Adaptation into a Game: Involvement and Presence in Four Different PC-Games

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ABSTRACT
This study examines psychological adaptation in four different game-worlds. The concept of adaptation is used to describe the way the players willingly form a relationship with the physical and social reality provided by the game. It is measured by using a model consisting of two psychologically relevant constructs: involvement and presence. These constructs and the seven measurement scales measuring them have been factor-analytically extracted in a large (n=2182 subjects) data collected both via the Internet and in the laboratory. Several background variables were also studied to further understand the differences in players' adaptation. The results showed different adaptation profiles among the four studied games. They also showed the challenges related to measure such multidimensional constructs. Especially, the difference in the nature of the presence in each game would have left unnoticed if only simple measures had been used. Thus, the need for multivariate measurement of game adaptation is emphasized in order to gain full advantage of the concept in future game design.

Author Keywords
Games, User experience, Psychology, Measurement

INTRODUCTION
"(Digital) games have been with us a long time. Games are big business. Games are on the cutting edge of innovation." [36] Clearly, there is an increasing need to understand better the different aspects of digital games. Weather the aim is to sell and market more games, to understand the ways they impact the players as well as the society in general or to design and test new games, we can benefit greatly from understanding the psychology of the digital games.

Although digital games have been with us since the early 60's, the psychological research on digital games is still in its infancy [9]. Currently there are studies that focus on experiential aspects of gaming. These studies represent the pioneering work as far as the psychological aspects of the digital games are concerned. They are typically based on the qualitative interviews of the players with the aim of providing knowledge of the issues that are important in creating a gaming experience. The data obtained from these interviews offer a good qualitative ground for the present quantitative study of the gaming experience.

Gaming Experience

Realness
Computer and video games are said to be engaging because they are capable of providing visually realistic and life-like 3D –environments for action [19]. Realistic high-quality graphics are also found to be one of the most important game characters in empirical studies [37]. Besides graphics, also sound and setting are considered essential to form a high degree of realism in games [29, 37].

In addition to perceptual realness also functional realness or physical consistency in the game-world is required for impressive gaming experience [6]. Inconsistencies in the game-world make it difficult to learn the rules of the game and hinder the focus of attention towards the game [29]. Consistency is especially important in the beginning of the gaming; as the players become more immersed into a game lot of inconsistencies go unnoticed [4].

Attention and Arousal
Concentration and focusing attention into the game-world are often mentioned by the players when they talk about "the feeling of immersion" caused by the game [3, 29]. Alongside attention also emotional responses have been claimed to be related to feeling of immersion. Players have reported that certain game features such as audio [29], visual, task at hand as well as the plot [3] are all likely to affect their emotions and thus create the feeling of immersion.

These findings are in line with the earlier psychological studies concerning human attention. Attention is intimately linked with the human cognitive-affective system especially in arousal regulation: high level of emotional arousal enables greater allocation of attentional resources into a particular event or stimuli [11]. That is why the attentional system can be considered as a bridge between perception, cognition and action [15].

Transportation
Besides attention and emotions, players describe immersive gaming experience, for instance, as "to be in a game" [18] or "you feel like you're there" [3]. These feelings emerge from the same game features as attention and emotions, that is, audio, graphics as well as the plot. Brown and Cairns [3, p.1299] call the sum of these features an atmosphere and

emphasize the relevance "of the game features to the actions and location of the game characters" in creating this atmosphere. Also a good introduction phase and a strong narrative are considered important in order to get into the story and to become a part of it [29].

To be immersive a game must be able to create an atmosphere that is capable of mentally transporting a player away from the natural environment. Game atmosphere can be seen as another reality. It is a place created with digital graphics and sound. It provides a physical place or a stage in which the player is the actant participating in the action [10]. This physical space also includes social characters and social interaction between the characters. Social interaction with other characters form the events based on the narrative and plot which immerse the player even more as the game proceeds [5].

Narrative & Plot

Since the early 60's the games have developed dramatically. The traditional player-computer duals such as digital chess or "Space War" have been developed into large-scale adventures which provide a player the role of a hero in the story. Allies or opponents are controlled by sophisticated game engines or even other players over the Internet connection. Passive and linear stories have been integrated into active and non-linear games which have become interactive entertainment [22].

To get fully immersed into a hero's role in a game, players need to empathize with their character and the situation [3]. Players need to engage into the role provided by them and act accordingly. Especially in online games the player also needs a sense of togetherness in order to collaborate with others and to meet the common goals set by the game [1, 26]. Narrative and plot form the storyline of the game, which has its peaks and valleys. Together with the physical features (graphs, sounds) the storyline makes the game interesting for the player and affects strongly the formation of the gaming experience [5, 22].

Motivation and Involvement

Players must invest time, effort and attention into a game to get any experience from it [3, 5]. A game should be more interesting than the surrounding environment to draw players' focus of attention [22]. Motivation to attend and perceive certain stimuli enables their entry into the conscious interpretation. These perceptions entering into the awareness are the raw material of our conscious experience [8].

The participants in the above mentioned qualitative studies were experienced and regular players of the digital games. In their case the motivation is not an issue. However, the will to play is likely to have more levels beyond the initial motivation weather to play or to quit playing [5]. Besides, along the emotions and cognitions, motivation is considered a fundamental psychological factor in the formation of an experience [7]. Because of this it should be studied more deeply in the gaming context.

There are already studies concerning the various reasons to play [38], but a better understanding is needed about the source, energy and direction of the motivation in order to understand gaming experience. In this study the motivation in the subjective player-game relationship is studied based on players' personal relevance and interest, which form the involvement structure [14].

Model for Game Adaptation

The players, game designers and researchers talk about immersion as they refer to the experience received from gaming [3, 5, 29]. A good gaming experience is thought to consist of at least the following psychological aspects: perceptual as well as physical realism, it is motivating and involving enough to draw the focus of attention and elicit emotional feelings and it has a capability of creating a feeling of a place/space in which the action as well as the social interaction within a narrative takes place.

We have developed a psychological measurement model that integrates these perceptual-attentive, cognitive-affective as well as motivational aspects of a gaming experience [21, 34]. Our current focus is on the adaptation process, which describes the way the players willingly form a relationship with a digital game [31]. The theoretical base of the model lies on the psychological studies concerning involvement and the sense of presence.

Involvement construct is a central and well established concept in the field of buyer behavior studies [2]. The sense of presence has been studied in a variety of mediated environments, for example virtual environments, movies and television as well as in gaming [24, 25, 33, 34]. Presence locates the user into a mediated world, and establishes a particular relationship between the user and a machine [16]. The research on presence is founded both theoretically and empirically, and it provides a valid framework to study gaming experience in digital game-worlds [17].

Our model of game adaptation is composed of 83 variables that have been factor-analytically extracted form a large data (n=2182 subjects) into eight measurement scales (see Figure 1). For the sake of simplicity, in Figure 1 these 83 variables are represented in 15 uni-dimensional scales used in our previous studies [21, 34]. For further information concerning the origin and previous use of the variables the reader is referred to [31-34].

Seven of these measurement scales form two distinct but correlative dimensions of adaptation: involvement and presence. We have tested and applied the adaptation model earlier in the laboratory with two different games and two different display conditions [33]. Here we go trough the theoretical foundation of our model and show how it is related into digital gaming.

Involvement

Involvement is used to measure the level of relevance based on inherent needs, values and interests of the perceiver towards a certain object [40]. It is defined as a continuum of

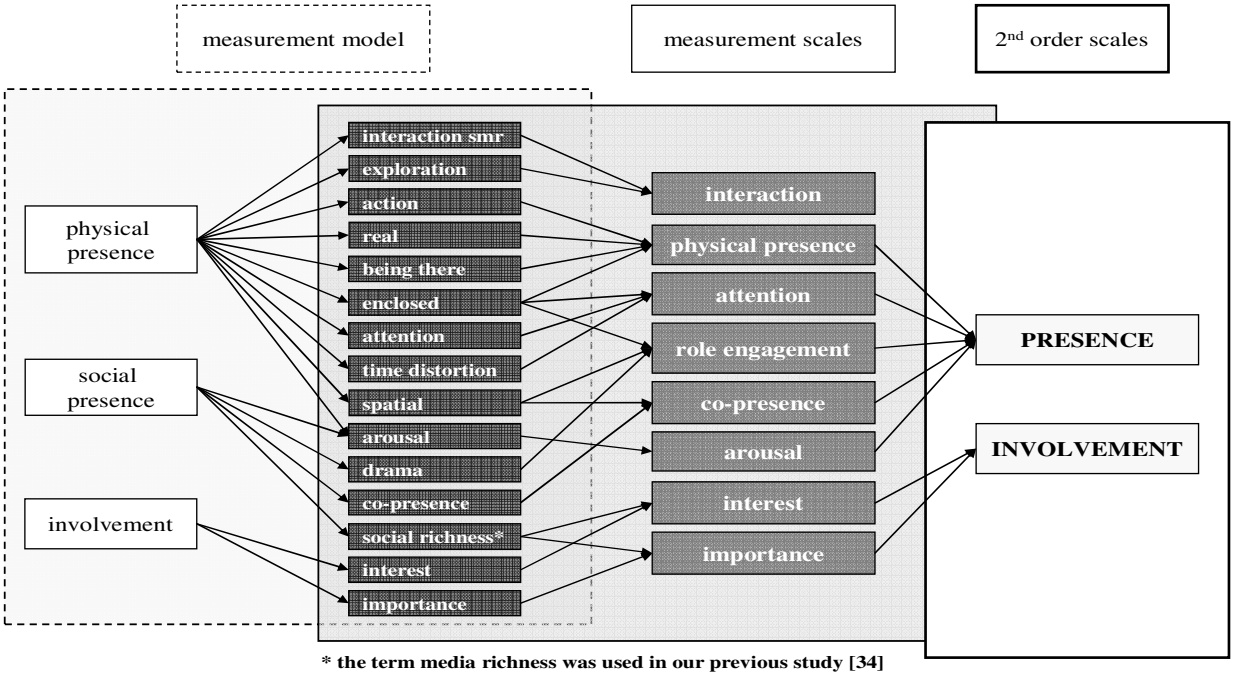


Figure 1. The measurement model and measurement scales for game adaptation.

unobservable state of motivation, arousal or interest towards a particular situation or stimulus [20].

Involvement includes two distinct but closely related dimensions: importance and interest [14]. Importance is dominantly a cognitive dimension concerning the meaning and relevance of the stimulus (e.g., it matters to me), whereas interest is composed of emotional and value-related valences, such as "it was exciting" [23]. A flu drug can be considered as an example: it is neither important nor interesting for a healthy person, it is important but not interesting for those having flu and it should be both important and interesting for those medical students taking an exam on drugs.

In our model both importance and interest measurement scales were extracted. These two scales formed an involvement dimension in a 2nd order analysis. **Interest** scale considers the game as interesting, exciting and lively. **Importance** scale measures, for example, how meaningful, relevant, close, personal and sensitive the studied games are. By using these two aspects of involvement we will see how personally relevant, meaningful and significant the studied games are. These inherent needs and values are describing the nature of the player-game relationship and act as motivational source and energy directing players' behavior in the game-world.

Presence

The perceptual-attentive and cognitive aspects of a digital experience have been included into a concept of the sense of presence (http://www.temple.edu/ispr/). There are already studies, in which the structure of physical presence has been factor analytically extracted in digital game-worlds [24, 31].

Physical Presence & Interaction

Lombard and Ditton [13] provided the following three components to study physical presence in mediated environments: **attention** (psychological immersion), **perceptual realness** (naturalness, ecological validity) and **spatial awareness** (transportation, engagement). This threefold construct has also been confirmed in previous factor analytical studies [12, 24, 31]. These all are central in any human-computer interaction, which aims at creating a meaningful interaction space between the user and a machine.

The range and consistency of the physical interaction is an integral part of both the gaming experience [5, 29] and the sense of presence [13]. Some authors even consider it as the only determinant of the presence experience [39]. Besides variables measuring the experienced activity in a game-world (e.g., I had real motion sensations) variables measuring the evaluation of the game-world's interactivity in terms of its speed, mapping and range [28] were included into our measurement mode. Also another feature of interaction, players' evaluation concerning the ability to explore the game-world, was included into the model.

Social Presence

Besides physical presence, a mediated environment with social content is also likely to elicit the sense of social presence. In the Lombard and Ditton's [13] explication, social presence was composed of social richness (intimacy-immediacy), social realism and co-presence (shared space). These aspects correspond well to social features found in digital games. **Social richness** is "the extent to which a medium is perceived as sociable, warm, sensitive, personal or intimate" [13, p.4]. **Social realism** refers to the sense of similarity between real and game-world objects, people and

events. In gaming the perceived drama and plot and engagement to own role in the storyline fit well in to this aspect of social presence. **Co-presence** is the feeling of being and acting there in a game-world together with other agents.

Presence in Adaptation Model

Altogether four measurement scales measuring different aspects of presence were extracted. **Physical presence** – scale describes a feeling of being transported into a real, live and vivid place. It combines Lombard and Dittons' [13] perceptual realness and spatial awareness components. Their third component **attention** forms a scale of its own in the model.

Two measurement scales for different aspects of social presence were also extracted. **Co-presence** includes the feeling of sharing a place with others and being active in there. **Role engagement** describes how captivated and enclosed a player was into the role provided by the storyline and narrative. It integrates the drama and role taking aspects of the Social realism -component [13] as well as attentional aspects of an experience.

Together physical and social presence measurement scales formed the presence dimension in 2nd order analysis. Besides these four scales also a measure of **emotional arousal** (e.g., active, stimulated vs. passive, unaroused) was included into the 2nd order presence dimension. The measurement scale of **interaction** was omitted from the 2nd order analysis because it did not load on either of the two factors. One reason for this could be the nature of the scale: it is more of a cognitive evaluation of the certain game-world features than a reported perceptual experience [24]. The experiential feelings of interaction (e.g., I had real motion sensations) loaded into the physical presence scale.

Presence: Measurement Issues

In this study we show that, for example, presence is a multidimensional construct that needs to be measured with multivariate analysis methods. The concept of presence can be seen as a so called latent true score that cannot be directly reached [35]. It can be understood by measuring the observed variables of its underlying components.

Slater [27] gives an example of this sort of a psychological phenomenon: colorfulness of a day. As people are asked how colorful their day was, it was found that it has something to do with having a good, pleasant, but not a frustrating day. These all represented the different dimensions or components of a made-up concept: colorfulness of a day. Together these components represent the meaning of the concept to the participants, something that can be named for example as colorfulness of a day.

Slater's example also shows how people can understand complex and many-faced phenomena in various ways. That is why question items including unfamiliar or many-faced concepts should not be used in surveys or interviews. That is also why single questions or simple scales hardly reach the true nature of a multidimensional phenomenon. The results of this study show how the simplification of a multidimensional presence construct, that is, the use of second order scale would have left essential aspects concerning the unique nature of the presence in each game unnoticed.

METHODS

Participants and Studied Games

To study adaptation in four different games, the following games were analyzed: an offline single player first-person shooter (FPS) Half-Life 2 (HL2), an online multiplayer FPS Counter Strike: Source (CS), an offline single player 3rd person action adventure (3rd person AA) Star Wars: Knight of the old republic (KOTOR) and a massively multiplayer online role-playing game (MMORPG) World of Warcraft (WOW).

Besides being the four largest games reported in our Internet -data, these four games also represent well the variety of game-worlds available today. Included were three different genres, online and offline contexts as well as 3rd person and 1st person perspectives. The two FPS's, an offline HL2 and an online CS are run by the same game engine technology, that is, Valve's Source®.

240 subjects (60 in each game group) were randomly selected from the larger sample (n=1912) collected via the Internet. Participants of the online survey were asked to recall one particular gaming session and fill in the EVE – Experience questionnaire (EVEQ-GP) keeping that session in mind. It was recommended to fill in the questionnaire right after a playing session. EVEQ-GP has been used to measure and study user experience both in virtual environments [32] and in digital game-worlds [31, 33, 34]. To inhibit the variation caused by the gender and different platforms only male PC-players were included into this study.

Half-Life 2

The following description of the HL2 is found from http://www.half-life.com/overview.html: "By taking the suspense, challenge and visceral charge of the original, and adding startling new realism and responsiveness, *Half-Life 2* opens the door to a world where the player's presence affects everything around him, from the physical environment to the behaviors even the emotions of both friends and enemies. The player again picks up the crowbar of research scientist Gordon Freeman, who finds himself on an alien-infested Earth being picked to the bone, its resources depleted, its populace dwindling. Freeman is thrust into the unenviable role of rescuing the world from the wrong he unleashed back at Black Mesa. And a lot of people - people he cares about - are counting on him." HL2 was named, for instance, a Metacritic's 2004 PC Game of the Year. In 2005 the PC-gamer magazine evaluated it the best game ever made.

Counter Strike: Source

Valve (http://storefront.steampowered.com) introduces the first part of its best-seller FPS flowingly:"Play the world's number 1 online action game. Engage in an incredibly realistic brand of terrorist warfare in this wildly popular team-based game. Ally with teammates to complete strategic mis-

sions. Take out enemy sites. Rescue hostages. Your role affects your team's success. Your team's success affects your role."

In Source –version of this popular game, "Valve has taken a large selection of the maps from the previous CS versions and recreated them for the Source® engine. According to Metacritics (www.metacritic.com):"Counter-Strike modifies the multiplayer aspects of "Half-Life" to bring it a more team-oriented game-play. Counter-Strike provides the player with an experience that a trained counter-terrorist unit or terrorist unit experiences."

Star Wars: Knights of the Old Republic

KOTOR game is based on the Star Wars movies produced by the Lucas Arts. Lucas arts introduce this game developed by Bioware flowingly: "immersive, action-packed *Star Wars* role-playing experience with customizable and evolving playable characters". Players can choose from nine customizable characters to build a party of three adventurers. Journey is said to span seven different worlds in which fast paced mini-games, such as racing swoop bikes, or manning turret guns take place (http://www.lucasarts.com/products/swkotor). KOTOR was the winner of over 40 'Game of the Year' awards in 2003.

World of Warcraft

"World of Warcraft is an online role-playing experience set in the award-winning Warcraft universe. Players assume the roles of Warcraft heroes as they explore, adventure, and quest across a vast world. Being "Massively Multiplayer," World of Warcraft allows thousands of players to interact within the same world. Whether adventuring together or fighting against each other in epic battles, players will form friendships, forge alliances, and compete with enemies for power and glory. A dedicated live team will create a constant stream of new adventures to undertake, lands to explore, and monsters to vanquish. This content ensures that the game will never be the same from month to month, and will continue to offer new challenges and adventures for years to come." (http://www.worldofwarcraft.com/)

Involvement and Presence Scales

The seven factor scores (see Figure 1) measuring involvement and presence used in this study are formed in a Principal axis factor analysis with oblique direct Oblimin rotation (delta=0) conducted to a sample (n=2182) that has been collected from both the laboratory experiments (n=270) and an Internet survey (n=1912). These scores are composed of 83 items measuring different aspects of involvement and presence. The reliability coefficients (Cronbach's alpha) of the scores ranged between 0.64-0.90.

To further study these factors a 2nd order factor analysis was conducted. This analysis resulted 2nd order involvement and presence factors, which form a two dimensional adaptation model. For further information concerning the forming of the adaptation model, extraction of the factor scores and the origin as well as the previous use of the items the reader is referred to [31-34].

Besides the involvement and presence scales the differences between the games were also examined in following background variables: age, duration of the game exposure, prior experience concerning the played game, playing frequency in general and the size of the display used.

Data analysis

All the statistical comparisons were made by using SPSS 13.0 statistical program. The difference between the four games in five presence scales was further analyzed with a direct multivariate discriminant analysis.

RESULTS

Background

First the background variables of the four different groups were examined. The players of the CS were younger (M=18.5 years, Sd=5.9) than the players of the HL2 (M=20.8, Sd=6.4), KOTOR (M=21.0, Sd=5.1) and WOW (M=21.4, Sd=6.6) (Anova, $F(3,236)=2.75$, $p<0.05$). CS (M=101.5, Sd=66.1) was also played shorter period of time as compared to HL2 (M=166.5 minutes, Sd=144.0), KOTOR (M=176.0, Sd=136.5) and WOW (M=186.3, Sd=116.9) (Anova, $F(3,196)=5.91$, $p<0.01$). The games did not differentiate on the size of the display used (M=17,92 inches, SD=1,28). Both the online games were played more frequently (i.e., daily) than the offline games (χ^2 (9)=20,82, $p<0.05$). On the other hand, the players of the offline games reported to be more experienced to play their game than the online gamers (χ^2 (6)=13,99, $p<0.05$).

Adaptation Space: 2nd Order Involvement and Presence

First the difference between the gaming groups was examined in an adaptation space formed by 2nd order involvement and presence scales, which were extracted in our previous study [31] (see Figure 2). Both FPS –games CS and HL2 were less involving than MMORPG WOW and 3rd person AA KOTOR (Anova, $F(3,236)=12.81$, $p<0.001$). These findings were supported when the importance and interest scales forming the 2nd order involvement were inspected separately.

As the Figure 2 shows, the games elicited an equal amount of the sense of presence. However, the 2nd order presence scale is a multidimensional measure of both the physical as well as social presence and further analyzes was conducted to find out weather there were differences in the nature of the presence between the games. Thus, the five presence components, physical presence, co-presence, arousal, attention, and role engagement, forming the 2nd order presence scale were further examined in a direct discriminant function analysis.

Presence Space

A direct discriminant function analysis (DISCRIM) was carried out using the five measurement scales forming the 2nd order presence as predictors of membership in four game groups. Since DISCRIM is highly sensitive to both univariate and multivariate outliers they were both detected and significant outliers were transformed [30].

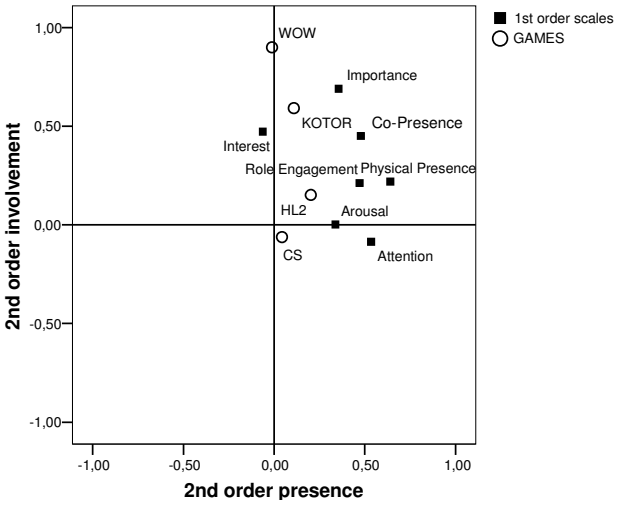


Figure 2. Games and 1st order scales plotted into a 2nd order adaptation space.

Three discriminant functions were calculated with combined $\chi^2(15) = 153.91$, $p < 0.001$. After removal of the first function the association between the studied groups and predictors was still significant, $\chi^2(8) = 61.38$, $p < 0.001$. Thus, the analysis produced two significant discriminant functions. These two significant functions accounted for 62,5% and 33,4% respectively, of the between group variability. The loading matrix of the correlations between the predictors and discriminant functions is presented in Table 1.

Table 1 shows that the first function discriminates between co and physical presence. The first function is named as Physical – Co-Presence. In the one end of the second function is role engagement and opposite of that arousal and attention. This function discriminates between action and narrative.

The clear difference between the games "inside" the 2nd order presence scale is presented in Figure 3. The reported presence is composed of different components in each of the games. Online and offline games are separated by the nature of presence: Online games being more on the co-presence side and offline games in physical presence side. 1st person and 3rd person games are separated by the second function, narrative-action. The direction of the CS is clearest towards arousal and attention and KOTOR is the closest to the role engagement. Although HL2 belongs to a FPS- genre it shows more tendencies towards MMORPG and 3rd person AA as compared to other FPS CS.

The classification of the participants into separate groups was not the main aim of this study, but it was examined in order to find out how well the presence scales classify groups as compared to the classification done by a chance.

The classification results indicated that 54,2% of the original grouped cases were correctly classified. This is well above to the 25% that would have been classified by the chance alone. The stability of the classification was checked in cross-validation. The cross-validation dropped the correctly classified cases to the 53,3%. This indicates a good level of consistency in the classification scheme.

Table 1. Results of discriminant function analysis of the presence scales.

Predictor Variable	Function		
	1	2	3
CO-PRESENCE	**0,69**	-0,05	0,46
ROLE ENGAGEMENT	-0,05	**0,78**	0,03
PHYSICAL PRESENCE	-0,31	0,12	**0,51**
AROUSAL	-0,03	-0,32	**-0,46**
ATTENTION	-0,15	-0,30	**0,42**
Canonical correlation	0,57	0,45	0,18
Eigenvalue	0,48	0,26	0,03

DISCUSSION

The aim of this study was to examine PC gaming experience and especially adaptation in four different PC-games. The games were played both online and offline. The male players' adaptation was studied with a measurement model that has been developed in our previous study [31]. This model has been applied into a gaming context [33] and the current study further validates the model. Here we also show the need for multidimensional measurement models in the study of complex psychological phenomena.

The adaptation model is composed of two distinct but correlative dimensions: involvement and presence. They are both theoretically and empirically well established in their own research fields. Although the theoretical foundations of our model is based on the consumer and media research it covers well the qualitative findings made and beliefs held

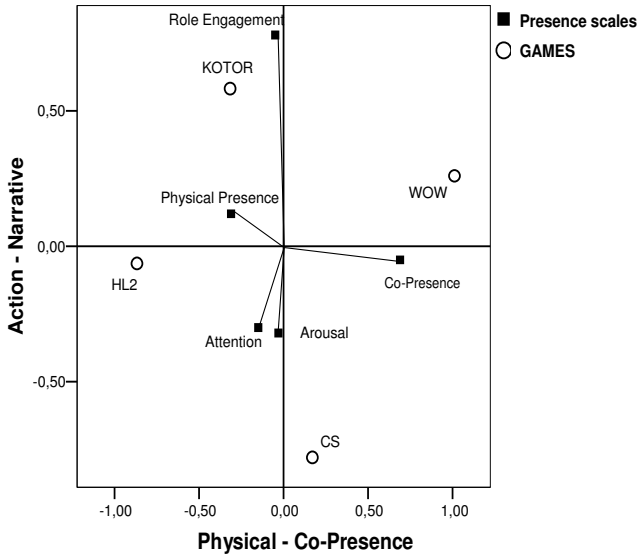


Figure 3. Plots of the group centroids and five predictive scales on two discriminant functions.

among the players and designers of the digital games. The results show that the fundamental psychological components, such as emotions, cognitions and motivation [7] should be considered in order to understand gaming experience.

Involvement

The results indicate that involvement in MMORPG and 3rd person AA was higher as compared to the both FPS's. It is possible that the level of involvement has been affected by the younger age of the FPS players as well as the shorter period of time spent in gaming. This was especially clear in CS, which is more of a match with strict goals, rules and timing than an adventure that could last for days, such as WOW.

Besides the level of involvement also the nature of the social interaction in these two online games is quite an opposite. CS is about team-play and it consists of short action filled periods but WOW is building up a character and its social status in a community. It should be stressed that the differences in the level of involvement do not discriminate the superiority between the games. It reflects the psychological player-game relationship and describes its qualitative and quantitative variation. The following discussion of the presence further clarifies this relationship.

Presence

The use of our 2nd order presence scale presented problems that are faced as overly simple or compressed scales are used to study a multi-dimensional construct. The results indicated that all the games elicited an equal and fairly high level of presence. The use of this type of a scale would have left the essential differences between the games unnoticed. As the scales were examined separately the unique presence profile for each game was revealed. This sort of a profile will provide, for example a game designer useful information concerning how a particular game-feature affected the gaming experience. Above all, the information will be more accurate as compared to a simple measures that only indicate weather a player experienced presence or not.

The nature of the presence was different in all the games. Both online games CS and WOW were high in co-presence but CS leaned more on attention and arousal as compared to WOW which was higher on role engagement. Although offline HL2 was run by the same game engine than CS its presence came mainly from the naturalness and sense of space. The other offline game, KOTOR was closest to the role engagement.

All in all the results show how presence in different games is experienced. MMORPG is about co-presence and role engagement, online FPS is about attention-arousal and co-presence. Offline FPS is about physical presence, attention and arousal and offline 3rd person AA is about role engagement and physical presence.

Adaptation

Two main ways to mentally adapt into a digital game was found. High social interaction, build-up role and strong drama seem to be linked with higher personal relevance, meaning and value. The close relationship between involvement and social interaction was also found in our adaptation –model [31] in which co-presence and importance scales cross-loaded in a 2nd order analysis.

The studied FPS's indicated another way to adapt into a game: task-oriented, straight-forward and arousing action is likely to lead into a higher allocation of attentional resources [11], which also hooks the players. If, for instance, drama aspects are added into an action game the level of involvement is likely to increase, as in a case of HL2. The longer time spent playing the game is also likely to increase the level of involvement and lower the intensity of the arousal-attention –couple.

Adaptation process can be seen as a crucial part of the gaming experience. It shapes the way the game is experienced. Since playing digital games is voluntarily it is likely that the above adaptive experiences are desired and they serve certain purposes on the behalf of the players.

The Usefulness of the Game Adaptation Construct

The aim of this study was not to show that co-presence in online games is higher that in offline games. The aim of this study was to provide a measurement tools that are both theoretically and methodologically sound to study the basis of the gaming experience. Current study showed how adaptation differentiated between FPS's, 3rd person AA and MMORPG. The adaptation into a, for example, strategy game would most probably be something different but still in the reach of the tool presented in this study.

The game adaptation model clarifies the heterogeneous set of concepts used in the young field of the psychology of the digital gaming. As the games are designed and sold to the players it is worth to know how the players attain and maintain a long lasting relationship with a product. The psychological dynamics of this relationship become clearer as components forming the constructs such as game adaptation are considered in a design phase of a digital game.

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