness, as most of the work of associative thinking is silent, hidden from human's conscious selves. This is something players are always doing inside the game: forming ideas as they discover about the game world and how it works.

Just to illustrate this topic a bit more, this method of influencing people's thoughts beyond their consciousness has been long used in society. Edward Bernays (n.d, as cited in Curtis, 2002), was the first person to take his uncle's (Sigmund Freud) ideas about human beings and use them to manipulate the masses. He showed corporations how they could make people want things they didn't need, by linking mass produced goods to their unconscious desires and by satisfying people's inner selfish desires. In games, this is important to relate with rewards as it may drive players in different ways, as each of them have different cravings. For instance, receiving an item, title or achieving something that will better represent players inside the game, satisfying a social need and causing an increase in their relationship with their avatar, and thus, within the game—as already discussed previously and mentioned many times already.

To relate to Bernays' (n.d) idea, Pat Jackson (n.d, as cited in Curtis, 2002), said that Bernays got from Freud the idea that there is a lot more going on in human decision making, so he began to formulate that you had to look at things that will play to people's irrational emotions. Also cited in Curtis (2002), Peter Strauss (n.d) examplied it saying that when selling something, as an automobile, do not sell it to people's intellect but, instead, that the buyer will feel better about it if they have the automobile, engaging themselves emotionally or personally with the product or service bought. This is something Rosewater (2016) discussed it's important so people come back to the game, also Gee (2014) and Schell (2014), when discussing people relationship and identity with their avatar.

Another idea worth mentioning is the quote of Daniel Yankelovish (n.d, as cited in Curtis, 2002) that products have always had an emotional meaning, the idea that it expresses who someone is and whether it is a small car, a particular music system, a clothing, these become ways in which people can spend their money in order to say to the world who they are. It may be possible to say that this relates to player ability to customize their experience. This kind of customization is a strategy that has been used in the game League of Legends (Riot Games, 2009) where players may buy new skins for their heroes (avatars in the game) to better represent and differentiate them from others inside the game.

3.2.3 Experiences, brain connections and habits

To connect human thinking and how humans are influenced by the environment, Gee (2008b) said that videogames externalize the way in which the human mind works and thinks in a better fashion than any other technology the world have. When talking about how the mind is like, he claims that the mind works as a slate waiting to be written on, mind as software and mind as a network of connections. This is relevant because players are always looking for it (affordances) to understand the designed game their playing, which is something that will contribute to their growth of knowledge and experiences.

This experiences cause physical changes in the human brain and in a few seconds new circuits are formed that can forever change the way to think about something or remember information (Weinschenk, 2011). She continued suggesting that recognition is easier than to recall a kind of information, because it makes use of context, which by the way can help you remember. For this reason, games must provide guidance through its context and not by making players remember things all the time, as they will probably forget about it, especially if they stop playing for a while and the game makes use of various kinds of buttons and actions in order to play it. This way, games may use their content to create a good contextualized environment (Gee, 2012) in order to make players feel the game as a warm hug (Squire, 2011) everytime they come back to play it and providing the best possible experience (Rosewater, 2016).

Continuing the previous idea, besides the concept of affordances discussed earlier provided by Gee (2014) and Weinschenk (2011), Mazur (2012) cited Aristotle's principles. The first one is contiguity, that is, the more closely together in space or time two items occur, the more likely will the thought of one item lead to the other (ex: chair and table). Second, is similarity, or the thought of one concept often leading to one similar concept (ex: responses orange or pear to the prompt apple). And the third one is contrast, where an item may lead to the thought of its opposite (ex: night and day).

However, Mazur (2012) warned that this list of principles seems incomplete and that other factors that affect the train of thought may have already occurred to you, which is probably true because it has already been shown facts that may influence thoughts. An attempt to complete the list, though, comes from Thomas Brown (1820, as cited in Mazur, 2012) by adding the length of time two sensations coexist which determines the strength of the association, as also the liveliness or vividness of the sensations. In Brown's point of view, intense stimuli or emotional events will be more easily associated and better remembered—something also argued by Gee (2008) when talking about emotions and its relationship with learning.

Mazur (2012) also quoted James Mill (1829), who proposed that if two or more simple sensations are repeatedly presented together, the product of their union may be a complex idea. Thus, no matter how complex it is, they are the product of simple ideas which are in turn the product of simple sensations. This concept may be related with what was previously demonstrated by Bogost (2010) when quoted Piaget's (1978), and then explaining that the ability to actively construct new ideas based on experiences and past knowledge of a person. Gee (2014) study may complement this by showing that humans treat the world as a sort of language, seeing it as basic units and their combinations transforms into larger patterns. In doing so, humans assign meanings to these units and patterns based on what they assume exists in the world, based on their cultural knowledge.

Aristotle's principles may also be said to have association with what is known today as Gestalt principles, or the psychology of perception. As Neisser (2002, p. 6) explained, when various items are combined together, it can be defined by Gestalt that “a whole that is more than the sum of its parts”. This is to say that, translating into English the work of Slomp (n.d), that for Gestalt it is extremely important the way that are presented to perception the disposition of every single element that constitutes a whole. Slomp (n.d) also presented that Gestalt through the phenomena of perception tends to explain how humans understand what they perceive. In order to do that, if the elements perceived do not presents equilibrium, simmetry, stability, simplicity and regularity, the “good-form” will not be achieved.

Although Gestalt is an important theory, the purpose of citing it was to relate it with cognitive sciente. As Neisser (2002, p. 6) explained:

> “There are indeed many organized wholistic systems in the world: Why should there not be? On this point the triumph of Gestalt psychology has been so complete that it is hard to understand how this was ever disputed or why Köhler had to demonstrate it. Interestingly, his demonstration anticipated many of the dynamic concepts that are now the “bread and butter” of cognitive science”.

All this is worth knowing because players will often generate ideas about what something is inside the game in order to comprehend it and thus creating connections in their mind about it. If they construct wrong connections, seem unable to do it or simply because designers did not design the relationship correctly, between actions and feedbacks, players will not be able to play. And this, for sure, is not something designers want to happen because will often lead to the game being a frustration to the player. For this motive, constructing the correct relation between the whole bunch of information players face when playing, will often lead to their way to master the game, achieve the game's goals and progress through it as the flow happens (discussed by Csikszentmihalyi's (as cited in Steinkuehler, 2012, section1, chapter7)) and players feel good about this achievements and progress, as claimed by Weinschenk (2011). Now this is something designers want to happen: player engagement and enjoyment.

3.3 Driving human behavior: The complex world we live in

It is easy to say that people confront a lot of information in everyday life. And so will players in the game. And how in this vast myriad of information people don not get lost? How they drive themselves? Is there anyway to drive people behavior through any kind of strategy? Guess what? Actually, there are some and it is what will be presented now. Again, it is a topic worth to be aware of and that using this or that will make people have a higher probability to be influenced, not that with this arguments or strategies people will behave just like designers want. However, it may be used for different reasons and objetives by designers when thinking about the design of their games. As soon as the concepts are presented it will be related to game design.

To begin with, Robert Cialdini (2007) studies demonstrates that humans are unchallenged in the ability to take into account a multitude of relevant facts and, consequently, to make good decisions. Indeed, it is this information-processing advantage over other species that has helped make humans the dominant form of life on the planet. Still, he continued claiming that humans do not perceive or process all information because of their capacity limitations and, for the sake of efficiency, they must sometimes retreat from the time-consuming, sophisticated, fully informed brand of decision making to a more automatic, primitive, single-feature type of responding.

He also claimed that there are factors that provides a highly reliable cue as to when people will be better off saying yes than no, often so automatically in making compliance decisions.

These factors involve reciprocation, consistency, social proof, liking, authority, scarcity and some others that will be soon briefly discussed. Another statement by him is that unlike other kinds of animals, whose cognitive powers have always been relatively deficient, humans have created their own deficiency by constructing a radically more complex world.

Inside this complex world we all live in, it is possible to bring back the concept presented by Ian Bogost (2010) about things that may have a unique persuasive power among computer software: videogames. He also quotes the work of Janet Murray (n.d) to describe why computers are interactive: because the procedural environment are not just rule-generated behavior, but also, people may induce the behavior, becoming an environment that is both procedural and participatory. And so are games, especially the ones people may connect with others, because social is a strong motivational factor (Weinschenk, 2011).

Finally, in games, Bogost, after presenting a study about slot machines, says that partial reinforcement is certainly a type of persuasion, but the persuasion is entirely self-referential: its goal is to cause the player to continue playing, and in so doing to increase coin drop— partial reinforcement and rewards will be deeper discussed as the final part of this chapter.

3.3.1 Persuasive strategies to drive behavior

For this section, it will be used the research presented in the book written by Robert Cialdini (2007), about things that may drive or influence humans in a certain way, with lots of experiments and real life examples to illustrate it. However, not all of them will be covered, only the ones that possibly may be used by game designers for: creating quests or asking the player to do something; building the narrative texts; creating guild features; enemies; challenges; rankings; special, rare or limited rewards along with special events; creating a system to control player aggression between one another; giving special sales for items in the in game market.

Cialdini then presents, as summarized and named (in some cases), for this work, his research results:

- **Asking a favor**: a well-known principle that people like to have reasons for what they do, that is, the chance that someone will do us a favor will be higher if provided a reason with it;
- **Reciprocation**: when someone provides something to another person, this later one should try to repay, in kind, what was provided. (ex: free samples commonly offered by some companies, and it may engage the reciprocity rule);
- **The rejection-then-retreat technique**: to be more successful when you want another person to agree to a certain request, first make a larger request that the person will probably turn down. Then, after it has been refused, make the smaller request you were interested in all along. This way, the second request will be seem as a concession to the requested person and should feel inclined to respond with a

concession of their own. Susan Weinschenk (2011) also talks about this, and may complement Cialdini saying that this changes the person self-persona, which opens the door to larger commitments;

- **Consistency**: once someone have made a choice or taken a stand, they will encounter personal and interpersonal pressures to behave consistently with that commitment. Those pressures will cause them to respond in ways that justify their earlier decision. To understand why consistency is such a powerful motive, it is important to recognize that in most circumstances consistency is valued and adaptive. Inconsistency is commonly thought to be an undesirable personality trait. The person whose beliefs, words, and deeds don't match may be seen as indecisive, confused, two-faced, or even mentally ill. On the other side, a high degree of consistency is normally associated with personal and intellectual strenght. It is at the heart of logic, rationality, stability, and honesty;
- **Commitment**: the reason that provides the powerful principle of consistency. If someone make a commitment (that is, to take a stand, to go on record), he or she will have set the stage for automatic and ill-considered consistency with that earlier commitment. Once a stand is taken, there is a natural tendency to behave in ways that are stubbornly consistent with the stand.
- **People's opinion**: what those around us think is true of us is enourmously important in determining what we ourselves think is true. For example, after hearing that they were considered charitable people, housewives gave much more money to a canvasser. Apparently the mere knowledge that someone viewed them as charitable caused these women to make their actions consistent with another's perception of them;
- **Valuing difficulty**: Cialdini, quoting the work of Elliot Aronson and Judson Mills (1959), shows that “persons who go through a great deal of trouble or pain to attain something tend to value it more highly than persons who attain the same thing with a minimum of effort.”. Another author that talks about it, is Weinschenk (2011) who quoted Leon Festinger (1956) and his theory of cognitive dissonance: People go through painful experiences only to find themselves part of a group that is not all that exciting or interesting, but that sets up a conflict (dissonance) in their thought process (“if it's boring and uninteresting, why did I submit myself to pain and hardship?”). He continued explaining that to reduce the dissonance, people then decide that the group is really important and worthwhile, which then it makes sense that people were willing to go through the pain;
- **Dealing with uncertainty**: examining the reactions of other people to resolve our uncertainty, especially in an ambiguous situation, the tendency for everyone to be looking to see what everyone else is doing can lead to a fascinating phenomenon called pluralistic ignorance. A thorough understanding of the pluralistic ignorance phonomenon helps immesurably to explain a occurrence that may happen: for

instance, the failure of entire groups of bystanders to aid victims in agonizing need of help. One reason for that to happen is that with several potential helpers around, the personal responsibility of each individual is reduced to thinking "perhaps someone else will help or call for aid, perhaps someone else already has." So with eveyone thinking that someone else will help or has helped, no one does;

- **Social proof and similarity**: Following the previous principle idea, people are more likely to use others' actions to decide how they themselves should act when uncertain. But, in addition, there is another important working condition: similarity. The principle of social proof (one means we use to determine what is correct is to find out what other people think is correct or seeing other performing a determined action) operates most powerfully when we are observing the behavior of people just like us. It is the conduct of such people that gives us the greatest insight into what constitutes correct behavior for ourselves. Therefore we are more inclined to follow the lead of a similar individual than a dissimilar one;
- **Familiarity**: as a rule, we most prefer to say yes to the requests of someone we know and like;
- **Beauty and the Halo Effect**: although it is generally acknowledged that good-looking people have an advantage in social interaction, recent findings indicate that we may sorely underestimate the size and reach of that advantage. It happens automatically, without forethought and the response itself falls into a category that social scientists call "halo effect". This occurs when one positive characteristic of a person dominates the way that person is viewed by others. And the evidence is now clear that physical attractiveness is often such a characteristic;
- **Similar backgrounds and interests**: requesters can manipulate similarity to increase liking and compliance by claiming that they have backgrounds and interests similar to ours. For example, car salesmenthat look for evidence of such things while examining the customer's trade-in;
- **Association**: suppose someone gives a bad news. This will immediately infects the teller, as there is a natural human tendency to dislike a person who brings us unpleasant information, even when that person did not cause the bad news. The simple association with it is enough to stimulate our dislike. The principle of association is a general one, governing both negative and positive connections. An innocent association with either bad things or good things will influence how people feel about us. Another example is if we can surround ourselves with success that we are connected with in even a superficial way (like a place of residence), our public prestige will rise, just as when our affiliated sports team win and we prove our own superiority by saying that “we” won, instead of “the team”;
- **Authority**: Cialdini quotes Milgram to say that, in an experiment where an authority gave orders to a person to give a experimenter shocks, the real culprit in the experiments was his subject's inability to defy the wishes of the boss of the study–the

lab-coated researcher who urged and, if need be, directed the subjects to perform their duties, despite the emotional and physical mayhem they were causing to the participant. We are trained from birth that obedience to proper authority is right and disobedience is wrong;

- **Status**: styled and expensive clothes carry an aura of status and position, as do trapping such as jewelry and cars. For instance, some experimenters discovered that drivers would wait significantly longer before honking their horns at a new, luxury car stopped in front of a green traffic light than at an older, economy model. So intimidating was the aura of the prestige automobile, that 50 percent of the motorists waited respectfully behind it, never touching their horns, until it drove on;
- **Scarcity**: something will appeal and become more attractive merely because it may soon become unavailable. As a rule, if it is rare or becoming rare, it is more valuable. When our freedom to have something is limited, the item becomes less available, and we experience an increased desire for it. However, we rarely recognize that psychological reactance has caused us to want the item more; all we know is that we want it. Furthermore, we will find a piece of information more persuasive if we think we can't get it elsewhere. The joy is not in experiencing a scarce commodity but in possessing it. It is important not to confuse the two;
- **A piece of a total**: Cialdini uses the example of a phrase from a dialogue that says “I guess your long hair makes you a girl” and a second one “I guess your wooden leg makes you a table” to say that we do not use all the relevant available information; we use, instead, only a single, highly representative piece of the total. And an isolated piece of information, even though it normally counsels us correctly, can lead us to clearly stupid mistakes that, when exploited by clever others, leave us looking silly or worse.

In the previous section it was showed by Cialdini that humans constructed a radically more complex world, and to complement his own argument, at the same time, despite the susceptibility to stupid decisions that accompanies a reliance on a single feature of the available data (the last principle presented, “a piece of a total”), the pace of modern life demands that we frequently use shortcuts (all principles that have been shown) to proccess information in a more automatically way.

To conclude, it has been presented so far information about games, its design, people behavior, influences, thinking, associations, incentives and so on. Now it's time to gather everything and focus on the main, and final, topic: how does rewards relate to it and what does it have to do with it?

3.4 Reward System

It has been presented so far that after players perform an action, they get a feedback for it. To define it, using a thermostat as an example, (Mazur, 2012) explained that first there is the

product of the action system (output) and then, this output of the action performed, feeds back and affects the actual input to the thermostat's comparator—it has rules that it follows to determine, based on the current actual input and reference input, what its output will be. Finally, such a goal-directed system is frequently called a feedback system or a closed-loop system. In the thermostat situation, it receives an input, compares to the reference one, and responds back with an output, or feedback. As for players, after they perform an action, the game system will check its rules and gives a specific feedback to them.

Another closed-loop system that is possible to demonstrate comes from Charles Duhigg's (2013) research about habits, that says that this process within our brains is a three-step loop: First, there is a cue (a trigger that tells the brain to go into automatic mode and which habit to use); second there is the routine (be it physical, mental or emotional); and the third one, the reward (helps your brain figure out if this particular loop is worth remembering for the future).

It is worth remembering that there is a lot of processes involving which actions players will perform, strategies that will be chosen and how the system, the game world, is specially designed for them. Both in real life and inside games it is possible to receive a feedback for the actions done, often accompained by a reward. (ex: as players hit an enemy, it looses life (feedback) and, when it is all gone, the enemy dies (victory reward). Rewards may be of different kinds in games and it is extremely powerful. Why? Because they satisfy cravings, although humans are often not consicous of the cravins that drive their behaviors (Duhigg, 2013).

Rewards are also powerful because, as affirmed by Soraker (2013), if people (players) perform a certain type of behavior and get a positive reward, they would probably do it again, on the contrary, they would probably not do it again. This can be related to Thorndike's (1898) Law of Effect principle (as cited in Mazur, 2012), and two learning principles are important to discuss about: classical and operant conditioning— even though instrumental will also be cited.

Just as a preview of rewards, it may come as score systems, experience points, item granting, resources that affect gameplay, achievements, feedback messages, plot animations and pictures and unlocking mechanisms that gives access to game content (Wang & Sun, 2011). But first, let it be introduced the psychological aspects of rewards.

3.4.1 Conditionings: Classical, Operant and Instrumental

In his book, Mazur (2012) presented the work of Ivan Pavlov (n.d) who studied the phenomenon now known as classical conditioning: He, Pavlov, concluded that his animals were exhibiting a simple type of learning, salivation, which began as a reflexive response to the stimulus of food in the dog's mouth, and now was elicited by a new (and initially ineffective) stimulus of a bell ring. He then speculated that many of an animal's learned

behaviors might be traced back to its innate reflexes, just as a dog's learned behavior of salivating when the experimenter appeared developed from the initial food-salivation reflex.

As another way of teaching behaviors, Mazur (2012) quoted Skinner's procedure to strenghthen a behavior through reinforcement, defined by operant conditioning and instrumental conditioning (the term instrumental conditioning is suggestive of the fact that the subject's behavior is instrumental in obtaining the reinforcer). Both of it reflect the large degree of control the subject has over the most important stimulus in the environment, the stimulus associated with the reinforcement: when delivered it is contingent on the subject's behavior; that is, no reinforcer will occur until the subject makes the required response and should not occur long after that.

When learning was discussed in Chapter 2, the term operant conditioning was already said to be described as “learning by doing” (Mazur, 2012). But, as he also said, it reflects the fact that the subject obtains reinforcement by operating on the environment. Does this sounds familiar? Games are all about players' actions inside of it, and that is a very powerful aspect that causes operant conditioning to be an important feature to be integrated in games: it requires interactivity and it is a tremendously more powerful way of changing behavior as opposed to classical conditioning (Soraker, 2013).

However, if affordances require a link between an object and the person being able to use it, it is worth mentioning that conditioning also needs a link between stimulus and a later event as it occurs only if the conditioned stimulus (CS) is informative and only if it predicts something important, such as an upcoming shock (Mazur, 2012). As an example of this occurrence, Mazur (2012) discussed about orienting response that often displays habituation: If a new sight or sound is presented to a dog or other animal, the animal may stop its current activity, lift its ears and its head, and turn in the direction of the stimulus. Orienting response will disappear if this stimulus is presented repeatedly but is of no consequence.

Still continuing idea of stimulus and response, Mazur (2012) also used Skinner's (n.d) research to explain that a contingency is a rule that states that some event, B, will occur if and only if another event, A, occurs. This is important to relate with what was discussed about feedback loop and habits because, as Skinner pointed out, there are actually three components in the operant conditioning contingency: first, the context or situation in which a response occurs preceded by a stimuli; second, the response itself; and third the stimuli that follow the response (reinforcer). Furthermore, Skinner (n.d, as cited in Mazur, 2012) noted that the contingency in operant conditioning usually takes the following form: In the presence of a specific stimulus, often called a discriminative stimulus, the reinforcer will occur if and only if the operant response occurs and, because of the three components, he called this relationship a three-term contingency.

As an example of how contingencies may be used in games Hopson (2001, p. 1):

> "The contingencies in computer games are more complex, but the analogy is clear enough. For example, players in an RPG earn experience points to gain levels or collect bonus items to gain extra lives. In an arcade-style game, power-ups appear at random intervals, or only when certain conditions are met. As in any contingency, there are actions on the part of the participant which provide a reward under specific circumstances. This is not to say that players are the same as rats, but that there are general rules of learning which apply equally to both."

Susan Weinschenk (2012, p. 120) asked the question about how operant conditioning could work: "the reinforcement (reward) must be something that particular audience wants. Hungry rats want food pellets. What does your particular audience really wants?". Just as in Chapter 1, when Gortari (2007) discussed target audience, now it is possible to complement it by saying that rewards also differ and impact different players in different ways. This way, it highlights the importance to really understand players' desires when deciding what choices must be done to satisfy it while designing a game.

An interesting warning by Weinschenk (2012, p. 120) was: "If you're not sure that operant conditioning is related to design, think about it more deeply". Even more than that, related with game design and, in order to demonstrate it, it will be presented something known as reinforcement schedules.

3.4.2 Reinforcement schedules

So it is just a matter of using operant conditioning and games produced will be a fine piece of art. Not at all! Game designers not only must know about operant conditioning, but also, must employ a particular type of it which is variable rates— more details of it below— of reinforcement: if there is no pattern between what you do and what kinda reward you get you tend to get steady activity, no passes and you can induce obsessive behavior if it is done right (Soraker, 2013). Although we can relate obsessive behavior with actions players may perform even if they are not having fun, it will be soon explained why it happens when explaining about Dopamine.

The cases showed so far are about every occurrence of the operant response being followed by a reinforcer, called continuous reinforcement (CRF), but it is only one of a myriad of possible ways for delivering a reinforcer (Mazur, 2012). As represented in the image below (*Figure 1*), Mazur said that it is one of the most noteworthy of Skinner's achievements, which is his experimental analysis of reinforcement schedules is simply a rule that states under what conditions a reinforcer will be delivered. Also, it was Skinner's (n.d) studies whether behavior increased or decreased based on how often and in what manner, a reinforcement (reward) was given (Weinschenk, 2011).

As Weinschenk (2011) also claimed, with Skinner studies it is possible to predict how often people will engage in a certain behavior based on the way they are reinforced or rewarded: If you want someone to engage in a certain behavior the most, then you would use a variable ratio schedule. Furthermore, the effectiveness of a reinforcement schedule depends on the nature of the reinforcer that is delivered, and important features of any reinforcer are its quality, its rate of presentation, its delay and the amount of reinforcement (Mazur, 2012). Another aspect worth considering is what Mazur called overshadowing, which a more salient stimuli will condition faster than less salient stimuli (e.g., if a dim light and a loud noise are presented together and followed by a food pellet, the noise will acquire excitatory strength faster than the light).

In order to understand why Soraker (2013) and Weinschenk (2011) emphasized variable ratio schedule, it must be brought into the discussion what kinds of schedules exists, which are: fixed ratio, fixed interval, variable interval and variable ratio.

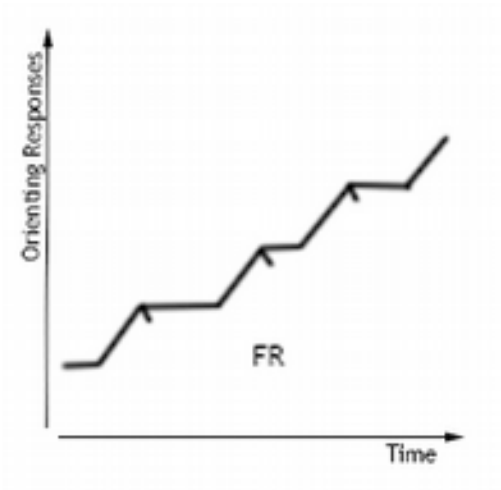

Figure 1. Typical pattern of behavior by the reinforcement schedules of FR (Fixed Ratio)

For the definitions that will be presented, it will be used James Mazur (2012) book as a reference. The first one brought into discussion is the Fixed Ratio (FR) schedule and its rule for reinforcement is that is delivered after every *n* number of responses, where *n* is the size of the ratio (Mazur, 2012). As *Figure 1* shows and he continued, after each reinforcer, there is a pause in responding that is sometimes called a postreinforcement pause. Eventually, this pause gives way to an abrupt continuation of responding. With FR schedules, the average size of the postreinforcement pause increases as the size of the ratio increases. For example, with a pigeon pecking a key, the average pause may be only a second or so with an FR 20 schedule — the pigeon has to peck 20 times to receive the reinforcement— but it may be several minutes long with an FR 200 schedule.

John Hopson (2001, p. 1) had an explanation of why this pause in FR is an issue for game designers:

> “The distinct pause shown under a fixed ratio schedule can be a real issue for game designers. Having a period of time where there is little incentive to play the game can lead to the player walking away. Additionally, the length of the pause is a function of the size of the ratio (the number of actions required), so the more actions required the longer the pause. This means that if the ratio increases over time, such as the increasing number of experience points required to gain a level in Dungeons & Dragons, so does the pause. Eventually, the pause can become infinite, and the player simply decides it's not worth it and walks away.”

To try to explain why this pause happens, Mazur (2012) argued that perhaps the postreinforcement pause is the result of: fatigue (after it has made many responses and has collected a reinforcer, the subject now rests to alleviate its fatigue); satiation (consumption of the food reinforcer causes a slight decrease in the animal's level of hunger, causing it to interrupt responding); and a third reason emphasizes the fact that on an FR schedule, the subject is farthest from the delivery of the next reinforcer immediately after the occurrence of the preivous reinforcer. Mazur (2012, p. 139) then also used other authors to discuss the reason for the pause:

> “Based on the representative of the results from several studies that used multiple FR (Crossman, 1968; Mintz, Mourer, & Gofseyeff, 1967), the analysis of the data has demonstrated quite clearly that the size of the postreinforcement pause depends heavily on the upcoming ratio requirement, and that the factors of satiation and fatigue play at most a minor role. Derenne and Baron (2002) shed further light on postreinforcement pauses by showing that they are longer if some alternative activity is available.”

Although the pause happens, there is also a contrary effect of it. Clark Hull (1934, as cited in Weinschenk, 2012) was the first to study the goal-gradient effect and, by using rats, he came to the conclusion that there is an acceleration in behavior as experimenters progressed closer their goal. For instance, Weinschenk (2012) cited Dropbox that shows how close people are to reaching a goal that gives extra storage space and, the closer you are, more motivated you will be to take the one or two steps left to reach it. In games it is possible to offer players multiple activities that they may do at any given moment, meaning that “if killing monsters becomes unrewarding, there are other activities within the game that can take up the slack. If monsters are unprofitable, exploration may be better” (Hopson, 2001, p. 2). This way, it is possible to keep players engaged in the game while they are in a pause from another kind of task.

Another ratio defined by Mazur (2012) was that of Fixed Interval (FI) that in all interval schedules, the presentation of a reinforcer depends both on the subject's behavior and on the

passage of time (*Figure 2*). The rule for this reinforcement schedule is that the first response after a fixed amount of time has elapsed is reinforced. He examplified it saying that in an FI 60-second schedule, immediately after one reinforcer has been delivered, a clock starts to time the next 60-second interval.

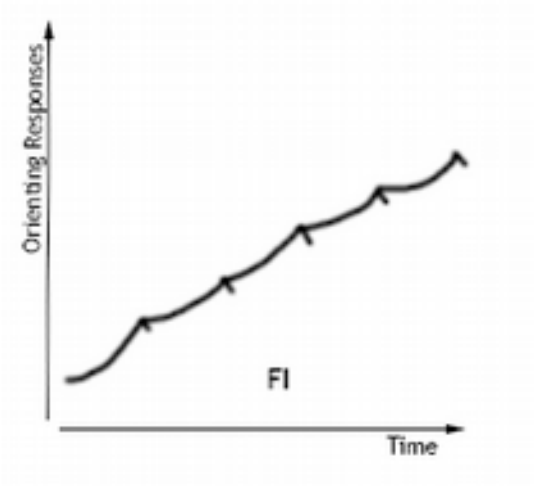

Figure 2. Typical pattern of behavior by the reinforcement schedules of FI (Fixed Interval)

The third schedule is the Variable Interval (VI) and noticed in *Figure 3*: just like FI schedules, except that the amount of time that must pass before a reinforcer is stored varies unpredictably from reinforcer to reinforcer. Mazur (2012), for instance, said that in a VI 60-second schedule, the time between the delivery of one reinforcer and the storage of another might be 6 seconds for one reinforcer, then 300 seconds for the next, 40 seconds for the next, and so on. As on FI schedules, the first response to occur after a reinforcer is stored collects that reinforcer, and the clock does not start again until the reinforcer is collected, he concludes.

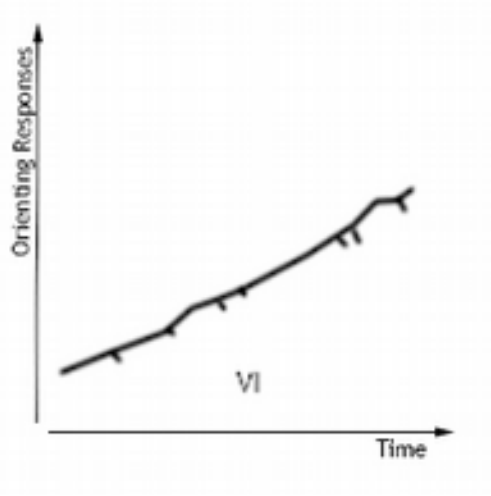

Figure 3. Typical pattern of behavior by the reinforcement schedules of VI (Variable Interval)

Variable Ratio (VR) is the last one to discuss (*Figure 4*) because it is going to be related to the next topic (dopamine) and is the one that produces the highest rates of activity. As Hopson

(2001, p. 1) said, “this doesn't necessarily mean they're the best, but if what you're looking for is a high and constant rate of play, you want a variable ratio contingency.”.

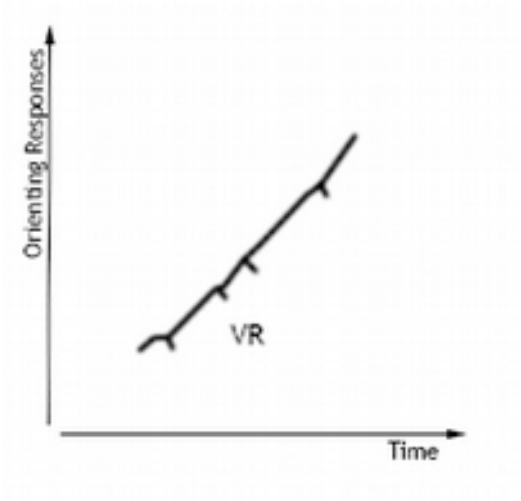

Figure 4. Typical pattern of behavior by the reinforcement schedules of VR (Variable Ratio)

As Mazur (2012) argued, the only difference between an FR schedule and a VR is that on the latter, the number of required responses is not constant from reinforcer to reinforcer. As an example, a list for VR 10 might contain the ratios 1, 2, 3, 4, 5, 6, 10, 19 and 40. In the long run, an average of 10 responses will be required for each reinforcer, but on a given trial, the required number may be as few as 1 or as many as 40. Another difference between the performance of these two schedules, as Mazur continued, is that postreinforcement pauses are typically quite brief on VR schedules (Blakely & Schlinger, 1988 as cited in Mazur, 2012). They are several times smaller than those found on FR schedules with equal response: reinforcer ratios (Mazur, 1983 as cited in Mazur, 2012). Intuitively, the reason for the shorter postreinforcement pauses on VR schedules seems clear: After each reinforcer, there is always the possibility that another reinforcer will be delivered after only a few additional responses (Mazur, 2012).

Mazur (2012, p. 131) also presents some behaviors reinforced on VR schedules, that are:

> “Playing practically any competitive sport, fishing, hunting, playing card games or video games, watching the home team play, and going to fraternity parties. The delivery of reinforcers for each of these activities fits the definition of a VR schedule: The occasion of the next reinforcer is unpredictable, but in the long run, the more often the behavior occurs, the more rapidly will reinforcers be received.”

There are other kinds of specific schedules, but the focus will be only in these ones that can be strongest related to game designing. However, one more schedule to mention is percentile schedules, where a response is reinforced if it is better than a certain percentage of the last several responses that the learner has made (Platt, 1973 as cited in Mazur, 2012). Ah Mazur explained, the criterion is set so that the required behavior is well within the learner's

current ability level, but only better performances are reinforced and, in doing so, this selective reinforcement of better performances should cause the learner's performance to improve. As an example, this may be used in games when players achieve a new top score (record).

3.4.3 Dopamine

Arvid Carlsson and Nils-Ake Hillarp, from the National Heart Institute of Sweden, identified the dopamine system in 1958 (Weinschenk, 2011). Besides, she argued that dopamine is created in various parts of the brain and is critical in all sorts of brain functions, including thinking, moving, sleeping, mood, attention, motivation, seeking, and reward. As Soraker (2013) said in his talk, dopamine is not really the pleasure chemical, it just makes you really, really want something even if you get no pleasure out of it. Consider this definition and explanation of dopamine:

> “You may have heard that dopamine controls the "pleasure" systems of the brain that make you feel enjoyment. But researchers have recently found that instead of causing you to experience pleasure, dopamine actually causes you to want, desire, seek out, and search. It increases your general level of arousal, motivation, and goal-directed behavior. It's not only about physical needs such as food or sex, but also about abstract concepts. Dopamine makes you curious about ideas and fuels your search for information. The latest research shows that it is the opioid system, more than the dopamine system, that is involved in feelings of pleasure. According to Kent Berridge (1998), these two systems— the "wanting" (dopamine) and the "liking" (opioid)— are complementary. The wanting system propels you to action and the liking system makes you feel satisfied, and therefore makes you pause your seeking. If your seeking isn't turned off, then you start to run in an endless loop. The dopamine system is stronger than the opioid system. You seek more than you are satisfied.” (Weinschenk, 2011, p. 121)

If dopamine is related with brain functions as thinking, mood, attention, reward, also causing animals to feel pleasure, desire, motivation, to want, seek and search for something and goal-directed behavior, then it is tremendously related with game designing, as it covers all that was said. Furthermore, dopamine is also stimulated by unpredictability (Weinschenk, 2011)—which brings back Variable Ratios.

3.4.3.1 Unpredictability and predictability

Dopamine is related with unpredictability, because providing something unexpected not only gets attention, but also can be actually pleasurable (Weinschenk, 2011). Just as it is not possible to predict when another reinforcer will be given at Variable Ratios, Weinschenk (2011) said that this is exactly what stimulates the dopamine system: unpredictablity. As for some examples of this use, she gave the system at work for gambling (slot machines), e-mail,

Twitter, and most social media that run on the variable ratio schedule that makes it likely that people will engage in the behavior again and again, as they never know when a new information will be available.

Besides unpredictability, the dopamine system is especially sensitive to cues that a reward is coming: If there is a small, specific cue that signifies that something is going to happen, that also sets off your dopamine system (Weinschenk, 2011). Also, she argued that this system is most powerfully stimulated when the information comes in small amounts, so that it does not full satisfy the desire for information, as a short text of a tweet in Twitter (which has a maximum of 140 characters) is ideally suited to sending the dopamine system raging.

Remember classical conditioning presented by Mazur (2012)? To explain Pavlov's experiment and demonstrate dopamine as predicting something to happen, Weinschenk (2011, p. 123) showed that:

> "Ths is a Pavlovian response, named for the Russian scientist Ivan Pavlov who experimented with dogs. When dogs (and humans) see food, they begin to salivate. Pavlov paired food with a sound, for instance, a bell. The bell is a stimulus. Every time the dogs saw food they would also hear a bell, and they would salivate at the sight of the food. After a while the dogs would salivate at the sound of the bell. The food wasn't even necessary for salivation to occur. When a stimulus is paired with information-seeking behavior, such as a sound and a message when a text arrives on your phone or sound or visual cue when an e-mail arrives in your inbox, you have the same Pavlovian response— dopamine is released and the information seeking starts all over again."

One experiment that is worth citing to exemplify the prediction of a reward is from Wolfram Schultz (1990, as cited in Duhigg, 2013), a professor of neuroscience at the University of Cambridge, who did an experiment with a monkey named Julio's. Duhigg (2013, p. 44-47) described and explains the experiment discoveries as follows:

> "Schultz positioned Julio on a chair in a dimly lit room and turned on a computer monitor. Julio's job was to touch a lever whenever colored shapes—small yellow spirals, red squiggles, blue lines—appeared on the screen. If Julio touched the lever when a shape appeared, a drop of blackberry juice would run down a tube hanging from the ceiling and onto the monkey's lips. […] Whenever Julio received his reward, his brain activity would spike in a manner that suggested he was experiencing happiness. [...] What was most interesting in to Schultz, however, was how things changed as the experiment proceeded. As the monkey became more and more practiced at the behavior—as the habit became stronger and stronger—Julio's brain began anticipating the blackberry juice. Schultz's probes started recording the "I got a reward!" pattern the instant Julio saw the shapes on the screen, before the juice arrived. […] When the

> juice didn't arrive or was late or diluted, Julio would get angry and make unhappy noises, or become mopey. And within Julio's brain, Schultz watched a new pattern emerge: craving. When Julio anticipated juice but didn't receive it, a neurological pattern associated with desire and frustration erupted inside his skull. When Julio saw the cue, he started anticipating a juice-fueled joy. But if the juice didn't arrive, that joy became a craving that, if unsatisfied, drove Julio to anger or depression."

This experiment demonstrated that habits are so powerful because they create neurological cravings which, most of the time, emerge so gradually that humans are not really aware they exist, so they are often blind to cravings influence (Duhigg, 2013). As he continued, humans associate cues with certain rewards, a subconscious craving emerges in our brains that starts the habit loop spinning. This is especially relevant because when designing rewards, one of the most basic and intriguing tasks is determining target customer motivation (Wang & Sun, 2011).

Other authors with similar discussions were also quoted by Mazur (2012, p. 180):

> "Thorndike (1946) and Hull (1943), suggested that the reinforcer is merely a sort of catalyst; that is, it strengthens an stimulus-response (S-R) association between the discriminative stimulus and the operant response, but the reinforcer itself is not included in that association. Opposing this view is the idea that a reinforcer not only stimulates associative learning but also becomes a part of the associative network (Mackintosh & Dickinson, 1979; Tolman, 1932). If so, the associative learning in operant conditioning would involve three distinct elements: the discriminative stimulus, the operant response, and the reinforcer. According to this view, we might say that the animal "develops an expectation" that a particular reinforcer will follow a particular response. […] An experiment by Tinklepaugh (1928) found that the switch in reinforcers did indeed affect the animal's behavior: The monkey appeared surprised and frustrated, and it refused to accept the lettuce. The monkey had evidently developed a strong expectation about what type of reinforcer (a slice of banana) was forthcoming."

Wang and Sun (2011) also gave examples of reward mechanisms in video games that produces Julio's feelings (fun, in this case) long before rewards are actually given—that is, rewards can create a sense of anticipation among players who know what is specifically required to earn them. Wang and Sun (2011) used the works of Loewenstein (1987) and Rozin (1999) to conclude why this antecipation is important in players when they play, they discussed the pleasure of anticipation as being an important aspect of positive experiences— for instance, looking forward to a trip to a new country is exciting by itself. In the context of video games, Wang and Sun (2011) said that players feel pleasure when anticipating rewards and one tactic used by designers is reminding players about potential rewards, perhaps programming non-player characters (NPCs) to talk about a legendary sword owned by a demon, thus

encouraging players to challenge that demon and capture the sword.

Combining different concepts, it is already possible to come to an important conclusion: remembering the warning of Hopson (2001) that players may walk away when pausing, Derenne and Baron (2002, as cited in Mazur, 2012) about other activities, and the relationship of VR and dopamine, it is possible to argue that if the game design covers various kinds of activities that players may choose and do (Rosewater, 2016), with unpredictable time and kinds of rewards, by satisfying specific needs (Weinschenk, 2011) of a specific audience (Gortari, 2007), this way creating an habit (Duhigg, 2013) inside the game that will engage players in a powerful way, through flow or going mindfully meta (Gee, 2014).

As discussed previously, there is a myriad of factors that may influence players, but the basic patterns of consequences and rewards form the framework which enable all the rest (Hopson, 2001). Using Hopson (2001, p. 2) words, "by understanding the fundamental patterns that underlie how players respond to what we ask of them, we can design games to bring out the kind of player we want.".

Besides satisfying cravings, Mazur (2012) presented, one question that is whether conditioned reinforcers affect behavior because they provide information (i.e., the future of a primary reinforcer, as a bell that rings before each meal) or because they add value to the situation (i.e., add additional reinforcing value above what the primary reinforcer already provides, as a bell that rings before each meal and also other periods of time). He quoted the works of Rachlin (1976) and Schuster (1969) that did experiments that supported the information theory of conditioned reinforcement— the strongest conditioned reinforcers are those that provide the best information about the delivery of primary reinforcers.

3.4.3.2 Breaking dopamine loop, habituation and habit change

Although dopamine is very stimulating, its constant stimulation can be exhausting and, to break its loop, it is needed to get away from the information-seeking environment, for instance, turning off the computer or leaving the phone out of sigh and reach (Weinschenk, 2011). She also claimed that one of the most powerful things to do to end a dopamine loop is to turn off the bells, rings and cues that tell you that a message or text has arrived.

Just as orienting response already presented, another phenomenon that may happen is habituation: a decrease in the strength of a response after repeated presentation of a stimulus that elicits the response, it is the decline and eventual dissappearance of a reflexive response when the same stimulus is repeatedly presented (Mazur, 2012). The function of habituation was explained by Mazur (2012, p. 36):

> "The function that habituation serves for the individual should be clear. In its everyday activies, a creature encounters many stimuli, some potentially beneficial, some potentially dangerous, and many neither helpful nor harmful. It is to the creature's

> advantage to be able to ignore the many insignificant stimuli it repeatedly encounters. Being continually startled or distracted by such stimuli would be a waste of the creature's time and energy."

Finally, about habits discussed, Duhigg (2013) quoting the strategy used by Tony Dungy (n.d) said that rather than creating new habits, Dungy was going to change player's old ones. The secret to changing old habits was using what was already inside player's heads. So, Duhigg continued saying that habits are a three-step loop— the cue, the routine, and the reward— but Dungy only wanted to attack the middle step, the routine, because he knew from experience that it was easier to convince someone to adopt a new behavior if there was something familiar at the beginning and end. This way, Duhigg concluded that rather, to change a habit, it must be kept the old cue, and deliver the old reward, but insert a new routine.

To transit to the next topic, it will be presented some experiments done with feedback and positive, as also negative, reinforcements:

> "Klimmt, Hartman, and Frey (2007) found that reducing player effectance in a game by reducing the immediate feedback provided to players about their actions in the game reduced players' enjoyment of the game, while reducing player control by increasing the speed of the game did not reduce player enjoyment. […] Chumbley and Griffiths (2006) and Qin, Rau, and Salvendy (2010) looked at how changing features of a game could change emotions and presence in the game respectively. Chumbley and Griffiths found that increasing the ratio of negative to positive reinforcement provided to players increased their frustration and decreased excitement, while increasing positive reinforcement increased the chances of players returning to play." (Boyle, Connolly, Hainey, & Boyle, 2011, p. 774)

3.4.4 Decreasing behaviors: Extinction

A simple technique for producing a reduction and eventual disappearance of the conditioned response (CR) is the procedure of extinction, which involves repeatedly presenting the conditioned stimulus (CS) without the unconditioned stimulus (US), as stated by Mazur (2012). As an example, Mazur recalled Pavlov's (n.d) experiment with dogs and, supposing it followed the acquisition phase with an extinction phase in which the bell was presented for many trials but no food was delivered, it would not salivate anymore after the bell was presented. As for operant condiotining, the procedure of extinction involves no longer being followed by the operant response with a reinforcer, and as in classical conditioning (Pavlov's experiment), the response will weaken and eventually disappear.

Another idea worth mentioning is about reinforcement value. As a general rule, extinction involves a lot of frustration and anger on the part of the subject (Hopson, 2001). To demonstrate his argument, Hopson demonstrated the behavioral contrast phenomenon that

occurs in chimpanzees, among other species. It stated that a chimpanzee was doing a simple task, such as pulling a lever and was being rewarded with pieces of lettuce, which they liked to eat, and after doing it for a while, one pull was rewarded with a grape, which they really loved to eat. He then continued saying that if on the next pull the chimpanzee was given lettuce again, they got very upset and started throwing the lettuce at the experimenter! They were perfectly happy with lettuce before, but the presentation of the latter reinforcer created new expectations and when those were not met, frustration and anger invariably resulted (Hopson, 2001). For instance, in a videogame, players may be able to kill a little fish or a dragon, but, if they know the reward will be better for killing the dragon, it is very unlikely for them to kill the fish as they know a much better reward may be obtained by killing the dragon.

3.4.4.1 Failure

As Weinschenk (2011) said, errors with a positive consequence are actions that do not give the desired result, but provide the person with information that helps him or her achieve an overall goal. On the contrary, errors that are followed by a negative consequence (that result in a dead end) undo a positive consequence, send the person back to a starting point or result in action that cannot be reversed.

The role of failure is very different in videogames: the price of failure is lowered— when players fail, they can, for example, start over at their last saved game (Gee, 2008). Furthermore, Gee continued arguing that failure— for example, a failure to kill a boss— is often seen as a way to learn the underlying pattern and eventually to win. These features of failure in games allow players to take risks and try out hypotheses that might be too costly in places where the cost of failure is higher or where no learning stems from failure.

Recent findings indicate that losing a game can be intrinsically motivating as well, if the player receives positive feedback (it works as a reinforcement) for his or her effort (Vansteenkiste & Deci, 2003, as cited in Ritterfeld & Weber, 2006). Nevertheless, the feedback does not take away negative feelings of disappointment (Ritterfeld & Weber, 2006).

One author that is possible to bring into the discussion is Jesper Juul (2012), who discussed the features of, as he named it, downloadable casual games, or those opposed to the ones he categorized as hardcore games and “that are easy to learn to play, fit well with a large number of players and work in many different situations” (Juul, 2012, p. 5). He claimed that they have reversibility, that is, instead of rarely allowing players to undo an action, downloadable casual games design structures like difficulty and punishment so that the player can generally recover from making a mistake by performing well during the rest of a level. Generally, he said, that these kind of games features randomization, making the replaying of a level more interesting and less punishing to players. Finally, they are not easier games compared to hardcore games; rather, they punish the player for mistakes in a slightly

different way than the traditional hardcore ones: the real is how the player is punished by failing, instead of difficulty (Juul, 2012). Among his examples, Juul (2012) cited Guitar Hero (Harmonix, 2005) which only cause players to lose a life after them have accumulated a number of mistakes.

3.4.4.2 Punishments (positive punishments)

The procedure of punishment is when a behavior is followed by an unpleasant stimulus, as also it may produce a complete cessation of behavior if introduced suddenly in a given intensity, but it may have little or no effect on behavior if it is gradually approached through a series of successive approximations (Mazur, 2012). As he suggested, since the goal when using punishment is to eliminate an undesirable behavior, not to shape a tolerance of the aversive stimulus, the punisher should be at its maximum intensity the first time it is presented.

Azrin and Holz (1966, as cited in Mazur, 2012) warned the desadvantages of using punishment is that it can elicit several emotional effects, such as fear and anger, that are generally disruptive of learning and performance— as previously showed in the monkey's experiments. Also, it can sometimes lead to a general suppression of all behaviors, not only the behavior being punished and, in real-world situations the use of punishment demands the continual monitoring of the individual's behavior. This way, they concluded and suggested that punishment should be used reluctantly and with great care.

As Hopson (2001) claimed and brought games into it, it is important to notice that reducing the level of reinforcement is a very punishing factor for your players and can act as an impetus for them to quit the game. Hopson (2001), as Azrin and Holz (1966, as cited in Mazur, 2012), also suggested that it needs to be done carefully, and gradually, or there may be an undesirable backlash, which applies even to temporary reductions. For instance, when killing a kind of enemy (e.g., orcs) may stop producing points but the player has not yet discovered that trolls can be killed instead, and then, suddenly loss of reward is very aversive and should be avoided whenever possible (Hopson, 2011). However when one kind of action is gradually becoming less rewarding, or no longer is being rewarded, this may be the opportunity for players to look for other activities that can be done inside the game world that are rewarding.

When he discussed about reinforcement of alternative behaviors, Mazur (2012) quoted Azrin and Holz (1966) who, based on their research with animals, concluded that punishment is much more effective when the individual has alternative ways to obtain the reinforcer. This reinforces the idea that giving players choices is a very important feature when designing games.

3.4.4.2.1 Negative Punishment

A differentiation presented by Mazur (2012) are between the two terms, positive (a stimulus is presented if a behavior occurs) and negative (a stimulus is subtracted, removed or avoided entirely if a behavior occurs). He claimed, though, that in both of them immediacy and consistency are important—previously demonstrated through showing experiments quoted by Mazur (2012) from Rachlin (1976) and Schuster (1969).

Mazur (2012) explained negative punishment, or omission, by saying that occurs when the possibility of losing a reinforcer can have strong effects on behavior, and also when a pleasant stimulus is removed or omitted if a behavior occurs (e.g., not giving a child a weekly allowance after behaving badly).

Skinner's (1938, as cited in Mazur, 2012) had the problem with his conclusion because although the effects of punishment were temporary in his experiment, so was the punishment itself. It is known that the effects of positive reinforcement are also “temporary” in the sense that operant responses will extinguish after the reinforcer is removed (Mazur, 2012).

3.4.4.3 Avoidance

John Hopson (2001) mentioned a contingency where participants work to keep things from happening, known as avoidance. He continued his argument by what game designers wants from players is a lot of behavioral momentum: a tendency to keep them doing what they are doing even during the parts where there is not an immediate reward.

A behavior increases in frequency if some unpleasant stimulus is removed after the behavior occurs, known as negative reinforcement— the term also includes instances of avoidance in which a response prevents an unpleasant stimulus from occurring in the first place (Mazur, 2012). He gave for example, a person with a headache that takes a medicine to be free from the pain of it. In doing so, the person escapes from the pain of the headache by performing some behavior that should be strengthened in the future: The next time the person has a headache, he or she is likely to take that medicine again.

One schedule that produces a lot of momentum is the avoidance schedule, where players work to prevent bad things from happening even when there is nothing going on, still players can achieve something positive by postponing a negative consequence (Hopson, 2001).

3.4.5 Getting game design back into the game

Mazur (2012) used Hackenberg's (2009) behavioral psychology's concept of token to define it as an object or symbol that can be exchanged for goods or services. Mazur continued by giving the example of money: it is normally a powerful generalized reinforcer precisely because it can be exchanged for so many different stimuli that are inherently reinforcing for most people, for example, food, clothing, material possessions, entertainment, and exciting vacations. However, it is not to be assumed that money or any other extrinsic reward to be

the best way to reward people: they must look for intrinsic rewards rather than extrinsic rewards (Weinschenk, 2011).

Looking back to previously presented studies, it is possible to assume that, by giving players a extrinsic reward, they may use it to exchange for in game features to satisfy their own cravings (intrinsic reward). As Gortari (2007, p. 6) explained, “gamers manage and administrate self-reward easily, for example through buying things, discovering new places or transforming their avatar.”. If game designers choose to use extrinsic rewards, it will be more motivating if it is unexpected (Weinschenk, 2011), as explained when discussed about Variable Ratios, and if it may be exchanged for items that may satisfy players intrinsic desires.

3.4.5.1 A dark side of psychological game design

One thing to be really alert about all processes discussed so far is that it may be used, not necessarily, for creating fun and engaging players. Soraker (2013) said that games have changed tremendously, as becoming free-to-play, using microtransactions, having several achievements, being offered in multiple mobile devices and integrating social media. Following Soraker's talk, he said that this strategies may create obsession in players, which not necessarily mean that they are having fun while playing.

The first reason he gave for it is that the more gamers play, the more likely are they will pay and that is what is driving these kind of game development. He used the phrase “save money by working instead of wasting money” (Soraker, 2013) to explain that when players spend many hours playing for free, they get the illusion that this is a meaningful activity (similar to the persuasive concept of “Valuing difficulty” discussed previously). After all, players can not admit to themselves that they wasted all those hours on something meaningless and this causes them to be more likely to spend money on it. To name it, Soraker (2013) used another phrase: “save time by paying instead of working”.

Although people may see themselves full determined to not pay the game, Soraker (2013) said that willpower is not unlimited: every time people spend it they have a little less of it left. So, when people are grinding and grindind— a term used in games when players keep doing the same task over and over again—in a game because they do not want to pay for it, at some point, though, their willpower reserve will be gone and they become more likely to pay for the game.

The final feature of this strategy examplified by Soraker (2013) is social media integration: social psychology and social comparison are one of the strongest motivational factors game companies can use, principally if players are playing with their friends or people related to them. So, just as the starting phrase of this chapter, players must be aware to ask

themselves: “Am I really having fun?”, because there is a chance that psychological effects are leading them to a miserable time instead (Soraker, 2013).

Bringing back the variable ratio concept of rewarding players, due to its unpredictability, Yee (2006a, as cited in King, Delfabbro, & Griffiths, 2009) has stated that players often report that the later stages of a video game can be more tedious and time-consuming than exciting, thus playing can become more like a second job than entertainment. He also claimed that it is possible that video game players may employ irrational logic similar to the gambler’s fallacy or hold superstitious beliefs about the reward schedules in games. And so, Yee said that games commonly feature fixed and variable schedules of reinforcement can sustain a player’s motivation to play a game for long periods because the next reward may be close to obtain.

The main purpose of games must be of satisfying players needs while having fun, not because an obsessive loop has been created just to game companies make profit out of it.

3.4.5.2 A good side of psychological game design and in-game rewards examples

Daniel King, Paul Delfabbro and Mark Griffiths (2009) said that for most video games the rewards are primarily psychological in nature, which can be related to the studies previously demonstrated that they satisfy peoples' desires. Remembering the mental model presented by Weinschenk (2011), they also discussed about it:

> “Cognitive psychology research has found that players rapidly develop a mental model of in-game elements that qualitatively shifts with experience to accommodate insights into the functional qualities of these elements (Graham et al. 2006). A study of video game playing children aged 10–11 years noted that they displayed “expert” behaviours such as selfmonitoring, pattern recognition, principled decision-making, qualitative thinking, and superior memory (VanDeventer, 2002). In this sense, the appeal of a video game lies in the variation of users’ ability to use the control scheme to learn new information about game elements and thereby maximise their rewards and enjoyment of the game.” (King et al., 2009, p. 96)

They also gave examples using rewards in different types: general features, punishment features, meta-game features, intermittent features, negative features, near miss features and event frequency features (King et al., 2009). Using King et al. (2009) work and summarizing it, each one of the features are as follows:

- **General Reward Type Features**: For being too fast in a racing game, force feedback may be used to reward players. Other games may reward the player with in-game currency (e.g., gold coins or tokens, as explained before) that also provides a system to judge the objective value of all other items in the game. Another reward are points and, depending on the type of game, experience points (XP) as players complete objectives and defeat enemies in the video game. Once they collect enough

XP, player avatar may level up and become stronger in various ways. Players can also earn various items and upgrades that make their character more proficient. Bonuses (e.g., concept artwork, and additional game modes) may also be unlocked by fulfilling specific tasks of the game world;

- **Punishment Features:** In general, positive reinforcement is used by game developers to reinforce a player's decision to keep playing. However, failure and punishment are perhaps essential in order to establish the contextual worth of in-game rewards. Historically, game developers incorporated rather severe failure scenarios, such as having to completely restart the game when the avatar "died" (Kent 2001, as cited in King et al., 2009). This was very used in arcade machines which accepted coins as payment if players wanted to keep playing, and the main design goals entailed persuading players to insert (more) coins (Bogost, 2010). Later, players could save their progress and restart from the place that have been recorded if a failure happened. As games became longer and more complex, making a punishment like permanent character death an unappealing feature, particularly for a less committed, casual playing audience. Common forms of punishment in games include having to restart a level, failing an objective, or losing resources of some kind (e.g., items, XP or points);
- **Meta-game Reward Features:** Meta-game rewards are designed to give players an overall assessment of their mastery over a game. In some of them, this has been represented by a single percentage rating that indicates how much of the game the player has completed. This encourages players to continue playing until total completion is reached (previously demonstrated by using Weinschenk, 2011 studies). King and Delfabbro (2009, as cited in King et al., 2009) reported that meta-game features often set large goals for the player, which keep a person playing longer than intended and contribute to the belief that no amount of time spent playing is "enough". Examples of this type of rewards include the Microsoft Xbox 360's Achievement Point system and the Sony Playstation 3 Trophies system. Achievement points are designed to keep the player involved with the video game after the game has been completed, either by replaying the game or playing the game online;
- **Intermittent Reward Features**: The way in which a player is rewarded for playing a game is more important than the rewards themselves (Skinner's schedules previously studied). Using variable ratio (VR) and fixed ratio (FR) schedules (these authors claim that VR are the least susceptible to extinction), for example, in role-playing games (RPGs), once the player has collected enough XP, their character levels up. The XP requirements per level usually increase each level, meaning the player has to play for increasingly longer periods in order to make progress in the more advanced stages of the game. Item rewards may also be delivered on variable ratio schedules, as 5% of the time players kill a kind of monster. As for FR, for example, a player may earn a particular reward for killing ten creatures;

- **Negative Reward Features:** Games may employ negative reinforcement techniques to keep players involved just as positive reinforcement, although in a lower percentage (Chumbley and Griffiths 2006, as cited in King et al., 2009). For example, in a shooting game, avatars may become injured by enemy fire, represented by a decreased in health statistic on the heads up display (HUD). By finding an item that will increase the avatar's health (e.g., bandages), the unwanted character state—injure—is removed and the player feels a sense of relief. Similarly, when a player is given difficult objectives to complete urgently, the player may be negatively reinforced by completing the objective and relieving a feeling of tension or pressure;
- **Near Miss Features:** This statement refers to the principle of the "near miss", the psychological construal of a losing event as being very similar to a winning one. This frequently occurs in video games and can be highly exciting. For example, in a platform jumping game, a player may execute three perfect jumping manoeuvres in a row and then misjudge the final obstacle and lose the game. In this example, the player may not perceive the loss purely as a loss, but as an attempt that came very close to winning. Video games may also provide some tutorial-like feedback to guide the player so that they do not repeat their mistakes, which reinforces to the player that the game's challenges are designed to be overcome. In this sense, a video game can be reinforcing even in "losing" situations because the player is often on the verge of winning and knows what needs to be done in order to win— this can be associated with previous concepts that have been shown, as Eysenck and Keane (2010) about deliberate practice and Weinschenk (2011) about errors.
- **Event Frequency Features:** In casual puzzle games, the player may be able to play hundreds of games over the course of an hour. Similarly, in a shooting multiplayer game, a player can kill numerous opponents in a short time. While there are goals in some games, such as Massive Multiplayer Online Role-Playing Games (MMORPGs), which may require hours, even months, to complete, often these goals are broken down into smaller tasks along the way, such as 'mini-games', checkpoints, levels, etc. In other kind of games the player is required to play continuously (without interruption) in order to earn a reward. Thus, the high event frequency of video games may explain why some individuals lose track of their video game playing and experience feelings of escape, immersion and dissociation (does it seems related with Flow? Yes, it does!).

A final aspect of rewards worth mentioning and that also discussed features of it that was already presented, is the work of Hao Wang and Chuen-Tsai Sun (2011). They presented some characteristics about how rewards, reward mechanisms, and players interact, believing that there are at least four reward system attributes that can be used to analyze their influences on different kinds of players (Bartle, 1996; Csikszentmihalyi, 1990; Ducheneaut & Moore, 2004; Yee, 2007, as cited in Wang and Sun, 2011).

The first one is social value, already told by Soraker (2013) and presented in the section “A dark side of games”, but now, it may also be presented by Wang's and Sun's (2011) work because it is suitable for either comparison purposes or social interactions: It is common for gamers to invite other players to their homes or to upload game records to show off their skills and to compare their current levels. Social value are a strong motivational feature in games and must be used for creating a good game experience.

The second attribute is that rewards may affect gameplay, ranging from no direct effect, to helping advance a game, to providing new content and each type attracts different kinds of players—people have different desires. Using Bartle’s (1996, as cited in Wang and Sun, 2011) taxonomy as an example, players considered achievers and killers focus on making personal progress, developing their avatars, challenging strong enemies, and defeating other players. These kinds of players are the least interested in visual rewards and minigames, and the most interested in accumulating treasure, weapons, titles, and other evidence of their advanced skills and accomplishments. Another kind of players are socializers, that show greater interest in superficial game aspects that can draw attention to them and support interactions with other players. Explorers, on the other side, are similar to achievers and killers in their desire to earn rewards that are new or unique. This way, their argument is that explorers' motivation for accumulating standard rewards differs in that their primary interest is in gaining sufficient strength to explore game worlds in detail. Finally, they suggested that it is possible to determine gamers playing styles by looking at what kinds of rewards they are most interested in acquiring. Rewards satisfy cravings and different people have different ones, do not forget about it.

The third attribute is the suitability of a reward for collection and review, with players having motivations that range from building a sense of accomplishment to preserving game memories (Formanek, 1994, as cited in Wang and Sun, 2011). Obviously, as they claimed, items that require a lot of effort have greater value as reminders of past experiences, or as representations of goal fulfillment— the value that people give to something was already discussed previously. From a social point of view, collecting helps players recognize other players with similar interests when gathering in online forums or at real-world meetings.

The fourth attribute they explained, which can be related to the concept explained of reinforcement schedules, is the time required to earn and/or receive a reward. Wang and Sun (2011) explained that whereas realworld rewards may take years to emerge (e.g., job promotions), game rewards can be as instantaneous and just as consistent and immediate as a pop-up message (e.g., “Perfect!”, which provides information of players actions), or as delayed as achieving a new level after days of repetitive monster killing.

To conclude this Chapter, remember Gortari (2007) when she spoke of gamers managing and administrating self-rewards? Wang and Sun (2011) also discussed about it presenting the following ways that players make use of rewards:

- **Advancement**: Players use rewards to make game progress—for example, building avatar strength with powerful World of Warcraft (Blizzard Entertainment, 2004) items. Rewards in this category mitigate challenge levels so that players can advance and gain feelings of increased skill and power. It can be argued that player skill levels are not actually affected by the use of rewards, but that players simply feel a greater sense of fun if they believe that their skills are improving.
- **Review**: Players like to check their achievement collections, view their avatars wearing powerful items, and watch animations presented in games. Reviewing rewards provides entertainment, a sense of accomplishment, and memories linking play events to specific rewards (Formanek, 1994, as cited in Wang and Sun, 2011).
- **Sociality:** Examples of using rewards as social tools include giving World of Warcraft (Blizzard Entertainment, 2005) avatars funny appearances, sharing information about rewards with other players, and showing off rare achievements or powerful weapons to establish status. These kinds of activities reflect the growing importance of player interaction via online forums or informal gatherings of gamers for single-player games. For example, a reward system based on revealing secrets can be explored by all players, who then discuss their search activities in forums, thereby building relationships with others.
- **Cooperate/Compete:** Examples include sharing resources with teammates and hoarding powerful items to maintain advantages over other players. Diablo II (Blizzard Entertainment, 2000) encourages cooperation in order to accumulate pieces of equipment called “set items” as bonuses. It is not easy to collect all items in a set, therefore many Diablo II players possess multiple items belonging to different sets. The game design encourages player interactions to make item exchanges.

For the next part of this study which is the empirical part, it will be tested the following sentences that compares different kinds of games with its players: what are the most satisfying features, motives players play beyond fun, most important features considered by players; social relation and game features considered important. But first, *Table 1* was created in order to summarize the principal concepts discussed until now and that may be helpful creating better gaming experiences for players.

Table 1: Features suggested as being helpful creating better engaging playing experiences for players, based on the literature discussed so far.

Feature type	Brief Description	Authors Related
Game Design		
a. Goals, challenges and Problem Solving	Players must be able to complete game goals with in-game information as they increase in difficulty.	Gee (2012) Gee (2008) Gee & Hayes (2012) & Gee (2014)
b. Precise feedback	The response of an action made by the player must be clear and given at the moment the action occurs.	Gee (2008) Gee (2014) Salen & Zimmerman (2003) Gee & Hayes (2012) Weinschenk (2011)
c. Mechanics	It must let players to perform actions inside the game in a way that it makes sense, are easy to perform and in an interesting way.	Gee (2014) Salen & Zimmerman (2003)
d. Narrative Content	Is the narrative relevant to the game?	Macklin & Sharp (2012)
e. Social	Does the social features in-game rewards players?	Weinschenk (2011) Soraker (2013) Wang & Sun (2011)
f. Community	Does the game have a community outside of the game world?	Dickey (2005) Steinkuehler (2008) Bogost (2010) Gee (2014)
g. Autonomy, Customization and Choices	The game must offer players choices. Thus, ablautonomy to create their own strategies and customize their experience as they like.	Azrin & Holz (1966, as cited in Mazur, 2012) Gee (2014) Gee (2005b) Gortari (2007) Hopson (2001) Rosewater (2016) Weinschenk (2011)
h. Progress	Players must be able to clearly check their progress.	Weinschenk (2011)
Persuasion		
i. Valuing difficulty	Is there any kind of really difficult tasks to be done or a clear increase in difficult through the game?	Cialdini (2007)
j. Scarcity	Resources that are offered in a limited period of time or that are not unlimited.	Cialdini (2007)
Rewards		
k. Unpredictability	Is there any kind of unexpected rewards?	Mazur (2012) Weinschenk (2011)
l. Notification	Use of notifications to symbolize a reward was obtained.	Weinschenk (2011)
m. Anticipation	Can players check how and/or	Wang & Sun (2011)

Feature type	Brief Description	Authors Related
	where a certain reward may be obtained?	
n. Token	Any feature that the game has that can be exchanged for something else.	Hackenberg (2009, as cited in Mazur, 2012)
o. Positive feedback for failure	Even if players lose or fail somewhere, does it offers anything positive to players?	(Vansteenkiste & Deci, 2003, as cited in Ritterfeld & Weber, 2006)
p. Variable Ratio	Does the game offer players rewards after a variable number of actions?	Mazur (2012)
q. Fixed Ratio	Does the game offer players rewards after a fixed number of actions?	Mazur (2012)
r. Fixed Interval	Does the game offer players rewards after a fixed period of time?	Mazur (2012)
s. Variable Interval	Does the game offer players rewards after a variable period of time?	Mazur (2012)
t. Percentile Schedules	If there is a "record" in the game that shows the best score/progress the player has ever achieved.	Mazur (2012)

4 Methodology

Introduction

The focus of this chapter is to demonstrate how results were obtained through an online form that was created and spread to players, along with its data analysis.

4.1 Participants

The total answers obtained from people (players) were of 182, and their charactistics are as follows:

- **Gender**: 80% male and 20% female;
- **Age**: 14% are below 20 years old, 70% are between 21 to 30 years old and 16% above 31 years old;
- **Scholarity**: 28% of them are undergraduated, 46,2% are graduated, 23,6% have a master degree and 2,2% have doctorated;
- **Play Time per Day**: 25,3% play less than one hour, 49,5% play between 1 to 3 hours, 17,6% play between 3 to 5 hours and 7,7% play more than 5 hours;
- **Region**: 48,4% are from South America, 44% from Europe, 7,1% from North America and 0,5% from Asia;
- **Type of game played**: 21,4% play sports, 25,3% play fighting, 63,2% play RPG, 31,3% play MMORPG, 17% play racing, 51,1% play strategy, 33% play MOBA, 40,1% play shooter, 54,4% play action, 46,2% play puzzle, 30,2% play other kind of games.

4.2 Instruments

The form was created using Google Form, a software from Google company that offers the possibility to create forms. In it there are questions related to the discussion done so far and that can be verified by viewing the section *Attachment A* at the end of this document.

4.3 Procedures

The form was spread online and offering the possibility to be created and collect data faster than a possible creation of a prototype, reaching a wider audience, not needing a lot of explanation of what people (players) needed to do and they could answer anytime they felt more comfortable or able to do it. It was opened to start collecting data from players on May 20, 2016 and it was closed on May 26, 2016. A total of 182 answers were collected.

To achieve players, the form was spread in Facebook communities of game developers from Brazil and Portugal, official game communities of Starcraft 2: Legacy of the Void (Blizzard Entertainment, 2015), Clash Royale (Supercell, 2016) and Clash of Clans (Supercell, 2012), via tweets in Twitter, spread in the course of Game Design at Universidade Anhembi Morumbi at

São Paulo (Brazil) and the course of Design and Development of Digital Games at Covilhã (Portugal).

4.4 Analysis

The type of analysis used was the cluster analysis to perform grouping of variables. Furthermore, it was also used Repeated-Measures ANOVA with GreenHouse-Geisser correction when esphericity assumptions was not met. Finally, we used Excel 2007 to organize data and SPSS 23 for statiscal analysis.

5 Results

Introduction

This chapter will present the results that could be obtained by analysing the form's data obtained and to answer the questions presented at the end of Chapter 3.

5.1 Game Categories

Before the results, it is worth mentioning that the games used in the form questions were categorized as:

- **Sports:** Like Fifa 2015 (EA Sports, 2014), games in this category are based on athletic competitions from traditional sports to extremes ones (Rogers, 2014);
- **Fighting:** This kind of game requires players to press a lot of buttons and combine them to perform different actions (e.g., punch, kick, jump, block, etc.), which may result in combos and requiring timing control and skill. For example, Street Fighter V (Capcom, 2016) is one game that fits this category;
- **Role-Playing Games (RPG):** One game to illustrate this category is Dragon Age: Inquition (BioWare, 2014), where players control a main character through discovering a whole history of a world, full of characters and quests, collect items and form alliances with other characters, including upgrading and customizing them as the player accumulate enough experience;
- **Massive Multiplayer Online Role-Playing Game (MMORPG):** Like RPG category, but players find themselves among a lot more players in an online experience, being able to combine their skills with other players to cooperative or fight against each another, as for a lot of other options available in-game. For example, World of Warcraft (Blizzard Entertainment, 2004) fits this category;
- **Racing:** This category includes games which players simulate driving a vehicle, like a race car and may be an experience where players feel like a realistic simulation (Rogers, 2014). As for example, Need for Speed Underground 2 may be cited in this category;
- **Strategy:** Games that requires thinking and planning (Rogers, 2014), resources control, build armied and vie for control of the battlefield (Blizzard Entertainment, 2016). As for a real-time strategy game example, is Starcraft II: Legacy of the Void (Blizzard Entertainment, 2015) where players may command 3 kinds of different races to try to defeat the enemy;
- **Multiplayer Online Battle Arena (MOBA):** League of Legends (Riot Games, 2009) is an example of this kind of game where players must perform team strategies with their unique hero to defend their own base as they try to destroy the enemy's base (Riot Games, 2016). As they play, they are able to level up their hero by gathering

experience and buying items to make their characters tougher;

- **Shooter:** Shooters primarily focus on making players to fire projectiles at each other (Rogers, 2014) like Killzone Shadow Fall (Guerrilla Games, 2013);
- **Action:** This category includes games like God of War 2 (SCE Sony Santa Monica, 2005) which rely on eye and hand coordination to play (Rogers, 2014), often requiring players to think fast as it often offers fast paced actions and decisions;
- **Puzzle:** This kind of game is most based on logic, observation, pattern completion, sometimes being slow and methodical and other ones being required quick eye/hand coordination (Rogers, 2014). As for example, it may be cited Candy Crush Saga (King, 2012);
- **Other:** These category includes games like card games like Hearthstone: Heroes of Warcraft (Blizzard Entertainment, 2014), board games— Risk (Brothers, 1959)—, adventure games— Full Throttle (LucasArts, 1995)—, endless runners— Zombie Tsunami (Mobigame, 2013) and other kinds of games that did not fit the categories previously listed.

Table 2 (see below) was created for the sake of better demonstrating the data collected using the form. In it we may observe the different types of games played and the percentage of the characteristics of their players: Gender, Age, Scholarity, Hours played per Day, Region their from.

Table 2: Form's data comparison

	Characteristic					
Type of Game	**Number of Cases**	**Gender** Male Female	**Age in Years** 20 or less 21 to 25 26 to 30 31 to 35 36 or more	**Scholarity** Undergratuated Graduated Masters Doctors	**Hours Played per Day** Less than 1 1 to 3 3 to 5 5 or more	**Region** South America Europe North America Asia
Sports	39	95% 5%	5% 41% 33,3% 10,3% 10,3%	23,1% 48,7% 20,5% 7,7%	35,9% 51,3% 10,3% 2,6%	51,3% 48,7%
Fighting	46	82,6% 17,4%	10,9% 32,6% 32,6% 13% 10,9%	26,1% 47,8% 21,7% 4,3%	34,8% 47,8% 8,7% 8,7%	71,7% 23,9% 4,3%
RPG	115	80% 20%	13% 43,5% 31,3% 7% 2%	27% 51,3% 20,9% 0,9%	16,5% 51,3% 9% 11,3%	46,1% 48,7% 5,2%
MMORPG	57	77,2% 12,8%	14% 52,6% 26,3% 5,3%	28,1% 59,6% 10,5% 1,8%	7% 36,8% 35,1% 21,1%	49,1% 47,4% 3,5%

	Characteristic					
			1,8%			
Racing	31	87,1% 12,9%	6,5% 45,2% 38,7% 6,5% 3,2%	29% 48,4% 22,6%	32,3% 45,2% 16,1% 6,5%	64,5% 32,3% 3,2%
Strategy	93	86% 14%	15,1% 41,9% 29% 4,3% 9,7%	28% 47,3% 22,6% 2,2%	19,4% 55,9% 17,2% 7,5%	39,8% 39,8% 9,7% 1,1%
MOBA	60	78,3% 11,7%	15% 50% 30% 5%	23,3% 66,7% 8,3% 1,7%	5% 40% 38,3% 16,7%	43,3% 51,7% 5%
Shooter	73	87,7% 12,3%	15,1% 39,7% 31,5% 8,2% 5,5%	27,4% 47,9% 23,3% 1,4%	17,8% 50,7% 19,2% 12,3%	54,8% 39,7% 5,5%
Action	99	83,8% 16,2%	7,1% 44,4% 33,3% 8,1% 7,1%	26,3% 51,5% 21,2% 1%	15,2% 52,5% 21,2% 11,1%	38,4% 54,5% 7,1%
Puzzle	84	70,2% 29,8%	11,9% 31% 35,7% 7,1% 14,3%	21,4% 44% 29,8% 4,8%	33,3% 47,6% 13,1% 6%	56% 36,9% 7,1%
Others	55	78,2% 13,8%	9,1% 41,8% 27,3% 5,5% 16,4%	25,5% 40% 30,9% 3,6%	25,5% 45,5% 21,8% 7,3%	49,1% 47,3% 3,6%

5.2 Cluster Analysis

After this general results that were generated, the games were categorized into groups, clusters, as Cluster Analysis (*Figure 5*) was used in order to do it. The clusters that resulted were Strategy and Puzzle ("brain"); MMORPG, MOBA, RPG, Action ("adventure"); and the third cluster Sports, Fighting, Racing, Others and Shooter ("experience"). The reason for this organization was to allow for statistical analisys that was impaired because of the overlapping of categories in the inicial form. Using the Cluster Analysis, it was identified that these kind of games were more related with each other. For example, players that played Strategy games were more susceptible playing Puzzle games, and so as for the other clusters created.

Another reason for the cluster organization was because it would result in clearer results (statistics) for testing the hyphoteses that were presented.

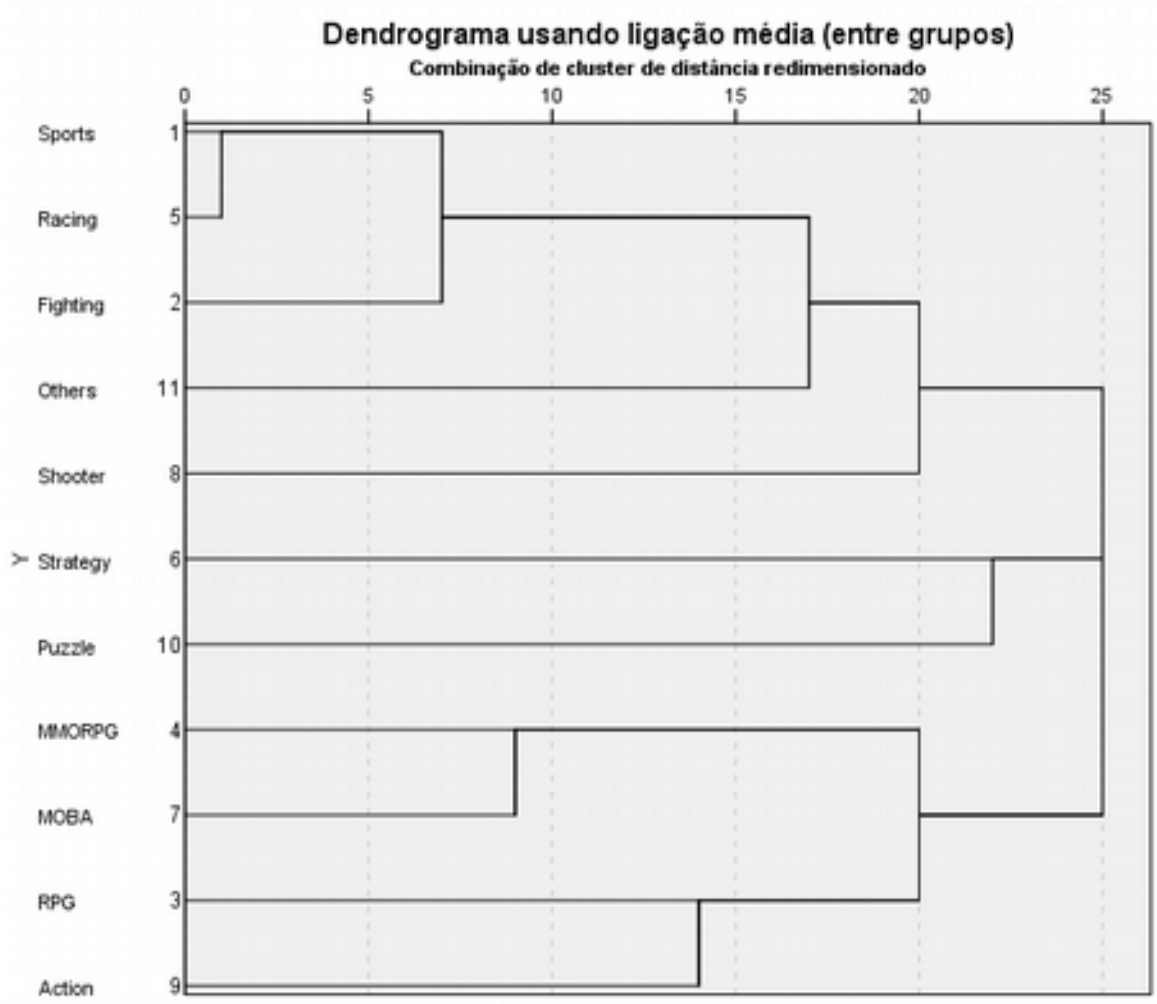

Figure 5. Demonstration of the Cluster Analysis used to group the types of games

5.2.1 Satisfaction

We have studied the player satisfaction while playing with a factorial design of clusters (3) x satisfaction (9). According to the clusters presented (brain, adventure and experience) the satisfaction items are: “when you overcome a very difficult challenge”, “surprise rewards”, “rewards obtained after a fixed period of time”, “fixed objetives which you must complete certain tasks to claim the reward”, “unlocking achievements”, “when a tip you looked for outside the game worked when you have tried it inside the game”, “when a friend directly helps or only tells you how to do something”, “when a stranger directly helps or only tells you how to do something” and “the act of paying to receive any kind of help inside the game”.

We found a principal effect of satisfaction F (6.46, 1156.86) = 48.9, p<.001, η_p^2 = .215. We did not find Cluster principal effects neither in interactions between Cluster and satisfaction.

Players reported more satisfaction for the item “when you overcome a very difficult challenge” (M=4.34) in relation to all the others, all p <.001. For the items “surprise rewards” (M=3.57), “fixed objectives which you must complete certain tasks to claim the reward” (M=3.51), “unlocking achievements” (M=3.64) and “when a tip you looked for outside

the game worked when you have tried it inside the game" (M=3.27) we did not find significant statistical differences. However, all of the later ones are reported as more satisfying than the items "rewards obtained after a fixed period of time" (M=2.96), "when a friend directly helps or only tells you how to do something" (M=3.01), "when a stranger directly helps or only tells you how to do something" (M=2.86). For probability $p<.001$ with the exception between "when a tip you looked for outside the game worked when you have tried it inside the game" and "when a stranger directly helps or only tells you how to do something" with $p=.004$. The item, "the act of paying to receive any kind of help inside the game" (M=2.28), was reported as the least satisfying, all $p<.001$.

5.2.2 Motives to play beyond fun

Another feature studied using the factorial design of clusters (3) x motives to play(7) was about the motives people may play games beyond the motive to have fun. They are: "play because you are a member of a guild/clan", "spending a lot of time just to gain or find a rare item", "to be able to show others what you have achieved", "playing just to keep the highest position or status", "playing just to show who is the best or the most victorious", "to be able to meet or talk with other players", "playing because one or more friends are playing it".

We found a principal effect of motives F (4.74, 849.22) = 15.41, $p<.001$, η_p^2 = .079; the Cluster principal effets F (3.14, 7.87) = 3,14, $p<.046$, η_p^2 = .034; and interactions effects between motives x Clusters F (9.49, 849.22) = 2.03, $p<.030$, η_p^2 = .022.

Through the Cluster principal effects collected it may be identified that the motives that makes players to play beyond fun is marginally smaller in the Cluster Brain (M=2.51) than in Adventure (M=2.90), $p=.068$. Still, the motive beyond fun that most makes players play is "playing because one or more friends are playing it" (M=3.45), $p<.001$. The motive "spending a lot of time just to gain or find a rare item" (M=2.90), is more important than "to be able to show others what you have achieved" (M=2.54), $p=0.41$ and "play because you are a member of a guild/clan" (M=2.49), $p=.007$.

Analysing the Cluster interactions, the Cluster Brain gives less importance than Adventure for the motives: "play because you are a member of a guild/clan" as Brain (M=2.11) and Adventure (M=2.80), $p=.005$; "spending a lot of time just to gain or find a rare item" as Brain (M=2.59) and Adventure (M=3.24), $p=.006$; and "playing because one or more friends are playing it" as Brain (M=3.11) and Adventure (M=3.71), $p=.019$.

For the Cluster Experience, the motive "play because you are a member of a guild/clan" (M=2.57) is least important than "playing because one or more friends are playing it" (M=3.52), $p=.037$.

As for the Cluster Brain, the most important motive is “playing because one or more friends are playing it” (M=3.11) when compared to all the others: “play because you are a member of a guild/clan”, p<.001; “spending a lot of time just to gain or find a rare item”, *p*=.031; “to be able to show others what you have achieved”, p<.001; “playing just to keep the highest position or status”, *p*=.004; “playing just to show who is the best or the most victorious”, *p*=.001; “to be able to meet or talk with other players”, p=.017. Besides, the motive “play because you are a member of a guild/clan” (M=2.11) is less important than “spending a lot of time just to gain or find a rare item” (M=2.59), *p*=.029, and “to be able to meet or talk with other players” (M=2.63), *p*=.031.

For the Cluster Adventure, the motive “playing because one or more friends are playing it” (M=3.71) is more important than: “play because you are a member of a guild/clan” (M=2.80), *p*=.039; “to be able to show others what you have achieved”, (M=2.56), *p*<.001; “playing just to keep the highest position or status” (M=2.54), *p*<.001; “playing just to show who is the best or the most victorious” (M=2.50), *p*<.001; “to be able to meet or talk with other players” (M=2.94), p<.001. Though, motive “spending a lot of time just to gain or find a rare item” is more important than “to be able to show others what you have achieved”, “playing just to keep the highest position or status”, “playing just to show who is the best or the most victorious”, *p*<.001.

5.2.3 Most important game features

For these features analysis, we have grouped into another 3 Clusters (*Figure 6*) the features considered most important by the players. They are: Resources, Mechanics and Social and to understand *Figure 6* codes for the Clusters, see *Figure 7*, *Figure 8* and *Figure 9* respectively.

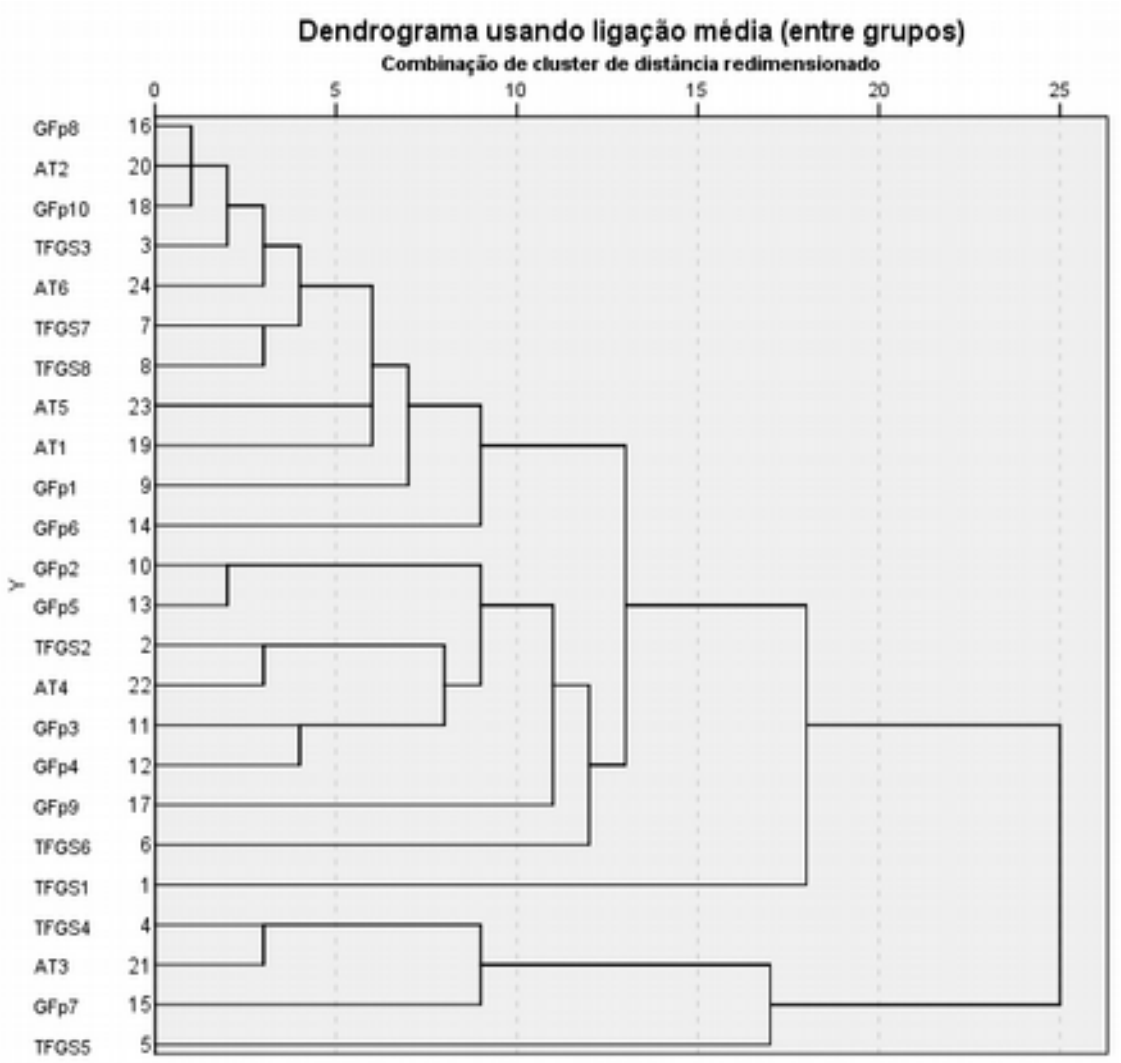

Figure 6. Demonstration of the Cluster organization for the most important game features.

Table 3: Cluster Resources codes and what it is to identify in *Figure 6*.

Resources	Code	Description
1	GFp8	Player progress through the game
2	AT2	Choices
3	GFp10	When the game offers a lot of choices and the player can manage their own strategy
4	TFGS3	Choices offered by the game
5	AT6	Mechanics of the games played
6	TFGS7	Feedback (responses of the game after you do something in it)
7	TFGS8	Challenges
8	AT5	The theme and narrative of the game
9	AT1	Objectives that must be done inside the game
10	GFp1	Feedbacks that transmit clear information of player actions
11	GFp6	Surprise Rewards

Table 4: Cluster Gameplay codes and what it is to identify in *Figure 6*.

Gameplay	Code	Description
1	GFp2	Short-play sessions
2	GFp5	Short-term objectives
3	TFGS2	Game rewards
4	AT4	The way the game rewards players: items, gold, characters, etc.
5	GFp3	Long play sessions
6	GFp9	When the game offers fixed choices and the player must learn how to use it effectively
7	TFGS6	Customization
8	TFGS1	Time to finish a game session

Table 5: Cluster Social codes and what it is to identify in *Figure 6*.

Social	Code	Description
1	TFGS4	Social features
2	TFGS5	Paid resources (ex: items, gold, etc.)
3	GFp4	Long-term objectives
4	GFp7	Cultural exchange between players
5	AT3	Social possibilities to interact with other players

5.2.3.1 Resources

Using the factorial design of clusters (3) x resources (11) was about the motives people may play games beyond the motive to have fun. They are: “player progress through the game”, “choices”, “when the game offers a lot of choices and the player can manage their own strategy”, “choices offered by the game”, “mechanics of the games played”, “feedback (responses of the game after you do something in it)”, “challenges”, “the theme and narrative of the game”, “objectives that must be done inside the game”, “feedbacks that transmit clear information of player actions”, “surprise rewards”

We found a principal effect of resources F (8.09, 1448.03) = 9.434, p<.001, η_p^2 = .050; no Cluster effects nor interactions effects between resources x Clusters were identified.

Through the Resources Cluster it may be identified that the feature “mechanics of the games played” (M=4.56) is more important than “player progress through the game” (M=4.27), p=.018, “choices” (M=4.23), p=.011, “choices offered by the game” (M=4.05), p<.001, “feedback (responses of the game after you do something in it)” “objectives that must be done inside the game” (M=3.92), p<.001, “feedbacks that transmit clear information of player actions” (M=3.84), p<.001, “surprise rewards” (M=3.90), p<.001. The feature “player progress

through the game" is more important than 9 "objectives that must be done inside the game", *p*=.006, "feedbacks that transmit clear information of player actions", *p*=.003 and "surprise rewards", *p*=.048. The feature "choices" is more important than "objectives that must be done inside the game", *p*=.033 and "feedbacks that transmit clear information of player actions", *p*=.009. The feature "when the game offers a lot of choices and the player can manage their own strategy" (M=4.33) is more important than "objectives that must be done inside the game", *p*=.009, "feedbacks that transmit clear information of player actions", *p*=.001, and "surprise rewards", *p*=.012. The feature "challenges" (M=4.27) is more important than "objectives that must be done inside the game", *p*=.009 and "feedbacks that transmit clear information of player actions", *p*=.010. Finally, the feature "the theme and narrative of the game" (M=4.28) is more important than "feedbacks that transmit clear information of player actions", *p*=.012 and "surprise rewards", *p*=.031.

5.2.3.2 Gameplay

Now for the factorial design of clusters (3) x Gameplay (8) they are: "short-play sessions", "short-term objectives", "game rewards", "the way the game rewards players: items, gold, characters, etc.", "long play sessions", "when the game offers fixed choices and the player must learn how to use it effectively", "customization", "time to finish a game session".

We found a principal effect of gameplay *F* (5.87, 1050.46) = 3.74, *p*=.001, η_p^2 = .020; for interactions effects between gameplay x Clusters *F* (11.74, 1050.46) = 2.945, *p*=.001, η_p^2 = .032. No Cluster effects were found.

For the Cluster principal effects of gameplay we found that the feature "when the game offers fixed choices and the player must learn how to use it effectively" (M=3.61) is more important than "time to finish a game session" (M=3.17), *p*=.049. And that feature "customization" (M=3.63) is also more important than "time to finish a game session" *p*=.040.

For the Cluster interaction between gameplay x Clusters we found that for Cluster Brain feature "short-term objectives" (M=3.50) is more important than "long play sessions" (M=2.95) *p*=.024, and that this later ones is less important than "when the game offers fixed choices and the player must learn how to use it effectively" (M=3.57), *p*=.003. As for Cluster Adventure the feature "short-play sessions" (M=2.94) is less important than "short-term objectives" (M=3.38), *p*=.001, "game rewards" (M=3.44), *p*=.015, "the way the game rewards players: items, gold, characters, etc." (M=3.51), *p*=.016 and "customization" (M=3.70), *p*=.001. This later one is more important than "time to finish a game session" (M=2.99), *p*=.003.

For the feature 1 "short-play sessions" it is more important for Cluster Brain (M=3.43) than Adventure (M=2.94), *p*=.014.

5.2.3.3 Social

Finally, for the factorial design of clusters (3) x Social (5) they are: “social features”, “paid resources (ex: items, gold, etc.)”, “long-term objectives”, “cultural exchange between players”, “social possibilities to interact with other players”.

We found a principal effect of social F (3.45, 617.67) = 44.78, p<.001, η_p^2 = .200; no Cluster effects nor interactions effects between social x Clusters were identified.

For the Cluster principal effects of gameplay we found that the feature “social features” (M=2.64) is more important than “paid resources (ex: items, gold, etc.)” (M=2.13), p<.001 and “cultural exchange between players” (M=3.17), p=.001, but less important than “long-term objectives” (M=3.71), p<.001 and “social possibilities to interact with other players” (M=2.92), p=.022. The feature “paid resources (ex: items, gold, etc.)” is less important than “long-term objectives”, p<.001, “cultural exchange between players”, p<.001, “social possibilities to interact with other players”, p<.001. The feature “long-term objectives” is more important than “cultural exchange between players”, p=.001 and “social possibilities to interact with other players”, p<.001.

6 Conclusion

Our journey is finally coming to an end after a quite long time discussing about how rewards impact in players' behavior. And what is it possible to conclude? Moreover, what are possible future studies that can follow along the ideas demonstrated in this research?

In the first level of the study, Chapter 1, we have discussed about some of the core concepts that compose a game to try to establish a basic idea of what is a game. Still, it was presented some of the games utilities besides just creating fun experiences for players, as they may also be used for learning, to create cultural value and form communities.

Getting into the middle of the journey, Chapter 2, the purpose was to present some of the strategies to create the whole game world that players will interact with. Following that idea, it was also discussed how players come to understand the world designed in order to act upon it.

As for the final part of the theoretical research's journey, Chapter 3, we got into psychological ideas as cognitive psychology, what strategies may be used to influence human behavior, attention, habits and finally focusing on rewards. In this later, we presented the concepts of reinforcement schedules, dopamine effect, attention while using punishment and some of rewards specific characteristics.

For the “boss level”, the final part of this research, it was where the answers gathered from players themselves (an online form was used for it) were analysed and used to come to some conclusions, relating it with the concepts discussed all along the dissertation's research.

The form, as any other tool, was not all perfect! It had some disavantages of being limited by the options from the software it has been created, did not offer the possibility to go deeper into some features, players could have answered something different from expected because did not compreenhend well the question. The most problematic thing happened to occur when the time had come to analyse the data based on the game categories that were given, as it was a multiple choice question. Fortunately, using Cluster Analysis we were able to come up to some interesting conclusions and we will get into it now. After all, we deserve the reward to come up with a conclusion after all this long journey, don't we? For this purpose, we will relate the form results with the Table 1 that was presented at the end of Chapter 3.

The first item that was studied was features that most satisfy players while playing: Just as Cialdini (2007) talked about Valuying Difficulty, the results were that the most satifying feature is when players overcome a very difficult challenge. So, we can say that the a really satisfying game experience is when players use their current skills to challenge themselves against a very difficult challenge compared to the current skills they have, be it in the middle or at the final part of the game.

Social features were discussed by Weinschenk (2011), Soraker (2013), Wang & Sun (2011) and we can also relate it with Cialdini (2007) when he demonstrated the importance of similarity and familiarity. And that what exactly what was found to be important to make players play a game! The most important reasons found to make players play beyond the fact of having fun were because their friends are playing it or to find a rare item, as it happens when we play a cooperative game as World of Warcraft (Blizzard Entertainment, 2004) that has a lot of rare items to be obtained by defeating difficult bosses. But, as verified, friends are not only important for these kind of games, but all others. Definitely paid resources do not satisfy players and do not seem important to players, and if one of the core of game experiences are to produce joy for players, this feature must not be used to try to satisfy players in any action they must do inside the game.

As for in-game features, player progress and the choices they may choose, especially if they can manage their own were not only verified to be important, but were also the argument of various authors like Azrin & Holz (1966, as cited in Mazur, 2012), Gee (2014), Gee (2005b, Gortari (2007), Hopson (2001), Rosewater (2016) and Weinschenk (2011). It is possible to assume that this kind of choices chosen by the player can be a kind of customization to fit his or her characteristics and style of playing the game.

As we could also verify 78% of players think that the quality of rewards are better and most satisfying for producing emotional relation to the game and thus to make them keep playing it. So what if we combine the concepts presented and verified as being important for players' gaming experience, with the ones presented by Mazur (2012) about reinforcement schedules and that Weinschenk (2011) suggested that Variable Ratios produce the most engaging behavior? If all those features are combined with the correct kind of reward that will satisfy players cravings by being of high quality, it may really produce an even more engaging experience, remembering that Wang and Sun (2011) said to not forget that different people have different cravings.

Hopson (2001) said that if we can understand how players respond to what we ask of them, we can design games to attract the kind of player it is designed for, but more than that, we can also create them a great gaming experience through our game design. As Weinschenk (2012) said that the reward must be something your target audience wants and, if hungry rats want food pellets, what does your particular audience really wants? Find that answer, use the concepts presented (check *Table 1* at the end of Chapter 3!) as important and your reward may be the surprising one of you coming up with a deeper and engaging game experience for your audience that they will enjoy.

And what can we plan or suggest for the future? The first option would be to apply the reinforcement ideas using a real designed game with players playing it in real time, in order to test how rewards may influence better player behavior. Another option, would be to

incorporate psychological concepts presented were incorporeted into objectives? Would players be more motivated in doing them and being satisfied by its tasks?

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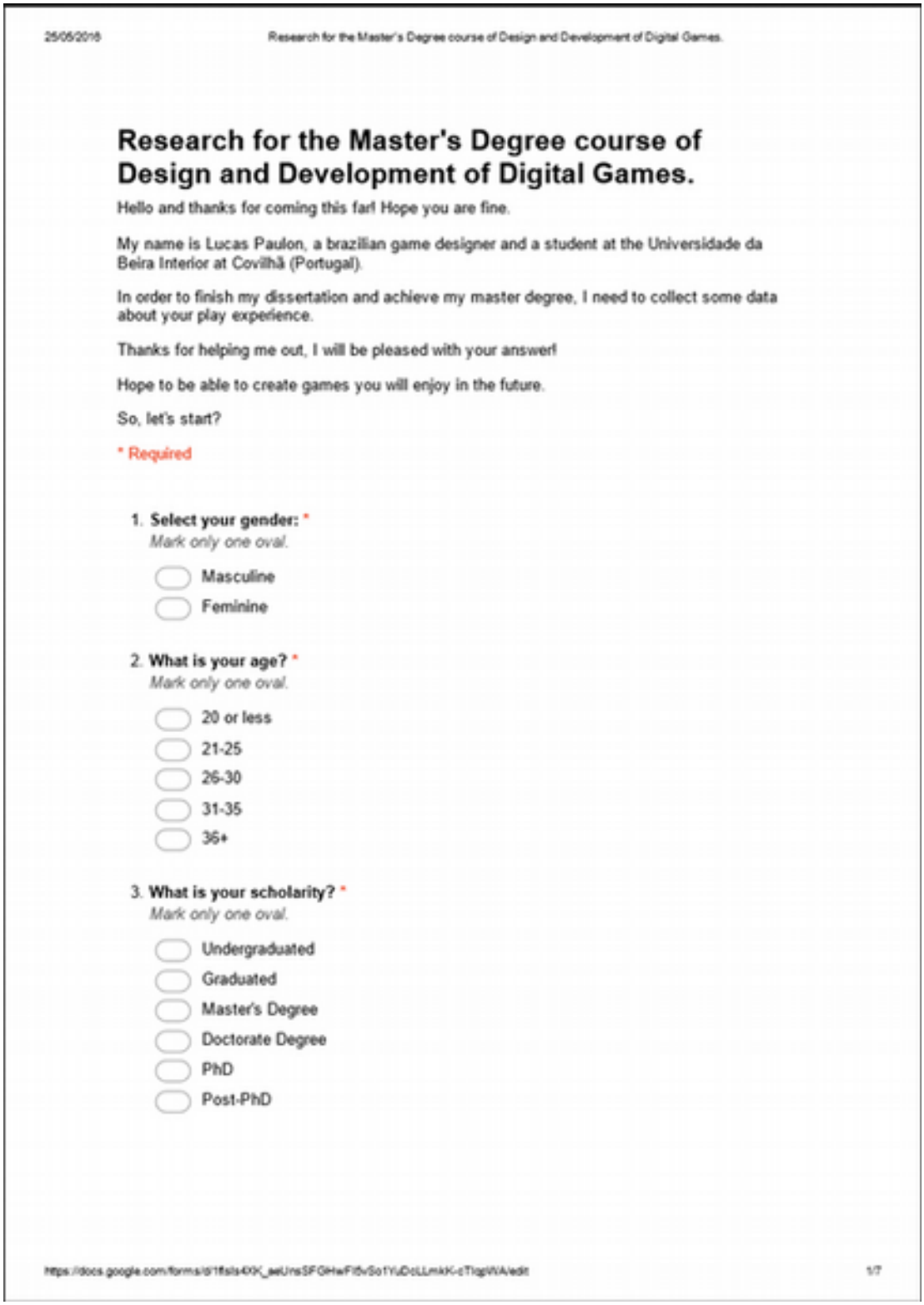
Attachment A – Form



25/05/2016 Research for the Master's Degree course of Design and Development of Digital Games.

Research for the Master's Degree course of Design and Development of Digital Games.

Hello and thanks for coming this far! Hope you are fine.

My name is Lucas Paulon, a brazilian game designer and a student at the Universidade da Beira Interior at Covilhã (Portugal).

In order to finish my dissertation and achieve my master degree, I need to collect some data about your play experience.

Thanks for helping me out, I will be pleased with your answer!

Hope to be able to create games you will enjoy in the future.

So, let's start?

* Required

1. **Select your gender:** *
   Mark only one oval.
   - ◯ Masculine
   - ◯ Feminine

2. **What is your age?** *
   Mark only one oval.
   - ◯ 20 or less
   - ◯ 21-25
   - ◯ 26-30
   - ◯ 31-35
   - ◯ 36+

3. **What is your scholarity?** *
   Mark only one oval.
   - ◯ Undergraduated
   - ◯ Graduated
   - ◯ Master's Degree
   - ◯ Doctorate Degree
   - ◯ PhD
   - ◯ Post-PhD

https://docs.google.com/forms/d/1f8sls4XK_aeUnsSFGHwFt5vSo1YuDcLLmkK-cTlqpWA/edit 1/7

4. **How much time do you spend time playing games per day?** *
Mark only one oval.

- ◯ Less than 1 hour
- ◯ 1-3 hours
- ◯ 3-5 hours
- ◯ More than 5

5. **Which region of the world are you from?** *
Mark only one oval.

- ◯ North America
- ◯ Central America
- ◯ South America
- ◯ Caribbean
- ◯ Europe
- ◯ Africa
- ◯ Middle East
- ◯ Asia
- ◯ Oceania

6. **What kind of games do you usually play?** *
Check all that apply.

- ☐ Sports (ex: Fifa, Tony Hawk, etc.)
- ☐ Fighting (ex: Street Fighter, Mortal Kombat, etc.)
- ☐ RPG (ex: Dragon Age, Neverwinter Nights, etc.)
- ☐ MMORPG (ex: World of Warcraft, Guild Wars, etc.)
- ☐ Racing (ex: Need for Speed, Formula 1, etc.)
- ☐ Strategy (ex: Age of Empires, Starcraft, etc.)
- ☐ MOBA (ex: Heroes of the Storm, League of Legends, etc.)
- ☐ Shooter (ex: Call of Duty, Killzone, etc.)
- ☐ Action (ex: Diablo, God of War, etc.)
- ☐ Puzzle (ex: Candy Crush, Tetris, etc.)
- ☐ Others

Level 2

You can do it!

7. **In a scale from 1 to 5, select the option you think it's more important when you play a game: (consider 1 as not important and 5 as very important)** *

Mark only one oval per row.

	1	2	3	4	5
The game itself and your progress inside of it					
The emotional feelings the game makes players feel					
The start of an objective inside the game					
The progress through achieving the objective					
The reward the game offers for completing the objective					
To show off to other players what was accomplished					

8. **In a scale from 1 to 5, when you are playing a game, select how important are each of the features below: (consider 1 as not important and 5 as very important)** *

Mark only one oval per row.

	1	2	3	4	5
Time to finish a game session					
Game rewards					
Choices offered by the game					
Social features					
Paid resources (ex: items, gold, etc.)					
Customization					
Feedback (responses of the game after you do something in it)					
Challenges					

9. **From the choices below, select the things that most attract you to a game, from 1 to 5: (consider 1 as not important and 5 as very important)** *

Mark only one oval per row.

	1	2	3	4	5
Objectives that must be done inside the game					
Choices offered by the game					
Social possibilities to interact with other players					
The way the game rewards players: items, gold, characters, etc.					
The theme and narrative of the game					
Mechanics (how the game is played)					

10. **About game rewards, which is more important? (consider 1 as Quantity much more important than Quality, and 5, the contrary)** *

Mark only one oval.

	1	2	3	4	5	
Quantity	◯	◯	◯	◯	◯	Quality

11. **What do you think about the relationship between game rewards and the emotional state it causes at people to keep playing?** *

Mark only one oval.

	1	2	3	4	5	
Not important	◯	◯	◯	◯	◯	Very Important

12. **In a scale from 1 to 5, when do you feel more emotional attracted to the game while playing? (consider 1 as not attracted and 5 as very attracted)** *

Mark only one oval per row.

	1	2	3	4	5
Receiving rewards	◯	◯	◯	◯	◯
Completing objectives	◯	◯	◯	◯	◯
Winning or losing a match	◯	◯	◯	◯	◯
Helping someone and getting a "thanks"	◯	◯	◯	◯	◯
Interacting with other players	◯	◯	◯	◯	◯
Listening to game music	◯	◯	◯	◯	◯
Reading the game's history	◯	◯	◯	◯	◯

13. **About game challenges, from 1 to 5, select how important you think each of them are:** *

Mark only one oval per row.

	1	2	3	4	5
Easy ones that gives small rewards	◯	◯	◯	◯	◯
Moderate ones that gives moderate rewards	◯	◯	◯	◯	◯
Really difficult ones with big rewards	◯	◯	◯	◯	◯
A mixture of all the above and players can choose which ones to do	◯	◯	◯	◯	◯
A mixture of all the above that you let the game surprises you which one will be the next challenge	◯	◯	◯	◯	◯

14. **When you play a game, the objectives you prefer are (consider 1 as not important and 5 as very important):** *

Mark only one oval per row.

	1	2	3	4	5
The objectives completed very fast					
The objectives that takes a long period of time to complete					
The ones that takes a while to complete but that also has small ones along the way					
I do not care about the time of it as long as I am having fun playing					

15. **Among the game features below, select the ones you prefer: (consider 1 as not important and 5 as very important)** *

Mark only one oval per row.

	1	2	3	4	5
Feedbacks that transmit clear information of player actions					
Short play sessions					
Long play sessions					
Long-term objectives					
Short-term objectives					
Surprise Rewards					
Cultural exchange between players					
Player progress through the game					
When the game offers fixed choices and the player must learn how to use it effectively					
When the game offers a lot of choices and the player can manage their own strategy					

16. **Which of the game features presented you consider to satisfy you the most? (consider 1 as not important and 5 as very important)** *

Mark only one oval per row.

	1	2	3	4	5
When you overcome a very difficult challenge					
Suprise rewards (ex: gold, items, characters, etc.)					
Rewards obtained after a fixed period of time					
Fixed objetives which you must complete certain tasks to claim the reward					
Unlocking achievements					
When a tip you looked for outside the game worked when you have tried it inside the game					
When a friend directly helps or only tells you how to do something					
When a stranger directly helps or only tells you how to do something					
The act of paying to receive any kind of help inside the game (ex: items, gold, characters, etc.)					

Boss: Final Level!

The journey was rough, but you have beien doing a good job.
You just got to finish the boss and it is over!

17. **When you are playing a game you like, do you really feel like having fun over all the time you spend playing it? Select in the scale which number best describes your answer.** *

Mark only one oval.

	1	2	3	4	5	
"Just play"						Play and have fun

18. **Comparing the time that you really "have fun" while playing a game against the time you "just play", for any other reason it may be, then select in the scale the answer that best fits your feeling while playing:** *

Mark only one oval.

	1	2	3	4	5	
Time playing because you "must" and not actually having fun						Play because you are really enjoying the game

19. **If any of the factors below represents a motive to play, besides to have fun, please mark the ones you think, or experienced yourself, that may be a motive to it: (consider 1 as not important and 5 as very important)** *

Mark only one oval per row.

	1	2	3	4	5
Play because you are a member of a guild/clan					
Spending a lot of time just to gain or find a rare item					
To be able to show others what you have achieved					
Playing just to keep the highest position or status					
Playing just to show who is the best or the most victorious					
To be able to meet or talk with other players					
Playing because one or more friends are playing it					

20. **If any of the factors presented may be learned by players and transfered to real life, select the ones you most consider to be useful: (consider 1 as not important and 5 as very important)** *

Mark only one oval per row.

	1	2	3	4	5
Ability to think fast and come up with a solution when under pressure					
Problem Solving					
Strategy planning before acting when you have a lof of choices					
Ability to follow orders					
Resources control to use it effectively					
Team management as being the leader of a guild, clan or any group of players					
Cultural exchange between players					
Ability to complete tasks					
Timing control					
Memory					
Pattern Recognition					

Attachment B – Statistical Tables

Análise da satisfação

Origem		gl	F	Sig.	Eta parcial quadrado
satisfaction	Esfericidade considerada	8	48,903	,000	,215
	Greenhouse-Geisser	6,463	48,903	,000	,215
	Huynh-Feldt	6,806	48,903	,000	,215
	Limite inferior	1,000	48,903	,000	,215
satisfaction * Cluster	Esfericidade considerada	16	,917	,549	,010
	Greenhouse-Geisser	12,926	,917	,534	,010
	Huynh-Feldt	13,612	,917	,537	,010
	Limite inferior	2,000	,917	,401	,010
Erro(satisfaction)	Esfericidade considerada	1432			
	Greenhouse-Geisser	1156,860			
	Huynh-Feldt	1218,234			
	Limite inferior	179,000			

Estimativas

Medida: MEASURE_1

satisfaction	Média	Erro Erro	Intervalo de Confiança 95%	
			Limite inferior	Limite superior
1	4,341	,083	4,178	4,504
2	3,573	,100	3,375	3,771
3	2,955	,102	2,754	3,156
4	3,505	,091	3,326	3,684
5	3,640	,109	3,424	3,855
6	3,274	,105	3,066	3,482
7	3,055	,105	2,848	3,262
8	2,858	,104	2,653	3,063
9	2,282	,120	2,044	2,519

Comparações por Método Pairwise

Medida: MEASURE_1

(I) satisfaction	(J) satisfaction	Diferença média (I-J)	Erro Erro	Sig.[b]	95% Intervalo de Confiança para Diferença[b]	
					Limite inferior	Limite superior
1	2	,768*	,115	,000	,396	1,140
	3	1,386*	,118	,000	1,001	1,771
	4	,836*	,107	,000	,488	1,184
	5	,701*	,130	,000	,279	1,124
	6	1,067*	,116	,000	,690	1,444
	7	1,286*	,115	,000	,912	1,661
	8	1,483*	,113	,000	1,117	1,849
	9	2,059*	,148	,000	1,579	2,540
2	1	-,768*	,115	,000	-1,140	-,396
	3	,618*	,105	,000	,277	,960
	4	,068	,106	1,000	-,276	,412
	5	-,067	,126	1,000	-,476	,343
	6	,299	,109	,235	-,054	,652
	7	,519*	,117	,001	,138	,899
	8	,715*	,119	,000	,328	1,102
	9	1,292*	,143	,000	,826	1,757
3	1	-1,386*	,118	,000	-1,771	-1,001
	2	-,618*	,105	,000	-,960	-,277
	4	-,550*	,088	,000	-,835	-,265
	5	-,685*	,113	,000	-1,053	-,317
	6	-,319	,115	,225	-,694	,055
	7	-,100	,116	1,000	-,476	,276
	8	,097	,112	1,000	-,268	,462
	9	,673*	,128	,000	,259	1,088
4	1	-,836*	,107	,000	-1,184	-,488
	2	-,068	,106	1,000	-,412	,276
	3	,550*	,088	,000	,265	,835
	5	-,135	,109	1,000	-,489	,219
	6	,231	,108	1,000	-,118	,580
	7	,450*	,112	,003	,087	,814
	8	,647*	,111	,000	,286	1,008
	9	1,223*	,132	,000	,796	1,651
5	1	-,701*	,130	,000	-1,124	-,279
	2	,067	,126	1,000	-,343	,476
	3	,685*	,113	,000	,317	1,053
	4	,135	,109	1,000	-,219	,489

	6	,366	,121	,100	-,026	,757
	7	,585*	,127	,000	,172	,998
	8	,782*	,135	,000	,344	1,220
	9	1,358*	,139	,000	,905	1,811
6	1	-1,067*	,116	,000	-1,444	-,690
	2	-,299	,109	,235	-,652	,054
	3	,319	,115	,225	-,055	,694
	4	-,231	,108	1,000	-,580	,118
	5	-,366	,121	,100	-,757	,026
	7	,219	,092	,639	-,078	,517
	8	,416*	,105	,004	,074	,758
	9	,992*	,135	,000	,555	1,430
7	1	-1,286*	,115	,000	-1,661	-,912
	2	-,519*	,117	,001	-,899	-,138
	3	,100	,116	1,000	-,276	,476
	4	-,450*	,112	,003	-,814	-,087
	5	-,585*	,127	,000	-,998	-,172
	6	-,219	,092	,639	-,517	,078
	8	,197	,076	,367	-,049	,442
	9	,773*	,131	,000	,346	1,200
8	1	-1,483*	,113	,000	-1,849	-1,117
	2	-,715*	,119	,000	-1,102	-,328
	3	-,097	,112	1,000	-,462	,268
	4	-,647*	,111	,000	-1,008	-,286
	5	-,782*	,135	,000	-1,220	-,344
	6	-,416*	,105	,004	-,758	-,074
	7	-,197	,076	,367	-,442	,049
	9	,576*	,122	,000	,181	,972
9	1	-2,059*	,148	,000	-2,540	-1,579
	2	-1,292*	,143	,000	-1,757	-,826
	3	-,673*	,128	,000	-1,088	-,259
	4	-1,223*	,132	,000	-1,651	-,796
	5	-1,358*	,139	,000	-1,811	-,905
	6	-,992*	,135	,000	-1,430	-,555
	7	-,773*	,131	,000	-1,200	-,346
	8	-,576*	,122	,000	-,972	-,181

Baseado em médias marginais estimadas

*. A diferença média é significativa no nível ,05.

b. Ajustamento para diversas comparações: Bonferroni.

RECOMPENSAS

About game rewards, which is more important? (consider 1 as Quantity much more important than Quality, and 5, the contrary)

		Frequência	Porcentagem	Porcentagem válida	Porcentagem cumulativa
Válido	1	1	,5	,5	,5
	2	4	2,2	2,2	2,7
	3	33	18,1	18,1	20,9
	4	74	40,7	40,7	61,5
	5	70	38,5	38,5	100,0
	Total	182	100,0	100,0	

What do you think about the relationship between game rewards and the emotional state it causes at people to keep playing?

		Frequência	Porcentagem	Porcentagem válida	Porcentagem cumulativa
Válido	1	4	2,2	2,2	2,2
	2	7	3,8	3,8	6,0
	3	28	15,4	15,4	21,4
	4	82	45,1	45,1	66,5
	5	61	33,5	33,5	100,0
	Total	182	100,0	100,0	

cluster(3) x Motivos(7)

Origem		gl	F	Sig.	Eta parcial quadrado
Motivos	Esfericidade considerada	6	15,405	,000	,079
	Greenhouse-Geisser	4,744	15,405	,000	,079
	Huynh-Feldt	4,944	15,405	,000	,079
	Limite inferior	1,000	15,405	,000	,079
Motivos * Cluster	Esfericidade considerada	12	2,032	,019	,022
	Greenhouse-Geisser	9,488	2,032	,030	,022
	Huynh-Feldt	9,887	2,032	,028	,022
	Limite inferior	2,000	2,032	,134	,022
Erro(Motivos)	Esfericidade considerada	1074			
	Greenhouse-Geisser	849,218			
	Huynh-Feldt	884,904			

Limite inferior	179,000			

Origem	gl	F	Sig.	Eta parcial quadrado
Intercepto	1	904,039	,000	,835
Cluster	2	3,139	,046	,034
Erro	179			

cluster

Estimativas

Medida: MEASURE_1

cluster	Média	Erro Erro	Intervalo de Confiança 95%	
			Limite inferior	Limite superior
Experience	2,950	,221	2,514	3,387
Brain	2,510	,122	2,269	2,752
Adventure	2,898	,116	2,670	3,126

Comparações por Método Pairwise

Medida: MEASURE_1

(I) cluster	(J) cluster	Diferença média (I-J)	Erro Erro	Sig.[a]	95% Intervalo de Confiança para Diferença[a]	
					Limite inferior	Limite superior
Experience	Brain	,440	,253	,251	-,171	1,051
	Adventure	,052	,250	1,000	-,551	,656
Brain	Experience	-,440	,253	,251	-1,051	,171
	Adventure	-,387	,168	,068	-,795	,020
Adventure	Experience	-,052	,250	1,000	-,656	,551
	Brain	,387	,168	,068	-,020	,795

Baseado em médias marginais estimadas

a. Ajustamento para diversas comparações: Bonferroni.

Motivos

Estimativas

Medida: MEASURE_1

Motivos	Média	Erro Erro	Intervalo de Confiança 95%	
			Limite inferior	Limite superior
1	2,490	,119	2,256	2,724

2	2,898	,114	2,674	3,122
3	2,544	,120	2,308	2,780
4	2,644	,124	2,399	2,889
5	2,639	,127	2,389	2,889
6	2,841	,120	2,605	3,078
7	3,448	,121	3,209	3,687

Comparações por Método Pairwise

Medida: MEASURE_1

(I) Motivos	(J) Motivos	Diferença média (I-J)	Erro Erro	Sig.[b]	95% Intervalo de Confiança para Diferença[b]	
					Limite inferior	Limite superior
1	2	-,408*	,112	,007	-,752	-,064
	3	-,054	,119	1,000	-,420	,311
	4	-,154	,120	1,000	-,526	,217
	5	-,149	,124	1,000	-,532	,234
	6	-,351	,122	,093	-,727	,024
	7	-,958*	,126	,000	-1,347	-,569
2	1	,408*	,112	,007	,064	,752
	3	,354*	,113	,041	,007	,701
	4	,254	,116	,612	-,102	,610
	5	,259	,129	,978	-,139	,658
	6	,057	,136	1,000	-,362	,475
	7	-,549*	,126	,000	-,939	-,160
3	1	,054	,119	1,000	-,311	,420
	2	-,354*	,113	,041	-,701	-,007
	4	-,100	,089	1,000	-,375	,175
	5	-,095	,092	1,000	-,377	,187
	6	-,297	,112	,185	-,643	,049
	7	-,904*	,118	,000	-1,268	-,539
4	1	,154	,120	1,000	-,217	,526
	2	-,254	,116	,612	-,610	,102
	3	,100	,089	1,000	-,175	,375
	5	,005	,077	1,000	-,233	,243
	6	-,197	,126	1,000	-,586	,192
	7	-,803*	,132	,000	-1,210	-,397
5	1	,149	,124	1,000	-,234	,532
	2	-,259	,129	,978	-,658	,139
	3	,095	,092	1,000	-,187	,377
	4	-,005	,077	1,000	-,243	,233

	6	-,202	,126	1,000	-,590	,185
	7	-,809*	,132	,000	-1,216	-,401
6	1	,351	,122	,093	-,024	,727
	2	-,057	,136	1,000	-,475	,362
	3	,297	,112	,185	-,049	,643
	4	,197	,126	1,000	-,192	,586
	5	,202	,126	1,000	-,185	,590
	7	-,606*	,107	,000	-,935	-,277
7	1	,958*	,126	,000	,569	1,347
	2	,549*	,126	,000	,160	,939
	3	,904*	,118	,000	,539	1,268
	4	,803*	,132	,000	,397	1,210
	5	,809*	,132	,000	,401	1,216
	6	,606*	,107	,000	,277	,935

Baseado em médias marginais estimadas

*. A diferença média é significativa no nível ,05.

b. Ajustamento para diversas comparações: Bonferroni.

cluster*motivos

Estimativas

Medida: MEASURE_1

				Intervalo de Confiança 95%	
cluster	Motivos	Média	Erro Erro	Limite inferior	Limite superior
Experience	1	2,565	,283	2,006	3,124
	2	2,870	,271	2,335	3,404
	3	2,739	,286	2,176	3,303
	4	2,957	,296	2,373	3,540
	5	3,043	,302	2,448	3,639
	6	2,957	,286	2,392	3,521
	7	3,522	,289	2,951	4,092
Brain	1	2,107	,157	1,797	2,416
	2	2,587	,150	2,291	2,883
	3	2,333	,158	2,021	2,645
	4	2,440	,164	2,117	2,763
	5	2,373	,167	2,043	2,703
	6	2,627	,158	2,314	2,939
	7	3,107	,160	2,791	3,423
Adventure	1	2,798	,148	2,505	3,090

	2	3,238	,142	2,958	3,518
	3	2,560	,149	2,265	2,854
	4	2,536	,155	2,230	2,841
	5	2,500	,158	2,188	2,812
	6	2,940	,150	2,645	3,236
	7	3,714	,151	3,416	4,013

Comparações por Método Pairwise

Medida: MEASURE_1

cluster	(I) Motivos	(J) Motivos	Diferença média (I-J)	Erro Erro	Sig.[b]	95% Intervalo de Confiança para Diferença[b]	
						Limite inferior	Limite superior
Experience	1	2	-,304	,266	1,000	-1,126	,517
		3	-,174	,283	1,000	-1,046	,698
		4	-,391	,288	1,000	-1,278	,495
		5	-,478	,297	1,000	-1,392	,436
		6	-,391	,291	1,000	-1,288	,505
		7	-,957*	,301	,037	-1,885	-,028
	2	1	,304	,266	1,000	-,517	1,126
		3	,130	,269	1,000	-,698	,958
		4	-,087	,276	1,000	-,936	,763
		5	-,174	,309	1,000	-1,125	,777
		6	-,087	,324	1,000	-1,086	,912
		7	-,652	,302	,672	-1,582	,278
	3	1	,174	,283	1,000	-,698	1,046
		2	-,130	,269	1,000	-,958	,698
		4	-,217	,213	1,000	-,874	,439
		5	-,304	,218	1,000	-,978	,369
		6	-,217	,268	1,000	-1,043	,608
		7	-,783	,282	,129	-1,653	,087
	4	1	,391	,288	1,000	-,495	1,278
		2	,087	,276	1,000	-,763	,936
		3	,217	,213	1,000	-,439	,874
		5	-,087	,184	1,000	-,654	,480
		6	,000	,301	1,000	-,928	,928
		7	-,565	,315	1,000	-1,536	,406

	5	1	,478	,297	1,000	-,436	1,392
		2	,174	,309	1,000	-,777	1,125
		3	,304	,218	1,000	-,369	,978
		4	,087	,184	1,000	-,480	,654
		6	,087	,300	1,000	-,838	1,012
		7	-,478	,316	1,000	-1,452	,495
	6	1	,391	,291	1,000	-,505	1,288
		2	,087	,324	1,000	-,912	1,086
		3	,217	,268	1,000	-,608	1,043
		4	,000	,301	1,000	-,928	,928
		5	-,087	,300	1,000	-1,012	,838
		7	-,565	,255	,582	-1,350	,220
	7	1	,957*	,301	,037	,028	1,885
		2	,652	,302	,672	-,278	1,582
		3	,783	,282	,129	-,087	1,653
		4	,565	,315	1,000	-,406	1,536
		5	,478	,316	1,000	-,495	1,452
		6	,565	,255	,582	-,220	1,350
Brain	1	2	-,480*	,148	,029	-,935	-,025
		3	-,227	,157	1,000	-,710	,256
		4	-,333	,159	,792	-,824	,157
		5	-,267	,164	1,000	-,773	,239
		6	-,520*	,161	,031	-1,017	-,023
		7	-1,000*	,167	,000	-1,514	-,486
	2	1	,480*	,148	,029	,025	,935
		3	,253	,149	1,000	-,205	,712
		4	,147	,153	1,000	-,324	,617
		5	,213	,171	1,000	-,313	,740
		6	-,040	,179	1,000	-,593	,513
		7	-,520*	,167	,045	-1,035	-,005
	3	1	,227	,157	1,000	-,256	,710
		2	-,253	,149	1,000	-,712	,205
		4	-,107	,118	1,000	-,470	,257
		5	-,040	,121	1,000	-,413	,333
		6	-,293	,148	1,000	-,750	,164
		7	-,773*	,156	,000	-1,255	-,292
	4	1	,333	,159	,792	-,157	,824
		2	-,147	,153	1,000	-,617	,324
		3	,107	,118	1,000	-,257	,470
		5	,067	,102	1,000	-,247	,381

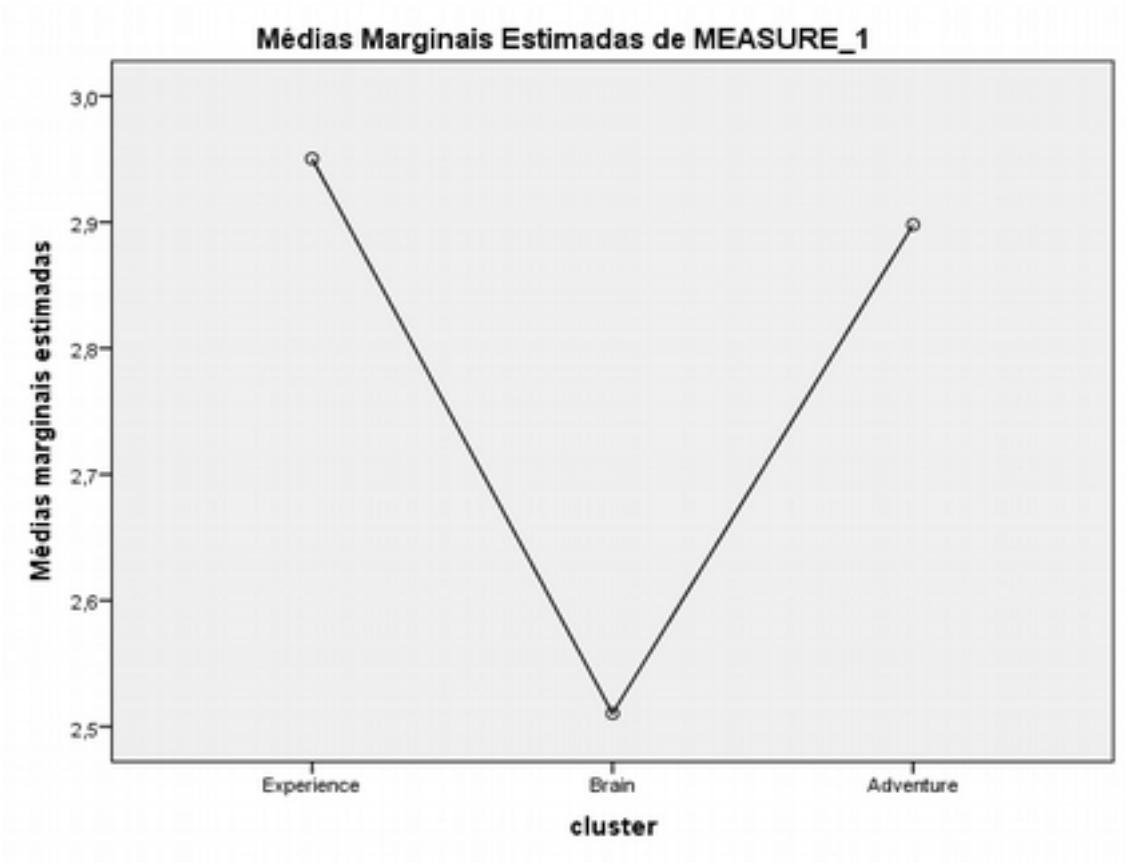
		6	-,187	,167	1,000	-,701	,327
		7	-,667*	,174	,004	-1,204	-,129
	5	1	,267	,164	1,000	-,239	,773
		2	-,213	,171	1,000	-,740	,313
		3	,040	,121	1,000	-,333	,413
		4	-,067	,102	1,000	-,381	,247
		6	-,253	,166	1,000	-,765	,259
		7	-,733*	,175	,001	-1,272	-,194
	6	1	,520*	,161	,031	,023	1,017
		2	,040	,179	1,000	-,513	,593
		3	,293	,148	1,000	-,164	,750
		4	,187	,167	1,000	-,327	,701
		5	,253	,166	1,000	-,259	,765
		7	-,480*	,141	,017	-,915	-,045
	7	1	1,000*	,167	,000	,486	1,514
		2	,520*	,167	,045	,005	1,035
		3	,773*	,156	,000	,292	1,255
		4	,667*	,174	,004	,129	1,204
		5	,733*	,175	,001	,194	1,272
		6	,480*	,141	,017	,045	,915
Adventure	1	2	-,440*	,139	,039	-,870	-,011
		3	,238	,148	1,000	-,218	,694
		4	,262	,150	1,000	-,202	,726
		5	,298	,155	1,000	-,181	,776
		6	-,143	,152	1,000	-,612	,326
		7	-,917*	,158	,000	-1,402	-,431
	2	1	,440*	,139	,039	,011	,870
		3	,679*	,141	,000	,245	1,112
		4	,702*	,144	,000	,258	1,147
		5	,738*	,161	,000	,240	1,236
		6	,298	,170	1,000	-,225	,820
		7	-,476	,158	,062	-,963	,010
	3	1	-,238	,148	1,000	-,694	,218
		2	-,679*	,141	,000	-1,112	-,245
		4	,024	,112	1,000	-,320	,368
		5	,060	,114	1,000	-,293	,412
		6	-,381	,140	,151	-,813	,051
		7	-1,155*	,148	,000	-1,610	-,700
	4	1	-,262	,150	1,000	-,726	,202

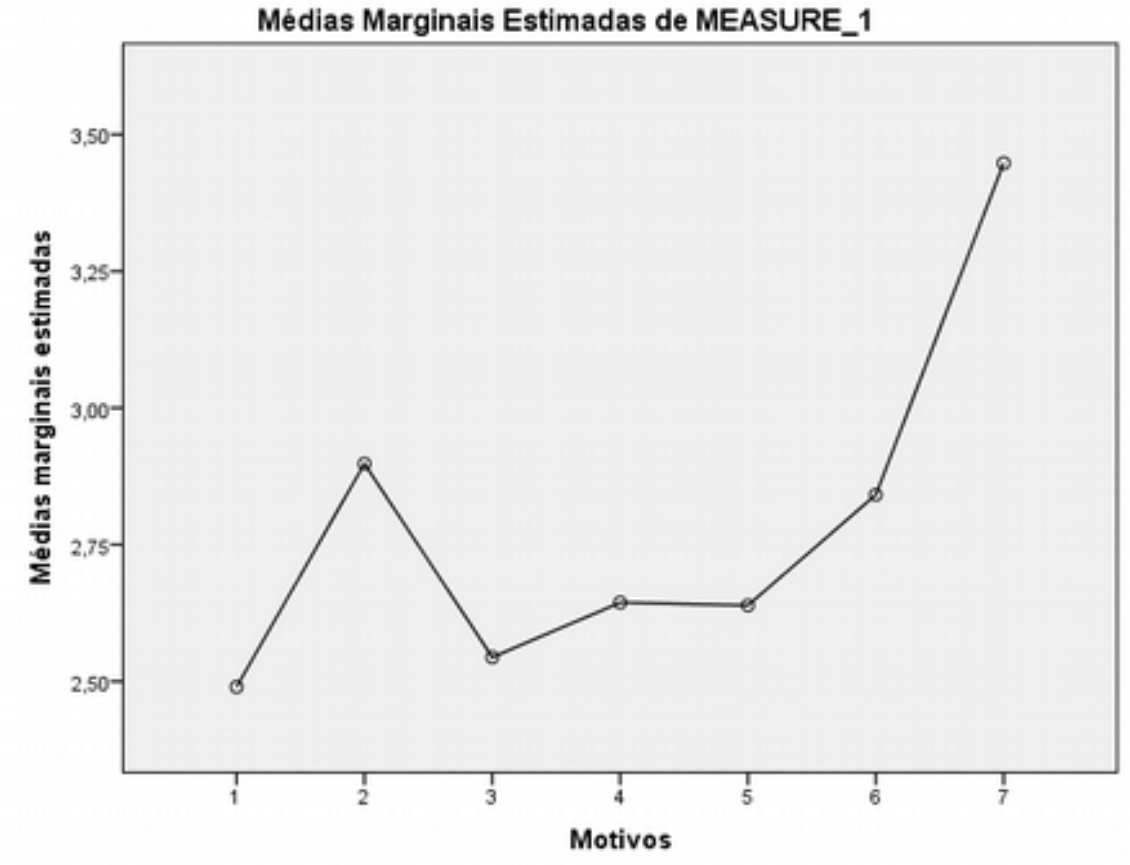
		2	-,702*	,144	,000	-1,147	-,258
		3	-,024	,112	1,000	-,368	,320
		5	,036	,096	1,000	-,261	,332
		6	-,405	,158	,232	-,891	,081
		7	-1,179*	,165	,000	-1,687	-,670
	5	1	-,298	,155	1,000	-,776	,181
		2	-,738*	,161	,000	-1,236	-,240
		3	-,060	,114	1,000	-,412	,293
		4	-,036	,096	1,000	-,332	,261
		6	-,440	,157	,117	-,924	,043
		7	-1,214*	,165	,000	-1,724	-,705
	6	1	,143	,152	1,000	-,326	,612
		2	-,298	,170	1,000	-,820	,225
		3	,381	,140	,151	-,051	,813
		4	,405	,158	,232	-,081	,891
		5	,440	,157	,117	-,043	,924
		7	-,774*	,133	,000	-1,185	-,363
	7	1	,917*	,158	,000	,431	1,402
		2	,476	,158	,062	-,010	,963
		3	1,155*	,148	,000	,700	1,610
		4	1,179*	,165	,000	,670	1,687
		5	1,214*	,165	,000	,705	1,724
		6	,774*	,133	,000	,363	1,185

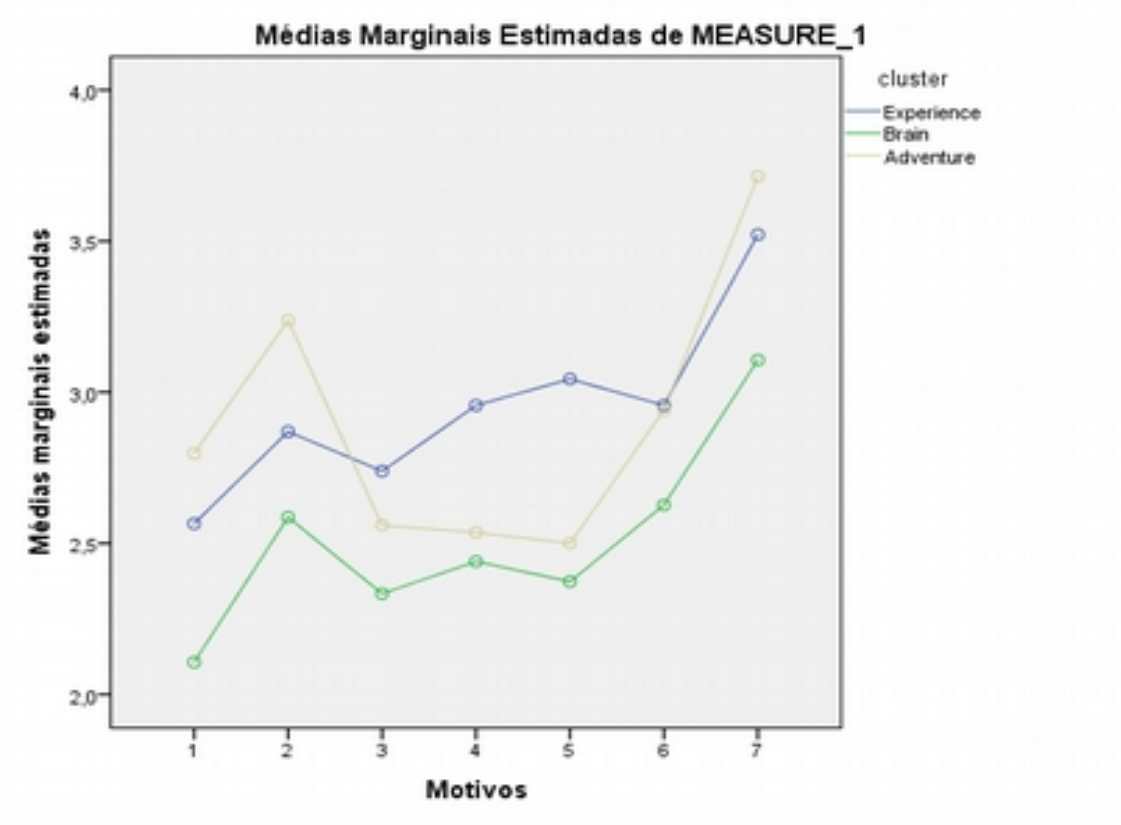
Baseado em médias marginais estimadas

*. A diferença média é significativa no nível ,05.

b. Ajustamento para diversas comparações: Bonferroni.


Médias Marginais Estimadas de MEASURE_1
Médias marginais estimadas
3,0
2,9
2,8
2,7
2,6
2,5
Experience
Brain
Adventure
cluster


Médias Marginais Estimadas de MEASURE_1
Médias marginais estimadas
3,50
3,25
3,00
2,75
2,50
1
2
3
4
5
6
7
Motivos

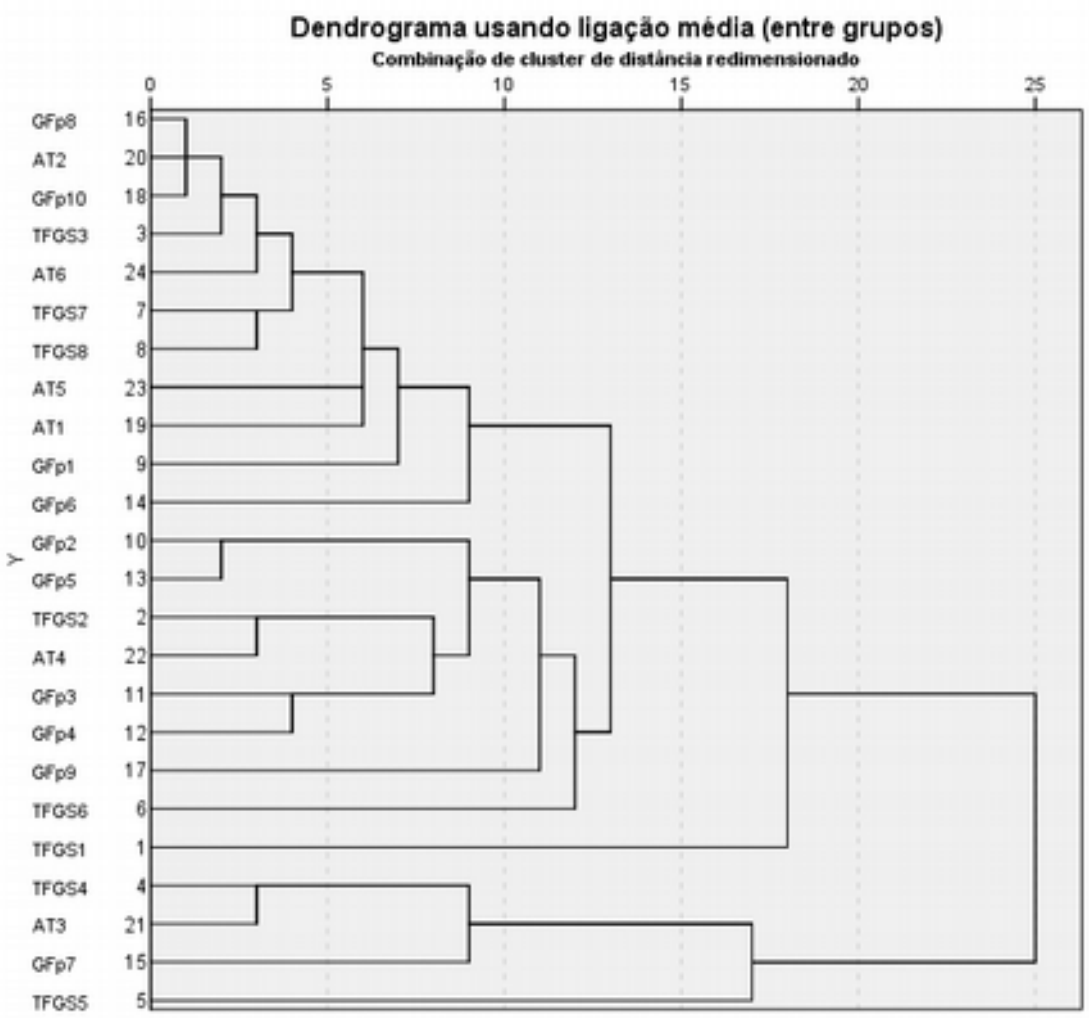


When you are playing a game you like, do you really feel like having fun over all the time you spend playing it? Select in the scale which number best describes your answer.

		N	Média	Desvio padrão
When you are playing a game you like, do you really feel like having fun over all the time you spend playing it? Select in the	Experience	23	4,57	,662

scale which number best describes your answer.	Brain	75	4,29	,63272
	Adventure	84	4,32	,77799
	Total	182	4,34	,70909
Comparing the time that you really "have fun" while playing a game against the time you "just play", for any other reason it may be, then select in the scale the answer that best fits your feeling while playing:	Experience	23	4,22	,67171
	Brain	75	4,23	,72727
	Adventure	84	4,26	,77783
	Total	182	4,24	,74141

Pontuam alto
---
reorganização de variáveis associação



Fatores dentre-sujeitos

Medida: MEASURE_1

resources	Variável dependente
1	GFp8
2	AT2
3	GFp10
4	TFGS3
5	AT6
6	TFGS7
7	TFGS8
8	AT5
9	AT1
10	GFp1
11	GFp6

Fatores dentre-sujeitos

Medida: MEASURE_1

gameplay	Variável dependente
1	GFp2
2	GFp5
3	TFGS2
4	AT4
5	GFp3
6	GFp9
7	TFGS6
8	TFGS1

Fatores dentre-sujeitos

Medida: MEASURE_1

social	Variável dependente
1	TFGS4
2	TFGS5
3	GFp4
4	GFp7
5	AT3

Cluster(3) Ressorces (11)

Estatísticas Descritivas

	cluster	Média	Erro Desvio	N
R [Player progress through the game]	Experience	4,35	,714	23
	Brain	4,11	,879	75
	Adventure	4,35	,752	84
	Total	4,25	,807	182
R [Choices offered by the game]	Experience	4,26	,752	23
	Brain	4,05	,899	75
	Adventure	4,38	,805	84
	Total	4,23	,848	182
R [When the game offers a lot of choices and the player	Experience	4,43	,662	23
	Brain	4,23	1,034	75
	Adventure	4,33	,869	84

can manage their own strategy]	Total	4,30	,918	182
R [Choices offered by the game]	Experience	4,00	1,000	23
	Brain	4,13	,890	75
	Adventure	4,01	1,000	84
	Total	4,06	,953	182
R [Mechanics (how the game is played)]	Experience	4,57	,788	23
	Brain	4,53	,827	75
	Adventure	4,58	,644	84
	Total	4,56	,739	182
R [Feedback (responses of the game after you do something in it)]	Experience	4,13	1,180	23
	Brain	3,99	1,020	75
	Adventure	4,05	1,040	84
	Total	4,03	1,045	182
R [Challenges]	Experience	4,39	,941	23
	Brain	4,20	,959	75
	Adventure	4,20	,915	84
	Total	4,23	,934	182
R [The theme and narrative of the game]	Experience	4,22	1,043	23
	Brain	4,25	,960	75
	Adventure	4,38	,968	84
	Total	4,31	,971	182
R [Objectives that must be done inside the game]	Experience	3,91	,848	23
	Brain	3,89	1,008	75
	Adventure	3,94	1,045	84
	Total	3,92	1,002	182
R [Feedbacks that transmit clear information of player actions]	Experience	3,65	1,027	23
	Brain	3,88	1,052	75
	Adventure	3,98	1,006	84
	Total	3,90	1,027	182
R [Surprise Rewards]	Experience	3,87	1,180	23
	Brain	3,84	1,115	75
	Adventure	3,98	1,151	84
	Total	3,91	1,136	182

Comparações por Método Pairwise

Medida: MEASURE_1

(I) resources	(J) resources	Diferença média (I-J)	Erro Erro	Sig.[b]	95% Intervalo de Confiança para Diferença[b]

					Limite inferior	Limite superior
1	2	,035	,080	1,000	-,234	,303
	3	-,065	,082	1,000	-,343	,213
	4	,218	,093	1,000	-,096	,533
	5	-,294*	,080	,018	-,565	-,023
	6	,212	,096	1,000	-,113	,537
	7	,002	,089	1,000	-,300	,304
	8	-,017	,098	1,000	-,346	,312
	9	,351*	,089	,006	,052	,650
	10	,430*	,105	,003	,077	,784
	11	,371*	,110	,048	,001	,741
2	1	-,035	,080	1,000	-,303	,234
	3	-,100	,087	1,000	-,392	,192
	4	,183	,077	1,000	-,077	,444
	5	-,329*	,086	,011	-,621	-,037
	6	,177	,090	1,000	-,128	,482
	7	-,033	,084	1,000	-,317	,251
	8	-,052	,108	1,000	-,416	,312
	9	,316*	,090	,033	,011	,621
	10	,396*	,103	,009	,048	,743
	11	,336	,114	,190	-,047	,720
3	1	,065	,082	1,000	-,213	,343
	2	,100	,087	1,000	-,192	,392
	4	,283	,090	,102	-,019	,586
	5	-,229	,091	,677	-,535	,077
	6	,277	,110	,703	-,094	,648
	7	,067	,102	1,000	-,277	,412
	8	,048	,101	1,000	-,292	,387
	9	,416*	,108	,009	,052	,780
	10	,495*	,109	,001	,127	,864
	11	,436*	,116	,012	,045	,827
4	1	-,218	,093	1,000	-,533	,096
	2	-,183	,077	1,000	-,444	,077
	3	-,283	,090	,102	-,586	,019
	5	-,512*	,090	,000	-,816	-,208
	6	-,006	,093	1,000	-,322	,309
	7	-,216	,090	,973	-,521	,088
	8	-,235	,102	1,000	-,579	,108
	9	,133	,108	1,000	-,230	,496

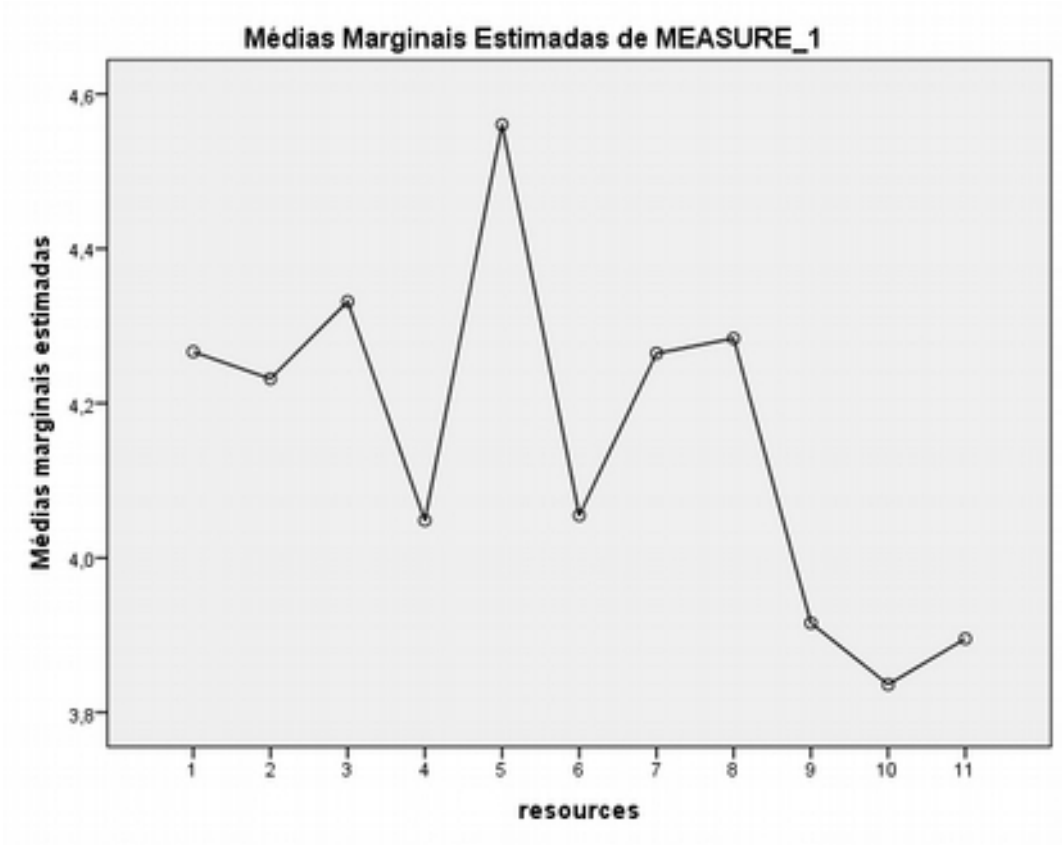
	10	,212	,105	1,000	-,140	,565
	11	,153	,114	1,000	-,232	,538
5	1	,294*	,080	,018	,023	,565
	2	,329*	,086	,011	,037	,621
	3	,229	,091	,677	-,077	,535
	4	,512*	,090	,000	,208	,816
	6	,506*	,095	,000	,186	,826
	7	,296	,092	,083	-,014	,606
	8	,277	,095	,223	-,044	,597
	9	,645*	,102	,000	,301	,989
	10	,725*	,095	,000	,403	1,046
	11	,665*	,109	,000	,299	1,032
6	1	-,212	,096	1,000	-,537	,113
	2	-,177	,090	1,000	-,482	,128
	3	-,277	,110	,703	-,648	,094
	4	,006	,093	1,000	-,309	,322
	5	-,506*	,095	,000	-,826	-,186
	7	-,210	,090	1,000	-,512	,092
	8	-,229	,112	1,000	-,608	,150
	9	,139	,116	1,000	-,251	,530
	10	,219	,097	1,000	-,108	,546
	11	,160	,125	1,000	-,263	,582
7	1	-,002	,089	1,000	-,304	,300
	2	,033	,084	1,000	-,251	,317
	3	-,067	,102	1,000	-,412	,277
	4	,216	,090	,973	-,088	,521
	5	-,296	,092	,083	-,606	,014
	6	,210	,090	1,000	-,092	,512
	8	-,019	,113	1,000	-,401	,362
	9	,349*	,090	,009	,044	,654
	10	,428*	,112	,010	,050	,807
	11	,369	,118	,111	-,028	,767
8	1	,017	,098	1,000	-,312	,346
	2	,052	,108	1,000	-,312	,416
	3	-,048	,101	1,000	-,387	,292
	4	,235	,102	1,000	-,108	,579
	5	-,277	,095	,223	-,597	,044
	6	,229	,112	1,000	-,150	,608
	7	,019	,113	1,000	-,362	,401
	9	,368	,114	,078	-,015	,752
	10	,448*	,119	,012	,048	,848

	11	,389*	,111	,031	,015	,762
9	1	-,351*	,089	,006	-,650	-,052
	2	-,316*	,090	,033	-,621	-,011
	3	-,416*	,108	,009	-,780	-,052
	4	-,133	,108	1,000	-,496	,230
	5	-,645*	,102	,000	-,989	-,301
	6	-,139	,116	1,000	-,530	,251
	7	-,349*	,090	,009	-,654	-,044
	8	-,368	,114	,078	-,752	,015
	10	,079	,123	1,000	-,335	,494
	11	,020	,119	1,000	-,381	,422
10	1	-,430*	,105	,003	-,784	-,077
	2	-,396*	,103	,009	-,743	-,048
	3	-,495*	,109	,001	-,864	-,127
	4	-,212	,105	1,000	-,565	,140
	5	-,725*	,095	,000	-1,046	-,403
	6	-,219	,097	1,000	-,546	,108
	7	-,428*	,112	,010	-,807	-,050
	8	-,448*	,119	,012	-,848	-,048
	9	-,079	,123	1,000	-,494	,335
	11	-,059	,130	1,000	-,497	,379
11	1	-,371*	,110	,048	-,741	-,001
	2	-,336	,114	,190	-,720	,047
	3	-,436*	,116	,012	-,827	-,045
	4	-,153	,114	1,000	-,538	,232
	5	-,665*	,109	,000	-1,032	-,299
	6	-,160	,125	1,000	-,582	,263
	7	-,369	,118	,111	-,767	,028
	8	-,389*	,111	,031	-,762	-,015
	9	-,020	,119	1,000	-,422	,381
	10	,059	,130	1,000	-,379	,497

Baseado em médias marginais estimadas

*. A diferença média é significativa no nível ,05.

b. Ajustamento para diversas comparações: Bonferroni.



GFp2 GFp5 TFGS2 AT4 GFp3 GFp9 TFGS6 TFGS1

TFGS4 TFGS5 GFp4 GFp7 AT3

GamePlay x Clusters

Estatísticas Descritivas

	cluster	Média	Erro Desvio	N
GP [Short play sessions]	Experience	3,43	1,199	23
	Brain	3,43	1,042	75
	Adventure	2,94	,998	84
	Total	3,20	1,065	182
GP [Short-term objectives]	Experience	3,48	1,123	23
	Brain	3,49	,964	75
	Adventure	3,38	,968	84
	Total	3,44	,983	182
GP [Game rewards]	Experience	3,48	1,201	23

	Brain	3,31	1,078	75
	Adventure	3,44	,923	84
	Total	3,39	1,023	182
GP [The way the game rewards players: items, gold, characters, etc.]	Experience	3,22	1,242	23
	Brain	3,16	1,231	75
	Adventure	3,51	1,081	84
	Total	3,33	1,171	182
GP [Long play sessions]	Experience	3,57	1,121	23
	Brain	2,95	1,126	75
	Adventure	3,36	1,071	84
	Total	3,21	1,119	182
GP [When the game offers fixed choices and the player must learn how to use it effectively]	Experience	3,87	,869	23
	Brain	3,57	1,002	75
	Adventure	3,39	1,162	84
	Total	3,53	1,070	182
GP [Customization]	Experience	3,78	1,085	23
	Brain	3,41	1,209	75
	Adventure	3,70	1,287	84
	Total	3,59	1,235	182
GP [Time to finish a game session]	Experience	3,09	1,345	23
	Brain	3,43	1,232	75
	Adventure	2,99	1,207	84
	Total	3,18	1,246	182

Origem		gl	F	Sig.	Eta parcial quadrado
gameplay	Esfericidade considerada	7	3,743	,001	,020
	Greenhouse-Geisser	5,868	3,743	,001	,020
	Huynh-Feldt	6,158	3,743	,001	,020
	Limite inferior	1,000	3,743	,055	,020
gameplay * Cluster	Esfericidade considerada	14	2,945	,000	,032
	Greenhouse-Geisser	11,737	2,945	,001	,032
	Huynh-Feldt	12,315	2,945	,000	,032
	Limite inferior	2,000	2,945	,055	,032
Erro(gameplay)	Esfericidade considerada	1253			
	Greenhouse-Geisser	1050,460			
	Huynh-Feldt	1102,201			
	Limite inferior	179,000			

Origem	gl	F	Sig.	Eta parcial quadrado
Intercepto	1	4001,018	,000	,957
Cluster	2	,585	,558	,006
Erro	179			

Estimativas

Medida: MEASURE_1

gameplay	Média	Erro Erro	Intervalo de Confiança 95%	
			Limite inferior	Limite superior
1	3,267	,091	3,087	3,447
2	3,451	,086	3,281	3,621
3	3,408	,090	3,232	3,585
4	3,296	,102	3,096	3,497
5	3,290	,096	3,100	3,479
6	3,612	,093	3,428	3,796
7	3,633	,108	3,420	3,845
8	3,167	,108	2,954	3,380

Comparações por Método Pairwise

Medida: MEASURE_1

(I) gameplay	(J) gameplay	Diferença média (I-J)	Erro Erro	Sig.[b]	95% Intervalo de Confiança para Diferença[b]	
					Limite inferior	Limite superior
1	2	-,184	,083	,803	-,447	,080
	3	-,141	,113	1,000	-,501	,219
	4	-,029	,130	1,000	-,442	,384
	5	-,022	,120	1,000	-,402	,357
	6	-,345	,127	,204	-,747	,058
	7	-,365	,132	,176	-,785	,054
	8	,100	,120	1,000	-,281	,481
2	1	,184	,083	,803	-,080	,447
	3	,042	,108	1,000	-,301	,385
	4	,154	,115	1,000	-,209	,518

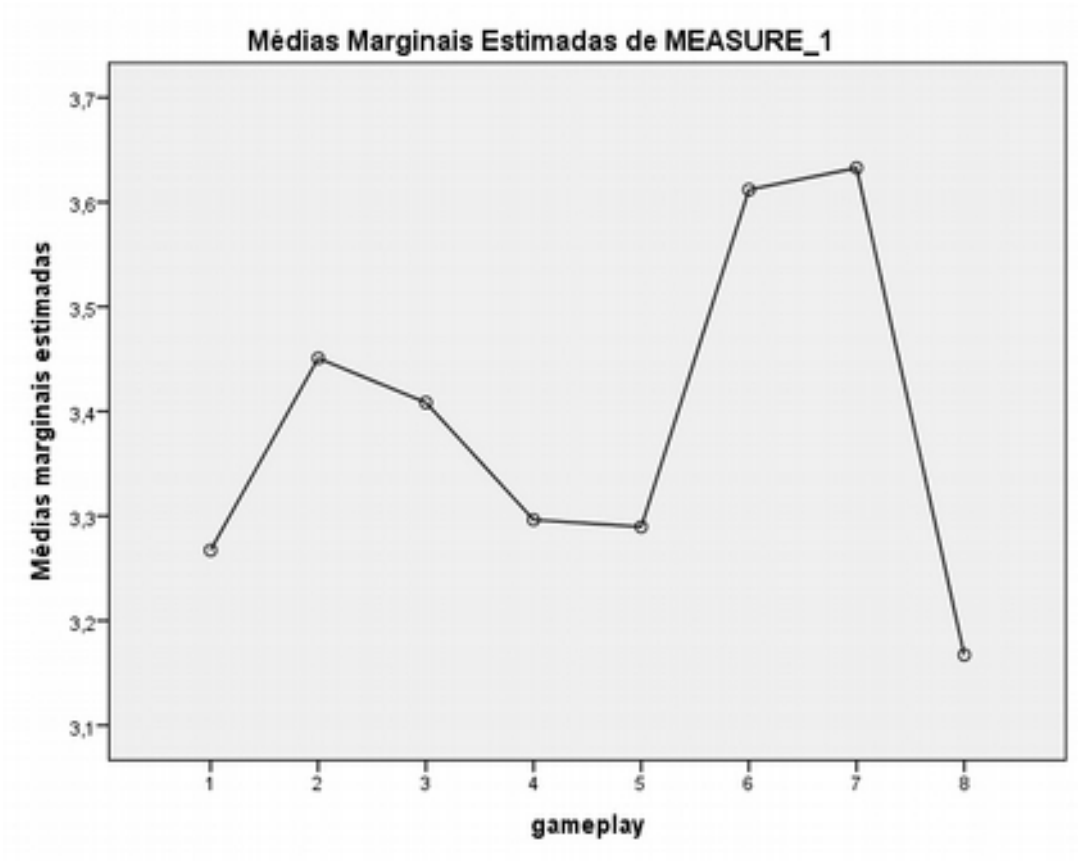
	5	,161	,122	1,000	-,225	,548
	6	-,161	,123	1,000	-,550	,228
	7	-,182	,134	1,000	-,608	,244
	8	,284	,127	,750	-,119	,686
3	1	,141	,113	1,000	-,219	,501
	2	-,042	,108	1,000	-,385	,301
	4	,112	,091	1,000	-,177	,402
	5	,119	,116	1,000	-,249	,487
	6	-,203	,118	1,000	-,579	,172
	7	-,224	,112	1,000	-,581	,132
	8	,241	,118	1,000	-,134	,616
4	1	,029	,130	1,000	-,384	,442
	2	-,154	,115	1,000	-,518	,209
	3	-,112	,091	1,000	-,402	,177
	5	,007	,113	1,000	-,352	,366
	6	-,315	,119	,240	-,692	,061
	7	-,336	,114	,104	-,699	,026
	8	,129	,140	1,000	-,316	,574
5	1	,022	,120	1,000	-,357	,402
	2	-,161	,122	1,000	-,548	,225
	3	-,119	,116	1,000	-,487	,249
	4	-,007	,113	1,000	-,366	,352
	6	-,322	,119	,206	-,699	,055
	7	-,343	,127	,215	-,747	,060
	8	,122	,139	1,000	-,320	,565
6	1	,345	,127	,204	-,058	,747
	2	,161	,123	1,000	-,228	,550
	3	,203	,118	1,000	-,172	,579
	4	,315	,119	,240	-,061	,692
	5	,322	,119	,206	-,055	,699
	7	-,021	,135	1,000	-,448	,407
	8	,445*	,140	,049	,001	,889
7	1	,365	,132	,176	-,054	,785
	2	,182	,134	1,000	-,244	,608
	3	,224	,112	1,000	-,132	,581
	4	,336	,114	,104	-,026	,699
	5	,343	,127	,215	-,060	,747
	6	,021	,135	1,000	-,407	,448
	8	,466*	,144	,040	,009	,922
8	1	-,100	,120	1,000	-,481	,281
	2	-,284	,127	,750	-,686	,119

3	-,241	,118	1,000	-,616	,134
4	-,129	,140	1,000	-,574	,316
5	-,122	,139	1,000	-,565	,320
6	-,445*	,140	,049	-,889	-,001
7	-,466*	,144	,040	-,922	-,009

Baseado em médias marginais estimadas

*. A diferença média é significativa no nível ,05.

b. Ajustamento para diversas comparações: Bonferroni.



interação cluster com gameplay

Estimativas

Medida: MEASURE_1

cluster	gameplay	Média	Erro Erro	Intervalo de Confiança 95%	
				Limite inferior	Limite superior
Experience	1	3,435	,217	3,006	3,864
	2	3,478	,206	3,072	3,884
	3	3,478	,214	3,056	3,900
	4	3,217	,243	2,738	3,697
	5	3,565	,229	3,112	4,018
	6	3,870	,222	3,431	4,308
	7	3,783	,257	3,276	4,290
	8	3,087	,258	2,579	3,595
Brain	1	3,427	,120	3,189	3,664
	2	3,493	,114	3,268	3,718
	3	3,307	,118	3,073	3,540
	4	3,160	,135	2,895	3,425
	5	2,947	,127	2,696	3,197
	6	3,573	,123	3,331	3,816
	7	3,413	,142	3,133	3,694
	8	3,427	,143	3,145	3,708
Adventure	1	2,940	,114	2,716	3,165
	2	3,381	,108	3,168	3,593
	3	3,440	,112	3,220	3,661
	4	3,512	,127	3,261	3,763
	5	3,357	,120	3,120	3,594
	6	3,393	,116	3,164	3,622
	7	3,702	,134	3,437	3,968
	8	2,988	,135	2,722	3,254

cluster	(I) gameplay	(J) gameplay	Diferença média (I-J)	Erro Erro	Sig.[b]
Experience	1	2	-,043	,199	1,000
		3	-,043	,271	1,000
		4	,217	,311	1,000
		5	-,130	,286	1,000
		6	-,435	,303	1,000
		7	-,348	,315	1,000
		8	,348	,287	1,000
	2	1	,043	,199	1,000

		3	-4,441E-16	,258	1,000
		4	,261	,274	1,000
		5	-,087	,291	1,000
		6	-,391	,292	1,000
		7	-,304	,320	1,000
		8	,391	,303	1,000
	3	1	,043	,271	1,000
		2	4,441E-16	,258	1,000
		4	,261	,218	1,000
		5	-,087	,277	1,000
		6	-,391	,282	1,000
		7	-,304	,268	1,000
		8	,391	,282	1,000
	4	1	-,217	,311	1,000
		2	-,261	,274	1,000
		3	-,261	,218	1,000
		5	-,348	,270	1,000
		6	-,652	,283	,628
		7	-,565	,273	1,000
		8	,130	,335	1,000
	5	1	,130	,286	1,000
		2	,087	,291	1,000
		3	,087	,277	1,000
		4	,348	,270	1,000
		6	-,304	,284	1,000
		7	-,217	,304	1,000
		8	,478	,333	1,000
	6	1	,435	,303	1,000
		2	,391	,292	1,000
		3	,391	,282	1,000
		4	,652	,283	,628
		5	,304	,284	1,000
		7	,087	,322	1,000
		8	,783	,334	,567
	7	1	,348	,315	1,000
		2	,304	,320	1,000
		3	,304	,268	1,000
		4	,565	,273	1,000

		5	,217	,304	1,000
		6	-,087	,322	1,000
		8	,696	,343	1,000
	8	1	-,348	,287	1,000
		2	-,391	,303	1,000
		3	-,391	,282	1,000
		4	-,130	,335	1,000
		5	-,478	,333	1,000
		6	-,783	,334	,567
		7	-,696	,343	1,000
Brain	1	2	-,067	,110	1,000
		3	,120	,150	1,000
		4	,267	,172	1,000
		5	,480	,158	,077
		6	-,147	,168	1,000
		7	,013	,175	1,000
		8	-4,441E-16	,159	1,000
	2	1	,067	,110	1,000
		3	,187	,143	1,000
		4	,333	,152	,818
		5	,547*	,161	,024
		6	-,080	,162	1,000
		7	,080	,177	1,000
		8	,067	,168	1,000
	3	1	-,120	,150	1,000
		2	-,187	,143	1,000
		4	,147	,121	1,000
		5	,360	,153	,559
		6	-,267	,156	1,000
		7	-,107	,149	1,000
		8	-,120	,156	1,000
	4	1	-,267	,172	1,000
		2	-,333	,152	,818
		3	-,147	,121	1,000
		5	,213	,150	1,000
		6	-,413	,157	,256
		7	-,253	,151	1,000
		8	-,267	,186	1,000
	5	1	-,480	,158	,077
		2	-,547*	,161	,024

		3	-,360	,153	,559
		4	-,213	,150	1,000
		6	-,627*	,157	,003
		7	-,467	,168	,171
		8	-,480	,184	,279
	6	1	,147	,168	1,000
		2	,080	,162	1,000
		3	,267	,156	1,000
		4	,413	,157	,256
		5	,627*	,157	,003
		7	,160	,178	1,000
		8	,147	,185	1,000
	7	1	-,013	,175	1,000
		2	-,080	,177	1,000
		3	,107	,149	1,000
		4	,253	,151	1,000
		5	,467	,168	,171
		6	-,160	,178	1,000
		8	-,013	,190	1,000
	8	1	4,441E-16	,159	1,000
		2	-,067	,168	1,000
		3	,120	,156	1,000
		4	,267	,186	1,000
		5	,480	,184	,279
		6	-,147	,185	1,000
		7	,013	,190	1,000
Adventure	1	2	-,440*	,104	,001
		3	-,500*	,142	,015
		4	-,571*	,163	,016
		5	-,417	,149	,164
		6	-,452	,159	,135
		7	-,762*	,165	,000
		8	-,048	,150	1,000
	2	1	,440*	,104	,001
		3	-,060	,135	1,000
		4	-,131	,143	1,000
		5	,024	,152	1,000
		6	-,012	,153	1,000
		7	-,321	,168	1,000
		8	,393	,159	,397

	3	1	,500*	,142	,015
		2	,060	,135	1,000
		4	-,071	,114	1,000
		5	,083	,145	1,000
		6	,048	,148	1,000
		7	-,262	,140	1,000
		8	,452	,148	,071
	4	1	,571*	,163	,016
		2	,131	,143	1,000
		3	,071	,114	1,000
		5	,155	,141	1,000
		6	,119	,148	1,000
		7	-,190	,143	1,000
		8	,524	,175	,090
	5	1	,417	,149	,164
		2	-,024	,152	1,000
		3	-,083	,145	1,000
		4	-,155	,141	1,000
		6	-,036	,148	1,000
		7	-,345	,159	,871
		8	,369	,174	,993
	6	1	,452	,159	,135
		2	,012	,153	1,000
		3	-,048	,148	1,000
		4	-,119	,148	1,000
		5	,036	,148	1,000
		7	-,310	,168	1,000
		8	,405	,175	,608
	7	1	,762*	,165	,000
		2	,321	,168	1,000
		3	,262	,140	1,000
		4	,190	,143	1,000
		5	,345	,159	,871
		6	,310	,168	1,000
		8	,714*	,180	,003
	8	1	,048	,150	1,000
		2	-,393	,159	,397
		3	-,452	,148	,071

	4	-,524	,175	,090
	5	-,369	,174	,993
	6	-,405	,175	,608
	7	-,714*	,180	,003

SOCIAL

Fatores dentre-sujeitos

Medida: MEASURE_1

social	Variável dependente
1	TFGS4
2	TFGS5
3	GFp4
4	GFp7
5	AT3

Estatísticas Descritivas

	cluster	Média	Erro Desvio	N
S [Social features]	Experience	2,57	1,161	23
	Brain	2,64	1,311	75
	Adventure	2,73	1,216	84
	Total	2,67	1,244	182
S [Paid resources (ex: items, gold, etc.)]	Experience	2,13	1,140	23
	Brain	2,11	1,203	75
	Adventure	2,14	1,243	84
	Total	2,13	1,208	182
S [Long-term objectives]	Experience	3,91	,793	23
	Brain	3,43	1,199	75
	Adventure	3,80	,967	84
	Total	3,66	1,064	182
S [Cultural exchange between players]	Experience	3,26	1,322	23
	Brain	2,95	1,283	75
	Adventure	3,26	1,407	84
	Total	3,13	1,348	182
	Experience	3,17	1,154	23

S [Social possibilities to interact with other players]	Brain	2,68	1,275	75
	Adventure	2,90	1,359	84
	Total	2,85	1,304	182

Origem		gl	F	Sig.	Eta parcial quadrado
social	Esfericidade considerada	4	44,775	,000	,200
	Greenhouse-Geisser	3,451	44,775	,000	,200
	Huynh-Feldt	3,566	44,775	,000	,200
	Limite inferior	1,000	44,775	,000	,200
social * Cluster	Esfericidade considerada	8	,809	,595	,009
	Greenhouse-Geisser	6,901	,809	,579	,009
	Huynh-Feldt	7,132	,809	,582	,009
	Limite inferior	2,000	,809	,447	,009
Erro(social)	Esfericidade considerada	716			
	Greenhouse-Geisser	617,674			
	Huynh-Feldt	638,332			
	Limite inferior	179,000			

Origem	gl	F	Sig.	Eta parcial quadrado
Intercepto	1	1549,697	,000	,896
Cluster	2	1,454	,236	,016
Erro	179			

Estimativas

Medida: MEASURE_1

social	Média	Erro Erro	Intervalo de Confiança 95%	
			Limite inferior	Limite superior
1	2,644	,109	2,428	2,859
2	2,127	,106	1,917	2,336
3	3,712	,092	3,531	3,894
4	3,156	,118	2,924	3,389
5	2,920	,114	2,695	3,144

Comparações por Método Pairwise

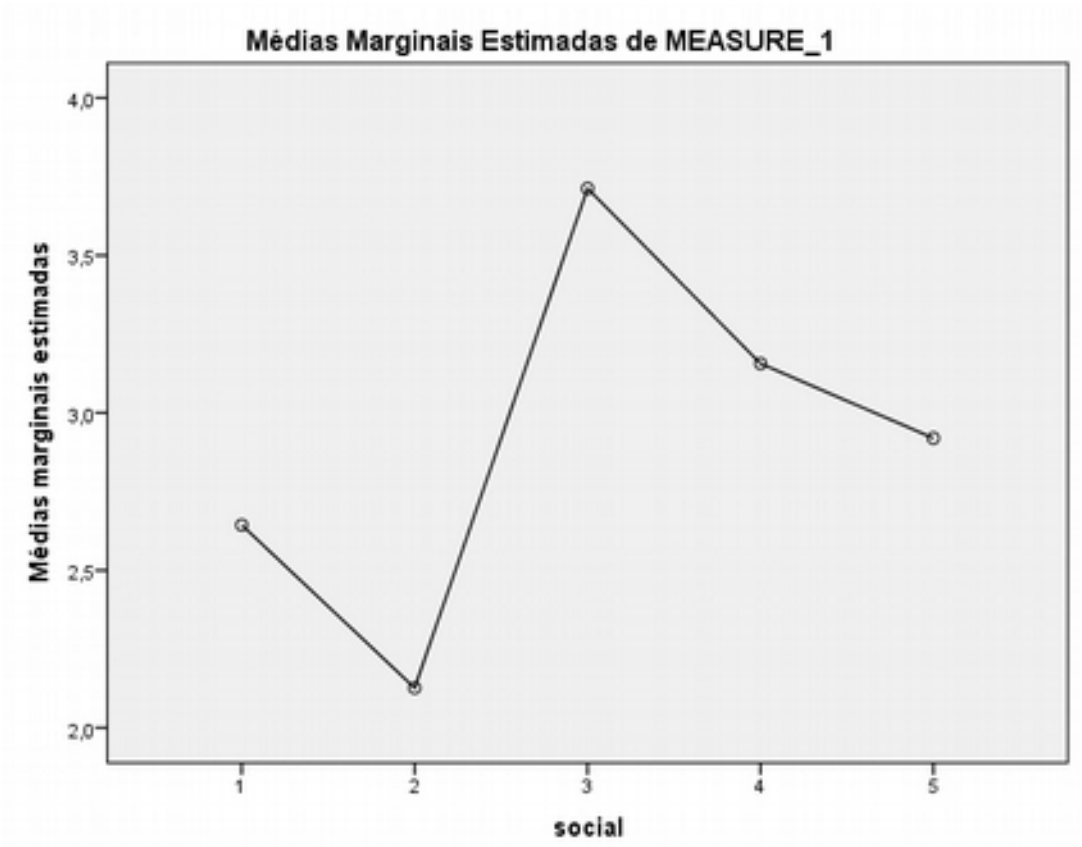
Medida: MEASURE_1

(I) social	(J) social	Diferença média (I-J)	Erro Erro	Sig.[b]	95% Intervalo de Confiança para Diferença[b]	
					Limite inferior	Limite superior
1	2	,517*	,123	,000	,169	,866
	3	-1,069*	,137	,000	-1,459	-,679
	4	-,513*	,126	,001	-,871	-,155
	5	-,276*	,089	,022	-,528	-,023
2	1	-,517*	,123	,000	-,866	-,169
	3	-1,586*	,126	,000	-1,944	-1,227
	4	-1,030*	,141	,000	-1,429	-,630
	5	-,793*	,126	,000	-1,152	-,434
3	1	1,069*	,137	,000	,679	1,459
	2	1,586*	,126	,000	1,227	1,944
	4	,556*	,134	,001	,174	,938
	5	,793*	,131	,000	,421	1,164
4	1	,513*	,126	,001	,155	,871
	2	1,030*	,141	,000	,630	1,429
	3	-,556*	,134	,001	-,938	-,174
	5	,237	,104	,234	-,058	,531
5	1	,276*	,089	,022	,023	,528
	2	,793*	,126	,000	,434	1,152
	3	-,793*	,131	,000	-1,164	-,421
	4	-,237	,104	,234	-,531	,058

Baseado em médias marginais estimadas

*. A diferença média é significativa no nível ,05.

b. Ajustamento para diversas comparações: Bonferroni.


Médias Marginais Estimadas de MEASURE_1
Médias marginais estimadas
4,0
3,5
3,0
2,5
2,0
1
2
3
4
5
social